Naval Networks: The Dominance of Communications in Maritime Operations

Edited by
David Stevens

SEA POWER CENTRE - AUSTRALIA
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2007 King-Hall Naval History Conference Proceedings
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Sea Power Centre – Australia
The Sea Power Centre - Australia was established to undertake activities to promote the study, discussion and awareness of maritime issues and strategy within the Royal Australian Navy, the Department of Defence and civil communities at large. Its mission is:

- to promote understanding of sea power and its application to the security of Australia’s national interests
- to manage the development of RAN doctrine and facilitate its incorporation into ADF joint doctrine
- to contribute to regional engagement
- contribute to the development of maritime strategic concepts and strategic and operational level doctrine, and facilitate informed forces structure decisions
- to preserve, develop, and promote Australian naval history.

A listing of Centre publications may be found at the back of this volume.

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Notes on Contributors

LIEUTENANT COMMANDER ANDREA ARGIRIDES, RANR
Andrea Argirides has a Masters in Defence Studies from the Australian Defence Force Academy, and a Masters of Assessment and Evaluation from the University of Melbourne, including a Postgraduate Degree in Classics and Archaeology. She also holds a number of other qualifications from Oxford University, the University of Melbourne, Swinburne University and Trinity College London. Since joining the RAN as a naval intelligence officer, Andrea has completed a number of postings, including an 18-month appointment at Government House, Canberra, as the Navy Aide-de-Camp to the Governor General. From July 2005 to December 2006; she joined the Sea Power Centre - Australia as the Senior Research Officer, and as Staff Officer Maritime Doctrine Development from January - December 2006. From December 2007 to July 2008, Andrea completed a tour of duty in Iraq as an embed with the 18th Airborne Division, Multi National Corps Iraq, Baghdad. Andrea is currently posted at Headquarters Joint Operations Command in the Directorate of Operational Intelligence Support. Andrea is also working towards a PhD with the School of Historical and Philosophical Studies, Centre for Classics and Archaeology, University of Melbourne

CAPTAIN RICHARD ARUNDEL, RAN (RTD)
Richard Arundel joined the Navy in 1947 and specialised in Signal Communications in 1959. His postings included Fleet Communication’s Officer, Officer-in-Charge Signal’s School, Director of Naval Communications, Deputy Director Joint Service Communications, and Defence Attaché Paris and Berne. In HMAS Vampire his communications team was awarded the Fleet Efficiency Award for Communications two years running. He lives in Queensland and the south of France with his French bride.

AIR COMMODORE NORMAN ASHWORTH (RTD)
Norman Ashworth was born in Sydney and educated in Perth. He entered the RAAF College, Point Cook, in January 1951, graduating as a General Duties pilot in December 1954. Relevant highlights of his RAAF career are service with and command of No 10 (Maritime Reconnaissance) Squadron, a member of the Directing Staff at the Joint Services Staff College and Chief of Staff at Operational Command (now Air Command). Since retiring from the RAAF in January 1988, he has taken a close interest in defence affairs and in the history of the RAAF during World War II. He has written and published two books, one dealing with the wartime history of No 461 Squadron (which was involved in the Battle of the Atlantic) and the other with the higher command of the RAAF during the war.
JOHN BRADFORD

John Bradford graduated in Mathematics, with honours, from Leicester University in 1958, joining the (then) Weapons Research Establishment at Salisbury, South Australia in 1960. For the first ten years of his defence science career, he was involved in analogue and digital computer mathematical modelling studies of guided weapon systems. From the early 1970s, until his retirement in 1992, he conducted a number of computer studies designed to determine the likely air defence capability of ships proposed for the RAN force structure.

Shortly after retiring, he began researching the Imperial awards system as it applied to the RAN in World War II – in particular, posthumous recognition issues. In 2000, he self-published a book profiling RAN heroism in the first Darwin raid of 19 February 1942 that also examined why, unlike Pearl Harbor, the Japanese, carrier-based strike force did not include torpedo bombers. Some months later, consequences of this omission were to have a bearing on the loss of the corvette, HMAS Armidale. Aspects of John’s naval history research have been published in the US Naval Institute magazine, Naval History; The Australian Defence Force Journal; The Journal of Australian Naval History; and the Australian War Memorial magazine, Wartime.

DR TIM COYLE

Dr Tim Coyle is an international arms control adviser to the Australian Government and has been an active naval reserve officer for over 20 years. In his naval role he has worked in intelligence-related appointments, largely as an analyst. His civilian background includes over 20 years in the international airline industry and as an analyst in regional political-military affairs.

Tim holds a Bachelor of Arts (Hons) from the Australian National University and received his PhD from the University of New South Wales in March 2007. His PhD thesis topic was ‘A History of Air Navigation in the Royal Australian Air Force and its Predecessor, the Australian Flying Corps 1914-1945’. Tim’s interests include Russian language, early-20th century architecture, and air and maritime history.

COMMANDER STEPHEN DRYDEN, RAN

Commander Stephen Dryden joined the RAN in 1987. After graduating from the Australian Defence Force Academy, he completed sea training in a variety of Fleet Units, including deploying in HMA Ships Success and Adelaide for Operation DAMASK I. Other appointments as a junior officer included instructional duties at the Royal Australian Naval College, an appointment as the Executive Officer of the Darwin-based patrol boat, HMAS Cessnock, and an appointment as a maritime intelligence watch officer in the then Maritime Intelligence Centre-Sydney. In 1998, he attended and graduated from the RAN Principal Warfare Officer’s (PWO) course.

A surface warfare and communications specialist, he commenced an appointment as the Signals Communication Officer in HMAS Brisbane in 1999. In 2000 he assumed CTG OP SO duties and in January 2001, was promoted to lieutenant commander.
Following the decommissioning of *Brisbane* later that same year, he was posted as a member of the Directing Staff at the PWO Faculty, HMAS *Watson*. In 2003, he joined Maritime Headquarters as the Deputy Director Maritime Communications and Information Systems (N63). In this role he was also a member of the Major Fleet Unit Sea Training Group, which was awarded a Group CDF Commendation. In mid-2003, Lieutenant Commander Dryden was appointed as the Commissioning Executive Officer of the *Anzac* class frigate HMAS *Ballarat*, joining her in December that year. His two-year tenure aboard *Ballarat* included a period in which he was appointed in temporary command. Graduating from the Australian Command & Staff Course in 2006, he was promoted to commander in January 2007. Following an appointment as the Commander Fleet Communications (N6) at Fleet Headquarters he took up a US Navy exchange appointment at Central Command.

**PROFESSOR BRUCE A ELLEMAN**


**DONALD L ENDICOTT, JR**

Don Endicott is a senior advisor to the Space and Naval Warfare Systems Center Pacific and Space and Naval Systems Command (SPAWAR) under a Re-employed Annuitant appointment since retiring from federal service as a member of the Senior Executive Service in 2009. From 2004 through 2009, he was Head of the Communication and Information Systems Department at SSC Pacific with responsibilities for research, development, test, and evaluation programs in the areas of communications and information systems. These activities encompass design, development, integration, networking, and deployment of Naval, Joint, and Coalition strategic and tactical systems. The department is comprised of 700 technical and administrative professionals with an annual Navy Working Capital Fund reimbursable operating budget of $260 million. Donald concurrently served as FORCEnet Technical Director for Communications and SPAWAR National Competency Lead for Communications and Networks. He also served as SPAWAR’s Deputy Chief Engineer in 2008 and 2009, the senior civilian engineering position in the Systems Command.

Mr Endicott received his Bachelor of Science degree in Mechanical Engineering Magna Cum Laude from the University of California, Santa Barbara in 1972 with recognition as a four-year Regents Scholar. He received his Master of Science degree in Mechanical Engineering from San Diego State University (1976). In 1990,
he was the Navy’s Sloan Fellow at the Massachusetts Institute of Technology, where he received a MS in Management (1991). Donald served as head of the Computer Sciences Division (1987-93) and Information Systems and Network Technology Division (1999) at SSC San Diego. He served as Program Manager for High Performance Networks at the Defense Advanced Research Projects Agency (1993-94) and Chief Information Officer of the Naval Command, Control and Ocean Surveillance Center (1994-97). His professional accomplishments include conception and development of the Defense Research and Engineering Network and leadership of the Department of Navy Information Technology Infrastructure Architecture on behalf of Department of the Navy Chief Information Officer.

Mr Endicott has received the Navy Superior Achievement Award (2009), two Navy Meritorious Achievement Awards (1992, 2001), four Special Act Awards, three SPAWAR Lightning Bolt Team Excellence Awards, and he was recognised as a Federal Computer Week ‘Top 100’ Federal Information Technology Professional (1999). He is a member of the Institute of Electrical and Electronics Engineers.

**DR NORMAN FRIEDMAN**

An internationally known strategist and naval historian, Dr Friedman spent more than a decade at a major US think-tank, and another as consultant to the Secretary of the Navy. He has been concerned throughout his career with the ways policy and technology intersect, in fields as disparate as national missile defence and mobilisation policy. He has consulted for the US Navy and the US Department of Defense and for major corporations. His more than 35 books include an award-winning account of US Cold War strategy and histories of British and Commonwealth cruisers and destroyers. He contributes a monthly column on world naval developments to the *US Naval Institute Proceedings*, writes articles for journals worldwide and is responsible for a commercial data base of world missiles. Dr Friedman holds a PhD from Columbia University, New York. He lectures widely on defence issues in forums such as the National Defence University, the Naval War College and the Royal United Services Institute. His current focus is on Network Centric Warfare; he recently published *Network Centric Warfare: How Navies Learned to Fight Smarter in Three World Wars*. In 2011, he published a book on unmanned combat air vehicles.

**CAPTAIN GEORGE GALDORISI, USN (RTD)**

George Galdorisi is Director of the Decision Support Group at Space and Naval Warfare Systems Center Pacific where he helps direct the Center’s efforts in strategic planning and corporate communications. Prior to joining SSC Pacific, he completed a 30-year career as a naval aviator, culminating in 14 years of consecutive experience as executive officer, commanding officer, commodore and chief of staff.
He is a 1970 graduate of the United States Naval Academy and holds a Masters Degree in Oceanography from the Naval Postgraduate School and a Masters Degree in International Relations from the University of San Diego. He graduated from both the Naval War College’s College of Command and Staff, and the College of Naval Warfare. In 1994 he received the Naval War College’s Admiral John Hayward Award for Academic Achievement. Additionally, he is a graduate of MIT Sloan School’s Program for Senior Executives.

**COLONEL TIM GELLEL**

Colonel Tim Gellel is a serving officer with the Australian Army whose key postings have included the Defence Intelligence Organisation, the Special Air Service Regiment and as Commanding Officer of the Australian Defence Force School of Languages. Colonel Gellel has also served on operations in Kuwait and Afghanistan. A Japanese linguist, he has been fortunate to have served in four postings in Japan, including as Australia’s Defence Attaché.

He is a graduate of both the Japan Ground Self-Defense Force Command and General Staff College, and the Japan National Institute for Defense Studies. He holds a Master of Arts Degree (International Relations), a Bachelor’s in Professional Studies, a Graduate Diploma in Information Management and Analysis, and is also a graduate of the Australian Defence Force School of Languages. His interests include military history, and his first book, on Australia’s military contribution to World War I, is in the process of being published through the Australian Army History Unit.

**DR GREGORY P GILBERT**

Dr Greg Gilbert worked with the Department of Defence (Navy) from 1985 to 1996, as a naval design engineer, and as a Defence contractor between 1997 and 2002. Since the early 1990s he has specialised in the archaeology and anthropology of warfare. He completed a PhD on ‘Weapons, Warriors and Warfare in Early Egypt’ from Macquarie University in 2004, and subsequently he was a postdoctoral research associate with the Department of Archaeology, University of Durham (UK).

Dr Gilbert is attached to the Australian National University as a visiting fellow. After a period as Senior Research Officer in the Sea Power Centre – Australia, he is now Deputy RAAF Historian at the Air Power Development Centre.

**DR RICHARD GIMBLETT**

Dr Richard Gimblett is the Command Historian of the Royal Canadian Navy. His previous uniformed service (1975-2001) included ships of various classes on both coasts, including as Combat Officer of HMCS *Protecteur* for operations in the Persian Gulf during the 1990-91 Gulf War, following which he co-authored the official account of Canadian participation in that war, published under the title *Operation FRICTION: The Canadian Forces in the Persian Gulf, 1990-1991*. His last in-uniform appointment was to the Directorate of Maritime Strategy, to assist in developing
**Leadmark: The Navy’s Strategy for 2020.** As an independent consultant (2001-06) he has been invited to appear before both the Senate and House of Commons defence committees, and contributed naval analyses for the Conference of Defence Associations, the Council for Canadian Security in the 21st Century, and the Royal Canadian Military Institute. His writings on contemporary Southwest Asia naval operations, networked operations and transformation have received national recognition. He is a contributing author to *The Seabound Coast: The Official History of the Royal Canadian Navy, Volume I, 1867-1939*, and is the editor of the recently published commemoratory volumes *The Naval Service of Canada, 1910-2010: The Centennial Story* and (with Michael Hadley) *Citizen Sailors: Chronicles of Canada’s Naval Reserves*. His various affiliations include: Past President of the Canadian Nautical Research Society, Past President of the Ottawa Branch of the Naval Officers Association of Canada, Adjunct Professor of History at Queen’s University; Research Fellow with the Centre for Foreign Policy Studies at Dalhousie University, Visiting Faculty of the Canadian Forces College and Research Associate with the Canadian Forces Leadership Institute.

**DR ERIC GROVE**

Eric Grove became a civilian lecturer at the Royal Naval College, Dartmouth in 1971 and left at the end of 1984 as Deputy Head of Strategic Studies. After a short period with the Council for Arms Control he became a self-employed strategic analyst and defence consultant, teaching at The Royal Naval College Greenwich and the University of Cambridge, and working with the Foundation for International Security. Under the latter’s auspices in 1988, he founded the Russia-UK-US naval discussions and confidence building talks that, with the recent addition of France, still continue. In 1993, he joined the University of Hull where he became Reader in Politics and International Studies and Director of the Centre for Security Studies. In 2005, Dr Grove moved to the University of Salford where he is now Director of the Centre for International Security and War Studies. His many books include: *Vanguard to Trident* (the standard work on post-1945 British naval policy), *The Future of Sea Power, Sea Battles in Close-Up, Fleet to Fleet Encounters, The Price of Disobedience* (the latest study of the Battle of the River Plate) and *The Royal Navy Since 1815*. He was a co-author of the original edition of the official publication *BR1806: The Fundamentals of British Maritime Doctrine*. Dr Grove is a Vice President of the Society for Nautical Research, a Member of Council of the Navy Records Society and a Fellow of the Royal Historical Society. He frequently appears on radio and television as a commentator on naval, defence and security issues, past and present.

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Kenneth J Hagan, recently retired as Professor of Strategy and War at the US Naval War College in Monterey, California. He enjoys the rank of Professor and Museum Director Emeritus at the US Naval Academy, Annapolis, Maryland, and is a retired

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**COMMANDER D HOBBS, MBE, RN (RTD)**
David Hobbs is a well known author and naval historian. He has written 11 books, the latest of which is *The British Pacific Fleet*, and has co-authored nine more. He writes for several journals and magazines and in 2005 won the award for the Aerospace Journalist of the Year, Best Defence Submission, in Paris. He also won the essay prize awarded by the Navy League of Australia in 2008.

He lectures on naval subjects worldwide and has been on radio and TV in several countries.

He served in the Royal Navy from 1964 until 1997 and retired with the rank of commander. He is qualified as both a fixed and rotary wing pilot and his log book contains 2300 hours with over 800 carrier landings, 150 of which were at night.

**DR ALEXANDER KALLONIATIS**
Alexander Kalloniatis completed a PhD in Theoretical Particle Physics in 1992 at the University of Adelaide. He spent some eight years as a postdoctoral research fellow in German research and higher education institutions: the Max-Planck Institute for Nuclear Physics in Heidelberg (1992-95), the Institute for Theoretical
Physics III of the University of Erlangen-Nuremberg (1996-2000) and the Institute for Theoretical Physics, University of Dortmund (2000). Throughout this period he developed techniques for studying quark theories of subatomic matter. This culminated in receiving an Australian Research Fellowship from the Australian Research Council to undertake a further five years of research at the Centre for the Subatomic Structure of Matter, where his interests broadened into other areas of nuclear physics and mathematics with an emphasis on analytic techniques for non-linear dynamical systems.

Throughout this time Dr Kalloniatis retained and developed an interest in military history, looking at periods from the Roman and Byzantine empires through to World War I. Combining travel in Europe with his various academic trips he visited sites of battles such as the D-Day landings at Normandy and the bridge over the river Tiber, the Milvian, across which a key Roman battle was fought in 312 AD. Reflection on this battle in light of physics ideas inspired the original ideas underpinning the research in his presentation. Since starting at the Defence Science and Technology Organisation (DSTO) in October 2005, he has developed these ideas further. He is a member of DSTO’s Joint Operations Division, based in Canberra, researching joint command and control processes and concepts.

PROFESSOR MICHAEL T MCMASTER
Michael T McMaster, is a Professor of Joint Maritime Operations at the US Naval War College in Monterey, California. He served 22 years in the US Navy as a surface warfare officer and is a retired commander. In 2006 and 2007, he jointly presented two papers with Professor Hagan on the history of US naval strategy at sea power conferences of the RAN, both of which have now been published. He contributed to and served as associate editor of the 30th Anniversary Edition of In Peace and War: Interpretations of American Naval History, an anthology spanning the entire course of US naval history. He was an editor for Strategy in the American War of Independence. With Professor Hagan he was co-author of ‘His Remarks Reverberated From Berlin to Washington’ in the United States Naval Institute Proceedings in December 2010 and ‘The Anglo-American Checkmate of Germany’s Guerre de Course, 1917-1918’, to be published in 2012 as a chapter of Guerre de Course Case Studies. He and Professor Hagan presented a paper on the US Navy in World War I at the Fifth Conference of the International Society for First World War Studies in 2009, and in 2011 they delivered a paper titled ‘William Sowden Sims and Five Classmates in the Old Navy’s School House, 1876-1880’ at the United States Naval Academy Naval History Symposium. Currently, as co-author with Professor Hagan, he is writing a biography of Admiral William S Sims.

PROFESSOR PAUL MITCHELL
Professor Paul Mitchell is a Professor at the Canadian Forces College in Toronto. He was the Director of Academics there between 2000 and 2004 where he helped to establish the Masters in Defence Studies for the Command and Staff Course
taught there. He also worked at Singapore’s S Rajaratnam School for International Studies between 2005 and 2007. His research interests are in US military policy and operations, especially in the area of transformation and emerging operational concepts. In 2003, he was awarded the US Naval Institute’s Literary Award for the best article on surface naval warfare for his article in the Naval War College Review, ‘Network Centric Warfare and Small Navies, is there a Role?’. He has published in Journal of Strategic Studies, Armed Forces and Society, US Naval Institute Proceedings, US Naval War College Review and the Canadian Military Journal. In 1997, he co-edited Multinational Naval Cooperation and Foreign Policy in the 21st Century. He has taught at Queen’s University, Kingston; Dalhousie University, Halifax; the Pearson Peacekeeping Centre; Royal Military College; and the Canadian Forces College. He has a PhD from Queen’s University in Political Studies and a MA from King’s College London in War Studies.

DR ALEXEY D MURAVIEV
Dr Alexey D Muraviev is a an award-winning senior lecturer in International Relations and Strategic Studies in the School of Social Sciences and Asian Languages at Curtin University, Perth, Western Australia. He is a Coordinator of the International Relations and National Security programs and the founder and Director of the Strategic Flashlight forum on national security and strategy at Curtin. He has about 50 publications on matters of national and international security.

His research interests include problems of modern maritime power, contemporary defence and strategic policy, Russia’s strategic and defence policy, Russia as a Pacific power, transnational terrorism, Australian national security, and others.

Alexey is a member of the Australian Member Committee, Council for Security Cooperation in the Asia-Pacific region; member of Russia-NATO Experts Group; member of the International Institute for Strategic Studies, London; member of the Research Network for Secure Australia, member of the Australian Institute of International Affairs, Western Australia branch; Royal United Services Institute of Western Australia; and other organisations and think-tanks. In 2007, 2008, 2009 and 2010, the Australian Research Council College of Experts has nominated Dr Muraviev as an ‘expert of international standing’. He advises members of state and federal governments on foreign policy and national security matters and is frequently interviewed by state, national and international media.

BOB NICHOLLS
Following his retirement from naval service in the 1980s, Bob Nicholls had long experience of writing books on Australian military history. His last work, published in 2012, was War to War: Australia’s Navy 1919-1939, an account of the preparedness of the RAN for the outbreak of war in 1939. Mr Nicholls passed away in 2011.
DR PETER OVERLACK
Dr Peter Overlack held a DAAD (German Academic Exchange) Scholarship and a University of Queensland Postgraduate Award. He completed his Doctoral thesis in 1995 on the East Asian Cruiser Squadron as an instrument of German world-policy in the decade before 1914, and implications for Australasian defence. He has had articles published in *Australian Journal of Politics and History, Journal of Australian Studies, Journal of Military History, Journal of Pacific History, Journal of Strategic Studies, Journal of the Australian Naval Institute, The Historian* and *War & Society*. He has also contributed to several books and has participated in international conferences on naval history. He currently teaches History at St John’s Anglican College in Brisbane.

PROFESSOR SCM PAINE
Professor Sarah Paine is a professor in the Strategy & Policy Department at the US Naval War College. She has a PhD in Russian and Chinese History from Columbia University. She is author of *Imperial Rivals: China, Russia and Their Disputed Frontiers* and *The Sino-Japanese War of 1894-1895: Perceptions, Power and Primacy*; co-editor of *Naval Blockades and Seapower: Strategies and Counter-Strategies, 1805-2005*, *Naval Coalition Warfare: From the Napoleonic War to Operation Iraqi Freedom*, and *Naval Power and Expeditionary Warfare: Peripheral Campaigns and New Theaters in Naval Campaigns*; editor of *Nation Building, State Building, and Economic Development: Case Studies and Comparisons*; and co-author of *Modern China: Continuity and Change, 1644 to the Present*.

DR IAN PFENNIGWERTH
Dr Ian Pfennigwerth spent 35 years in the RAN in seagoing, staff and overseas postings, including command of the guided missile destroyer HMAS *Perth* (II) and duty as the Defence Attaché in Beijing. After retiring to Port Stephens, NSW, he was awarded his PhD by the University of Newcastle in 2005. Ian has edited the Naval Historical Society of Australia’s *Journal of Australian Naval History* for five years and is a visiting fellow at the Australian Defence Force Academy in Canberra. He has written and published a series of books on Australian naval history, including *A Man of Intelligence*, *The Australian Cruiser Perth*, *Tiger Territory*, *Missing Pieces*, *The RAN and MacArthur* and *In Good Hands*.

MICHAEL RICHARDSON
Michael Richardson is a visiting senior research Fellow at the Institute of South East Asian Studies (ISEAS), in Singapore. Part of his recent research has focused on maritime security. His book, *A Time Bomb for Global Trade: Maritime-related Terrorism in an Age of Weapons of Mass Destruction*, was published by ISEAS in May 2004. His most recent reports, including one on maritime-related terrorism and another on the Proliferation Security Initiative, are available on the ISEAS website, (www.iseas.edu.sg) under Research, Trends in Southeast Asia. He is currently doing research into energy and sealane security in the Indo-Pacific region.
Based in Singapore since 1971, Mr Richardson was the Asia Editor of the International Herald Tribune from 1987 until 2001, with broad responsibility for writing Asia-Pacific news and analysis, and coordinating the International Herald Tribune’s reporting from the region.

Until August 2003, he was the International Herald Tribune’s Senior Asia-Pacific Correspondent. Since then, his columns and commentaries on regional security issues have appeared in various newspapers. Born in 1943, he was educated at schools in Australia and at Oxford University in Britain, where he graduated with honours in Modern History.

PROFESSOR NAM RODGER
Nicholas Rodger was educated at Ampleforth and University College, Oxford, where he earned his DPhil degree in 1974 with a thesis on ‘Naval policy and cruiser design, 1865-1890’. He served for 17 years at the Public Record Office as an Assistant Keeper of Public Records, 1974-91. After resigning from the public service, he began work on A Naval History of Britain with the support of the National Maritime Museum, the Navy Records Society and the Society for Nautical Research. The museum gave him the title of Anderson Senior Research Fellow, 1992–98. In 1999, he moved to the University of Exeter as Senior Lecturer, and the following year was appointed Professor of Naval History. In 2008, he left Exeter to become a senior research fellow of All Souls College, Oxford. He is a Fellow of the Royal Historical Society (1980) and was elected as a Fellow of the British Academy in 2003. He is currently engaged in writing a comprehensive history of the Royal Navy. The first two volumes: Safeguard of the Sea and Command of the Ocean have both been highly critically acclaimed. He received the Duke of Westminster’s Medal for Military Literature in 2005, and was also the winner of the 2005 British Academy Book Prize. In 2011 he received the first Hattendorf Prize for Naval History from the US Naval War College.

PROFESSOR JOHN R SCHINDLER
Professor John Schindler is professor of national security affairs at the US Naval War College in Newport, Rhode Island, where he also teaches courses on intelligence. He is chairman of the Partnership for Peace Consortium’s Combating Terrorism Working Group, and a senior fellow at Boston University’s International History Institute. He previously served for nearly a decade with the National Security Agency as an intelligence analyst and counterintelligence officer. He has also been an officer in the US Navy and was the command historian for the Naval Security Group, the US Navy’s cryptologic and information warfare agency. He has published widely on issues of intelligence, terrorism, and military history, and holds a PhD in European and Military History from McMaster University, and has previously taught at the Joint Military Intelligence College and the National Cryptologic School.
DR DAVID M STEVENS
David Stevens is a former naval officer, a graduate of the University of New South
Wales (PhD) and the Australian National University (MA), and currently Director
of Strategic and Historical Studies within the Sea Power Centre - Australia. He
has contributed articles and essays to many publications and his work has been
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Ashore and in the Air with John Reeve; Strength through Diversity: The Combined
Naval Role in Operation STABILISE; and Presence, Power Projection and Sea Control:
The RAN in the Gulf 1990-2009 with John Mortimer. The Naval Records Society
has also published his ‘Australian Naval Defence: Selections from the Papers and
Correspondence of Captain WHCS Thring, 1913-1934’, in The Naval Miscellany Vol
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Dr Gary Weir is Chief Historian at the US National Geospatial Intelligence Agency
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learned studies for NGA. His study Forged in War: The Naval-Industrial Complex
and American Submarine Construction, 1940-1961 received the 1993 Theodore and
Franklin D Roosevelt Naval History Prize as the best book in naval history published
that year. More recently, his book An Ocean in Common: Naval Officers, Scientists,
and the Ocean Environment, 1919-1961, a study of the US Navy’s role as participant
and patron in oceanographic research, was selected by the Organization of American
Historians as a recipient of the Richard W Leopold Prize for 2002.

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history, Chinese sea power, the Chinese diaspora and Sun Tzu’s Art of War. He
is also the author or editor of two books on the Chinese overseas, Ambition and
Identity: Chinese Merchant-Elites in Colonial Manila, 1885-1916 and The Chinese in
the Caribbean. Recently, he has been involved in editing China’s Future Nuclear
Submarine Force, a conference volume entitled War and Virtual War and he is
completing a new translation of Sun Tzu’s Art of War.
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>5thBS</td>
<td>5th Battle Squadron</td>
</tr>
<tr>
<td>AA</td>
<td>Anti-Aircraft</td>
</tr>
<tr>
<td>AAW</td>
<td>Anti-Air Warfare</td>
</tr>
<tr>
<td>ACH</td>
<td>Area Combined Headquarters</td>
</tr>
<tr>
<td>ACNB</td>
<td>Australian Commonwealth Naval Board</td>
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<tr>
<td>ADF</td>
<td>Australian Defence Force</td>
</tr>
<tr>
<td>ADM</td>
<td>Admiralty Files, Public Record Office, Kew, London</td>
</tr>
<tr>
<td>AGB</td>
<td>Allied Geographical Bureau</td>
</tr>
<tr>
<td>AIB</td>
<td>Allied Intelligence Bureau</td>
</tr>
<tr>
<td>AIF</td>
<td>Australian Imperial Force</td>
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<tr>
<td>APAN</td>
<td>Asia Pacific Area Network</td>
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<tr>
<td>ASUW</td>
<td>Anti-Surface Warfare</td>
</tr>
<tr>
<td>ASW</td>
<td>Anti-Submarine Warfare</td>
</tr>
<tr>
<td>ATIS</td>
<td>Allied Translation and Interpreting Section</td>
</tr>
<tr>
<td>AWACS</td>
<td>Airborne Warning and Control System</td>
</tr>
<tr>
<td>AWA</td>
<td>Amalgamated Wireless Australasia</td>
</tr>
<tr>
<td>AWD</td>
<td>Air Warfare Destroyer</td>
</tr>
<tr>
<td>AWM</td>
<td>Australian War Memorial</td>
</tr>
<tr>
<td>BCE</td>
<td>Before Common Era</td>
</tr>
<tr>
<td>BCF</td>
<td>Battle Cruiser Fleet</td>
</tr>
<tr>
<td>BFEM</td>
<td>Battle Force Email</td>
</tr>
<tr>
<td>BPD</td>
<td>Barrels Per Day</td>
</tr>
<tr>
<td>BPF</td>
<td>British Pacific Fleet</td>
</tr>
<tr>
<td>BR</td>
<td>Book of Reference</td>
</tr>
<tr>
<td>BuShips</td>
<td>Bureau of Ships</td>
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<tr>
<td>C2</td>
<td>Command and Control</td>
</tr>
<tr>
<td>C3I</td>
<td>Command, Control, Communications and Intelligence</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>C4ISR</td>
<td>Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance</td>
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<td>C&amp;CS</td>
<td>Code and Cipher Section</td>
</tr>
<tr>
<td>CENTCOM</td>
<td>Central Command</td>
</tr>
<tr>
<td>CENTRIXS</td>
<td>Combined Enterprise Regional Information Exchange System</td>
</tr>
<tr>
<td>CINC</td>
<td>Commander in Chief</td>
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<tr>
<td>CINCFES</td>
<td>Commander in Chief Far East Station</td>
</tr>
<tr>
<td>CIS</td>
<td>Communications and Information Systems</td>
</tr>
<tr>
<td>CNS</td>
<td>Chief of Naval Staff</td>
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<tr>
<td>CNO</td>
<td>Chief of Naval Operations</td>
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<tr>
<td>COCOM</td>
<td>Coordinating Committee for Multilateral Export Controls</td>
</tr>
<tr>
<td>COIC</td>
<td>Combined Operational Intelligence Centre</td>
</tr>
<tr>
<td>COMINT</td>
<td>Communications Intelligence</td>
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<td>COMSEC</td>
<td>Communications Security</td>
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<td>COMNAVFE</td>
<td>Commander US Naval Forces Far East</td>
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<tr>
<td>COP</td>
<td>Common Operating Picture</td>
</tr>
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<td>COWAN</td>
<td>Coalition Operational Wide Area Network</td>
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<td>CSF</td>
<td>Combined Support Force</td>
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<td>CSG</td>
<td>Carrier Strike Group</td>
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<td>CTF</td>
<td>Combined Task Force</td>
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<td>CVBG</td>
<td>Carrier Battle Group</td>
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<td>CWC</td>
<td>Composite Warfare Commander</td>
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<tr>
<td>DHH</td>
<td>Directorate of History and Heritage, Ottawa</td>
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<tr>
<td>DNC</td>
<td>Director of Naval Communications</td>
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<tr>
<td>DNI</td>
<td>Director of Naval Intelligence</td>
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<tr>
<td>EOD</td>
<td>Explosive Ordnance Disposal</td>
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<tr>
<td>F2C2</td>
<td>Friendly Forces Coordination Centre</td>
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<tr>
<td>FAA</td>
<td>Fleet Air Arm</td>
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<tr>
<td>FDO</td>
<td>Fighter Direction Officer</td>
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<tr>
<td>FECB</td>
<td>Far East Combined Bureau</td>
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<tr>
<td>Abbreviation</td>
<td>Definition</td>
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<tr>
<td>FND</td>
<td>Flinders Naval Depot</td>
</tr>
<tr>
<td>FO2FES</td>
<td>Flag Officer Second-in-Command Far East Station</td>
</tr>
<tr>
<td>FRUMEL</td>
<td>Fleet Radio Unit Melbourne</td>
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<tr>
<td>GCCS</td>
<td>Global Command and Control System</td>
</tr>
<tr>
<td>GHQ SWPA</td>
<td>General Headquarters, South-West Pacific Area</td>
</tr>
<tr>
<td>GIG</td>
<td>Global Information Grid</td>
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<tr>
<td>GIUK</td>
<td>Greenland-Iceland-UK</td>
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<tr>
<td>GWOT</td>
<td>Global War On Terror</td>
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<tr>
<td>HEIC</td>
<td>Honourable East India Company</td>
</tr>
<tr>
<td>HIJMS</td>
<td>His Imperial Japanese Majesty’s Ship</td>
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<td>HMAS</td>
<td>His/Her Majesty’s Australian Ship</td>
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<tr>
<td>HMNZS</td>
<td>His/Her Majesty’s New Zealand Ship</td>
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<td>His/Her Majesty’s Ship</td>
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<td>HQ</td>
<td>Headquarters</td>
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<td>HSF</td>
<td>High Sea Fleet</td>
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<tr>
<td>HVB</td>
<td><em>Handelsverkeehrsbuch</em></td>
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<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
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<tr>
<td>IEA</td>
<td>International Energy Agency</td>
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<td>IJN</td>
<td>Imperial Japanese Navy</td>
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<td>International Force East Timor</td>
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<td>IP</td>
<td>Internet Protocol</td>
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<td>IRBM</td>
<td>Intermediate Range Ballistic Missiles</td>
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<td>JOC</td>
<td>Joint Operations Centre</td>
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<td>JTF</td>
<td>Joint Task Force</td>
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<td>KM</td>
<td>Kilometres</td>
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<td>LCA</td>
<td>Landing Craft Assault</td>
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<td>LIO</td>
<td>Leadership Interdiction Operation’</td>
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<tr>
<td>LNG</td>
<td>Liquefied Natural Gas</td>
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<td>LOSC</td>
<td>United Nations Convention of the Law of the Sea</td>
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<td>LRA</td>
<td>Long Range Aviation</td>
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<tr>
<td>LST</td>
<td>Landing Ship Tank</td>
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<td>M</td>
<td>Metres</td>
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<td>MAR</td>
<td>Maritime Systems Group</td>
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<td>MDA</td>
<td>Maritime Domain Awareness</td>
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<tr>
<td>MF</td>
<td>Medium Frequency</td>
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<td>MI-8</td>
<td>Military Intelligence Section 8</td>
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<td>NATO</td>
<td>North Atlantic Treaty Organisation</td>
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<td>NAVFOR</td>
<td>Naval Forward</td>
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<tr>
<td>NCB</td>
<td>Naval Cipher Box</td>
</tr>
<tr>
<td>NCW</td>
<td>Network Centric Warfare</td>
</tr>
<tr>
<td>NEI</td>
<td>Netherlands East Indies</td>
</tr>
<tr>
<td>NEOp</td>
<td>Networked-Enabled Operation</td>
</tr>
<tr>
<td>NGA</td>
<td>National Geospatial-Intelligence Agency</td>
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<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<td>NHC</td>
<td>Naval Historical Center, Washington</td>
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<td>NID</td>
<td>Naval Intelligence Division</td>
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<tr>
<td>NIMA</td>
<td>National Imaging and Mapping Agency</td>
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<td>NIO</td>
<td>Naval Intelligence Organisation</td>
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<tr>
<td>NIPRNET</td>
<td>Non-Classified Internet Protocol Router Network</td>
</tr>
<tr>
<td>NKPA</td>
<td>North Korean People’s Army</td>
</tr>
<tr>
<td>NM</td>
<td>Nautical Miles</td>
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<td>NOIC</td>
<td>Naval Officer in Charge</td>
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<tr>
<td>NTPF</td>
<td>Near-Term Positioning Force</td>
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<tr>
<td>MEB</td>
<td>Marine Expeditionary Brigade</td>
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<tr>
<td>MPS</td>
<td>Maritime Prepositioning Ships</td>
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<tr>
<td>OODA</td>
<td>Observe-Orientate-Decide-Act</td>
</tr>
<tr>
<td>OTC</td>
<td>Officer in Tactical Command</td>
</tr>
<tr>
<td>P&amp;O</td>
<td>Peninsula &amp; Orient</td>
</tr>
<tr>
<td>PACOM</td>
<td>Pacific Command</td>
</tr>
<tr>
<td>PAO</td>
<td>Public Affairs Officer</td>
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<tr>
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<td>Description</td>
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<tr>
<td>PPI</td>
<td>Plan Position Indicator</td>
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<tr>
<td>PWO</td>
<td>Principal Warfare Officer</td>
</tr>
<tr>
<td>QoL</td>
<td>Quality of Life</td>
</tr>
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<td>RAAF</td>
<td>Royal Australian Air Force</td>
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<td>RAF</td>
<td>Royal Air Force</td>
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<tr>
<td>RAN</td>
<td>Royal Australian Navy</td>
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<tr>
<td>RANHFV</td>
<td>RAN Helicopter Flight Vietnam</td>
</tr>
<tr>
<td>RANR</td>
<td>RAN Reserve</td>
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<tr>
<td>RANVR</td>
<td>RAN Volunteer Reserve</td>
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<tr>
<td>RCN</td>
<td>Royal Canadian Navy</td>
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<tr>
<td>RFA</td>
<td>Royal Fleet Auxiliary</td>
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<td>RMA</td>
<td>Revolution in Military Affairs</td>
</tr>
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<td>RN</td>
<td>Royal Navy</td>
</tr>
<tr>
<td>RNZN</td>
<td>Royal New Zealand Navy</td>
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<tr>
<td>ROE</td>
<td>Rules of Engagement</td>
</tr>
<tr>
<td>SEAL</td>
<td>Sea, Air, Land</td>
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<tr>
<td>SECNAV</td>
<td>Secretary Of The Navy</td>
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<tr>
<td>SIGINT</td>
<td>Signals Intelligence</td>
</tr>
<tr>
<td>SIPRNET</td>
<td>Secret Internet Protocol Router Network</td>
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<tr>
<td>SLBM</td>
<td>Submarine-Launched Ballistic Missile</td>
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<tr>
<td>SLOC</td>
<td>Sea Lines of Communication</td>
</tr>
<tr>
<td>SNA</td>
<td>Soviet Naval Aviation</td>
</tr>
<tr>
<td>SO(I)</td>
<td>Staff Officers (Intelligence)</td>
</tr>
<tr>
<td>SOSUS</td>
<td>Sound Surveillance System</td>
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<tr>
<td>SSBN</td>
<td>Nuclear-Powered Ballistic Missile Submarine</td>
</tr>
<tr>
<td>TBS</td>
<td>Talk Between Ships</td>
</tr>
<tr>
<td>TCP</td>
<td>Technical Cooperation Program</td>
</tr>
<tr>
<td>TF</td>
<td>Task Force</td>
</tr>
<tr>
<td>TRUMP</td>
<td>Tribal Update and Modernization Program</td>
</tr>
<tr>
<td>UAE</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>UHF</td>
<td>Ultra High Frequency</td>
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<tr>
<td>UK</td>
<td>United Kingdom</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>USAAF</td>
<td>United States Army Air Force</td>
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<tr>
<td>USAF</td>
<td>United States Air Force</td>
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<tr>
<td>USMC</td>
<td>United States Marine Corps</td>
</tr>
<tr>
<td>USN</td>
<td>United States Navy</td>
</tr>
<tr>
<td>USS</td>
<td>United States Ship</td>
</tr>
<tr>
<td>USSR</td>
<td>Union of Soviet Socialist Republics</td>
</tr>
<tr>
<td>VHF</td>
<td>Very High Frequency</td>
</tr>
<tr>
<td>WeCAN</td>
<td>Web-Centric Anti-submarine warfare Net</td>
</tr>
<tr>
<td>W/T</td>
<td>Wireless Telegraphy</td>
</tr>
<tr>
<td>WWI</td>
<td>World War I</td>
</tr>
<tr>
<td>WWII</td>
<td>World War II</td>
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</table>
The essays in this book have been selected from papers originally presented at the fifth King-Hall Naval History Conference held in Canberra in July 2007. The conference was sponsored by the Royal Australian Navy in conjunction with the University of New South Wales at the Australian Defence Force Academy. This book could not have been produced without the support, not only of the contributors, but also of a variety of individuals and organisations. Particular thanks are due to General Dynamics Systems Australia, DEFCREDIT and KBR for their sponsorship.

The analysis, opinions and conclusions expressed or implied in this volume are those of the authors and do not necessarily represent the views of any national military service, department, or other government agency.
This collection of essays looks at various aspects of maritime communications; and communications - tactical, operational and strategic - lie at the heart of maritime operations.

In one sense these communications, irrespective of the medium, allow naval forces to convey information, and hence coordinate actions with one another. This should not be a revelation. Efficient and effective communication at sea has been the goal of navies for thousands of years, the requirement for rapid, real time information exchange remains as a tactical and operational foundation, and communications and information systems provide core elements of network warfare planning.

Yet, modern navies also face new and continuing challenges as they seek to extract maximum value from advances in information technology. One of the many such issues that are discussed herein is the requirement to work closely with other agencies. In a very real sense, navies must in future ‘network’ not only with their sister-services and long-term friends and allies, but also with many other government and non-government organisations. The ‘human network’ is not a factor that tends to generate much debate among naval professionals, but when considering the full spectrum of potential maritime operations it is a vital component.

Similarly important are the limitations of the human element in communications. As several of the authors explain, navies expend considerable resources ensuring that they can keep up with the latest technological developments, but not so apparent is an emphasis on ensuring that the systems procured remain robust in a crisis. Reticence, low-grade encryption and basic security were the bread and butter of tactical communications during World War II (WWII) and the Cold War. When the natural tendency is to expand communications traffic to meet the capacity offered, how much attention is given in today’s training regimes to clarity and conciseness? Can today’s naval commanders actually cope with the volume of information that comes down the pipe? Will current procedures fail the empirical test of war, as has too often occurred in the past? These are not questions easily answered, but the studies within these pages will offer much food for thought.

There is, of course, another aspect to maritime communications highlighted in this book, and that is communications in the purely strategic sense. When considering the business of defence it is all too easy to become sidetracked by arguments over platform capabilities and numbers. Routinely, the public security debate revolves around the specific wants of an individual service - as if these could ever be looked at in isolation. Adherents to a particular perspective tend to confuse the end with the means in ongoing arguments over land power vs air power, ships vs aircraft or troops vs technology.
These commentators are often confusing actual striking power, be it from the sea, the air or the land, with the means of mounting that striking power. In essence, the real requirement is the ability to place, when and where required, the greatest concentration of power of whatever kind is best suited for the job in hand. The arguments and case studies presented in this collection, allow us to get back to fundamentals. Further, for want of a better term, the chief among these fundamentals might be termed ‘communications power’.

Throughout Australia’s history it has been ‘communications power’ that has moved the armed forces of our nation and its allies to where they were needed and kept them sustained at their objective. Communications power placed the Australian Imperial Force in Western Europe during World War I, the Royal Australian Air Force in Bomber Command during WWII and INTERFET in East Timor in 1999.

Communications power may be a source of both strength and of weakness. Where communications power has been successfully held, grown and extended we have seen our forces triumph and the enemy rendered impotent at every level. When our communications power has failed, as happened at Singapore in 1942, we have witnessed the tragedy of our own defeat and surrender.
By reasons of geography and the limitations of technology, the main vehicle of global communications power has been, and will continue to be, the surface ship. So long as this remains the case the primary function of our own and allied sea power must be the maintenance and safeguarding of our own sea lines of communication (or more specifically the carrying ships which traverse them) and, where necessary, the denial of such sea communication to an adversary. This neatly defines the maritime strategic concept of sea control, but it also points to the use of sea power in a holistic sense; for by what platforms or instruments sea control is achieved, should not matter in the slightest. The only thing that counts is the effective performance.

Such reflections on sea power are hardly new, but as the contributors to this volume make clear, we still have much to learn from the experiences of those who have gone before. At the very least, a better understanding of our past has the potential to open windows to new perspectives on current and future problems. It is hoped that this book goes some way towards achieving that aim.
PART 1

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Setting the Scene
Communication is a daunting subject. In one sense, all naval warfare is about sea communications, about exploiting for oneself, and denying to the enemy, the sea lines of communication, the power to convey people and goods across the oceans. Indeed, the significance of communication hardly stops there, for in a general sense, communication is surely what distinguishes human society from the brute creation. Humans are social animals, our society is fundamentally based on the use of language, and communication defines who and what we are. The history of communication, therefore, embraces the whole history of humankind.

I hope it will not be thought excessively timid, however, if I decline the challenge to cover the whole of human history in this short introduction, and concentrate on communication in the sense of the exchange of information. This is a key factor in naval history, and of course in the conduct of navies today, though as a historian I shall concentrate on the historical aspect. Communication in this sense presents the interest, but also the difficulty, of embracing two sorts of history, which tend to be studied by different historians in different ways: social history, and the history of technology. Communication must be a matter of social history because all communication takes place within a social context: people, not machines, exchange information with one another, and in order to understand how and how effectively they do so, we have to dissect the social organisations within which they interact.

The problem here is that far too little social history has been written of navies in the 19th and 20th centuries, and much of what we have does not address the question of how they were organised to exchange information. For this purpose, we need studies of navies as social networks, plotting the nodes and channels of communication within them. Conventional diagrams showing lines of command and responsibility go only a part of the way to meeting this requirement, for real communication takes place in many other ways than simply up and down the chain of command.

The history of technology is equally essential to understanding communications, because information has always been transmitted by and within navies by various sorts of technologies whose limitations and possibilities govern what information can be transmitted and how. It is therefore necessary to understand the technologies to understand communication - necessary, but not sufficient. Unfortunately much technological history is written by people who believe that the technology alone explains all that needs explaining, so that naval communication can be reduced to the machinery of signal flags or wireless sets, with the human agents implicitly regarded as the servants of the technology rather than its masters. What is worse,
most of what masquerades as the history of technology is really a history of innovation, if not of invention. In the real world, however, what is invented is by definition not in use. It may come into use at a later date, if circumstances are right, but it is not in use yet. The technology which is in use is older technology, often much older, but historians tend to be uninterested in old technology. As a result we have too few studies of the practical employment of real technology in real situations. There are, for example, many studies of the introduction of steam engines in the early stages of the Industrial Revolution, but they tend to fade out around 1830 – at which date the major motive power of British industry still came from water. The period of steam’s major economic impact was the period of its fastest rate of growth, in the 1880s, while its maximum installed base was about 1920, but little has been written about steam engines in this period.2

There is one particular technological factor in communications technology that heavily affects all discussion of the subject. In the mid-19th century, a development took place that really deserves the overworked adjective ‘revolutionary’. The introduction of the electric telegraph made it possible for the first time in history to send information beyond visual range much faster than goods and people could be sent. Previously, the fastest available conveyances of information (horses, post-chaises, despatch vessels) could convey people and things at the same speed. Now a method was available which could transmit information alone much faster than anything else. This opened the completely new possibility of long-range communication, rapid and eventually almost instantaneous, which transformed naval warfare as well as much else. The challenge for the historian is to acknowledge the transformation without falling into the trap of regarding the technology itself as the only factor which mattered, and without losing sight of the social structures which alone gave the signal technology its value and its possibilities. Because speed over distance is the dominant technical characteristic of modern signalling equipment, it is commonplace to read studies that implicitly assume that the speed with which information can be transmitted, and the quantity which can be transmitted, are the only factors that matter, and that in both cases more is better. This is the result of concentrating on the signal technology without asking what it exists to do; in other words, concentrating on the equipment rather than the social networks which it links. What really matters in naval operations is that the right information should reach the right people at the right time. Speed is in some circumstances essential for this, but not in all, and volume of information may be a real disadvantage if it swamps the communication channels, overwhelming the recipients who really need only a few critical, correct facts.3

To understand how and when communication works, we need to analyse the social networks that the technology serves. The lecture on which this chapter is based may stand as a simple example. The lecture is a social communication system, using a technology (the microphone and loudspeaker) so old that it often works. It allows one speaker to address a large number of addressees at once, and it can be made
secure, but the transmitting range is very short, and communication is largely one-way. It is an excellent medium to convey ideas, but unsuitable for masses of facts or figures. Those who teach in universities will know that lectures, like the early long-wave wireless sets, work best at certain times of the day: not first thing on Monday morning. We know all this, because lectures are very familiar to us, but it may serve as an example of how to analyse less familiar and more complex social networks in order to understand how communication takes place within them. Knowing about microphones does not tell us much about lectures, as indeed looking at the technology of signalling in isolation tells us very little about real communication.

Flag signalling is undoubtedly the oldest of all naval communications technologies. From the 16th century to the 21st the technology has scarcely changed (though perhaps the Inglefield Clip and the spring-clip should be acknowledged as significant technical advances). All the signalling problems of the 18th-century Royal Navy arose from the ill-designed systems which the flag hoists served. The meaning of particular flags or hoists was made to depend on where in the flagship’s rigging they were hoisted, and what guns were fired at the same time, so that it was difficult for ships in line ahead to read the signals, and almost impossible in action. The signals themselves referred to paragraphs in the Fighting Instructions, which were loosely worded, arranged in random order, and in many cases did not convey any order. Admiral Rodney, for example, issued to his squadron in the West Indies in 1780 a new signal to be made ‘when the commander in chief means to make an attack upon the enemy’s rear’. However, he provided no guidance to the captains as to how they were to realise his intention, and when he tried it in action none of them guessed what he wanted them to do. At the same period, Lord Howe was working on his combined Signal Book and Fighting Instructions, which was adopted by the Royal Navy after the American Revolutionary War (1775-83). Howe’s signals were technically more robust and better designed, but unfortunately he rewrote the Fighting Instructions in his own impenetrable prose. The first of his Additional Fighting Instructions of 1790, for example, reads:

Limitation to place and distance in order of battle in some occasions dispensed with: The chief purpose of the establishment of a regular disposition of the ships limited to place and distance in a stated order of battle has been that they may remain as little as possible exposed in their approach to the fire of more than the particular ships corresponding in station to them in the enemy’s line, or be subject to injury from each other. But as a strict adherence thereto may sometimes be found prejudicial to the service, by restraining the captains from taking advantage of the favourable incidents which may occur in the progress of a general action, it is the object of these instructions to facilitate the means of improving similar opportunities by an authorised deviation from such restrictive appointments occasionally.
Few captains understood this, and the new signals were effectively useful only to those admirals, like Nelson, who made a habit of speaking and writing to their captains to explain their intentions in advance. Once again, studying the signals technology in isolation tells us little about its strengths and weaknesses without assessing the social organisation within which it functioned.

Another example might be the early use in World War II (WWII) of the US Navy’s Talk Between Ships (TBS) radio-telephone system. In 1942, heavy night fighting took place in the Solomon Islands between US and Australian ships, equipped with TBS, and Japanese ships that were not. Unhappily, the US Navy had fitted its ships with several TBS stations each, all using the same frequency. In the sudden crisis of night action, everyone shouted at once, the channels were swamped, and communication failed completely. The Japanese relied on the old technology of the shaded signal lamp, which gave no opportunity for excited chatter. There was nothing wrong with the TBS system itself, but the social network which it served was not well designed to use it. The TBS system as initially installed implied a ‘flat’ social structure in which a large number of equals met around a table for a leisurely discussion. It hardly needs to be said that the real social structure of a squadron of warships in action is entirely different. Once proper radio discipline and procedures had been created to match the technology to the command structure of the ships, TBS proved to be an important asset to naval warfare – especially to anti-submarine warfare, in which context the enemy (a submerged submarine) could not exploit the radiotelephone’s inherently poor security by listening to the transmissions.

In this case the problems lay more with the operators than the equipment, but it is often the case that the advantages of new technology bring their own weaknesses. The Victorians greeted the first submarine telegraph cables with rapture, but in practice they paid a high price for the ability to send signals across the oceans in a few hours. The first cables were extremely unreliable, and the signals had to be repeatedly retransmitted by operators who sometimes did not speak English. Soon after the cable reached Australia in 1872 a message was received that Britain and the USA were about to go to war – after which the line went dead for six weeks. The colonial authorities were left to make what they might of a single piece of information, which in the event turned out to be totally false. By the 1890s, Australia and most other parts of the British Empire were linked to Britain by submarine cables, not touching or crossing foreign territory, which were much more reliable and secure. Telegrams remained, however, extremely expensive, and to keep the cost down messages were kept as short as possible. Australians now enjoyed information from Britain in less than 24 hours - but it came as brief snippets, often compressed beyond the point of ambiguity, in place of the ample quantities of fact and analysis which arrived six weeks later by steamer. Speed bought advantages, but at the price of both quality and quantity. In London, ministers hoped to be able to use the telegraph to restrain what Prime Minister Lord Henry Palmerston called the *furor consularis* (wrath of the consular), but it seems that more often than not the process...
worked the other way around: ‘The calming effect upon the most excited despatch of lying unread for a month in the darkness of a mailbag was lost.’ The man on the spot fed London with his selection of information, hurrying ministers into decisions that they might not have taken had they had time to reflect, or simply presented with a fait accompli, as in the case of Queensland’s annexation of New Guinea in 1883. The Admiralty found the cable network invaluable for communicating with commanders in chief overseas. However, it could not reach them at sea, meaning times of diplomatic tension the flagship tended to be held in port, sometimes for months at a time, effectively tied to the end of the telegraph wire. Once again speed of communication was bought at a price.

For Britain, the international submarine cable network constituted an enormous strategic asset. The great majority of the world’s submarine cables were British-owned: by the early 1890s, more than half the international telegrams in the world passed daily through the London headquarters of the Eastern Telegraph Company. Moreover, Britain had a virtual monopoly of the manufacture of deep-sea telegraph cables and of the supply of gutta percha (the only satisfactory insulator), owned almost all the world’s cable ships, alone possessed the technical skill to lay and recover cables in deep water, and trained all the world’s telegraph clerks. Other countries contemplated this situation with varying degrees of disquiet, greatly sharpened by the experience of the Spanish-American and Boer wars. In the Spanish-American War (1892) the US Navy demonstrated for the first time that a belligerent could cut the enemy’s underwater cables (in this case to Cuba), albeit in very shallow water. In the Far East, however, the US squadron was totally dependent on British companies for communications (and also for coal). American admirals and business executives, who suspected that their competitors in London were reading all their telegrams, loudly demanded an all-American world cable system. During the Boer War (1899-1902), Britain forbade all coded telegrams (and for a time all telegrams not in English) to pass east of Aden, thus allowing the Germans, French and Portuguese to communicate with their colonies and diplomats only in plain language. The French, who had already discovered that telegrams from their colonies were being read in London before – sometimes a long time before – they reached Paris, were particularly unhappy. The difficulty, for France, Germany and the United States, was the extreme expense and difficulty of duplicating the British cable network with neither the industrial infrastructure nor the commercial traffic to support it. After the Spanish-American War, the United States succeeded in laying a trans-Pacific cable to Hawaii and the Philippines, but it later emerged that it was 50 per cent owned by the Eastern Telegraph Company, and another 25 per cent by the Danish Great Northern Telegraph Company which Eastern secretly controlled. Moreover, the cable was made in Britain, laid by British ships and worked by British operators.
The development of wireless communication in the early 20th century seemed to Britain’s rivals to be a particularly timely discovery, allowing them to circumvent Britain’s long-range communications monopoly. The Germans in particular, invested very heavily in powerful long-wave stations to link their overseas possessions. The key to their system was the transmitter at Kamina in Togoland. Unhappily for them, the British were fully aware of what they were doing, and within the first six weeks of World War I (WWI) had captured or destroyed Kamina and almost all the links of the German system. Henceforward German overseas communications had for the most part to pass over British cables. The famous Zimmerman Telegram episode was only one of the consequences.\textsuperscript{15}

German attempts to retaliate on British communications were few and ineffectual. The cruiser SMS \textit{Emden} raided the telegraph and wireless station on Cocos Island, but besides bringing on her own destruction by HMAS \textit{Sydney} (I), the raid achieved nothing. The German landing party cut a dummy cable but missed the real one, which was buried. They smashed the equipment, but did not know that all British telegraph stations had spare sets of equipment buried nearby. The station was transmitting again within a few hours. (Remarkably enough, almost the same thing happened with the Japanese raid of 1942. Though the island was within easy reach of Japanese forces, they did not realise that both the telegraph and the wireless direction-finding stations were still working throughout the war.)\textsuperscript{16}
By 1914, the submarine telegraph was a mature technology, but wireless was new. Historians have accordingly tended to lose interest in submarine cables – but in reality, wireless had not at all rendered cables out of date. Wireless had unique characteristics, but it could not match the cable’s security, and the capacity it had given Britain during WWI either to cut, or discreetly to read, the enemy’s communications. The British Government remained determined to maintain the imperial cable network. When the growth of the Post Office short-wave wireless network in the late 1920s threatened to bankrupt both the telegraph and the older long-wave wireless networks, the government engineered the creation of Cable & Wireless, amalgamating the Eastern Telegraph and Marconi Companies with the Post Office Wireless stations to create a combination that could keep all three systems in operation. When WWII broke out, Britain once more derived enormous strategic value from the secure communications provided by submarine cables. However, the Italians cut the eastbound cables in the Mediterranean in 1940, further sections of the network were lost to the Japanese, and until the Mediterranean cables were reconnected in 1942 a great deal of British strategic signals had to be passed by wireless, using what were subsequently discovered to be insecure ciphers. Other powers, lacking Britain’s cable network, had always been in this position. The United States did not have a transatlantic cable landing outside Britain until 1943 – and that went to Gibraltar. It was the 1943 Anglo-American agreement that gave the US Government access for the first time to a mass of diplomatic and strategic intelligence, obtained from Britain’s worldwide cable network. Only in the 1950s did American Telephone & Telegraph, financed by the US Government, finally lay the world-wide American cable network that Washington had dreamt of for 70 years – and even then the cable was manufactured in Britain and laid by British cable ships.

Cables still mattered (and still matter) because they provided security. Wireless technology revolutionised naval warfare by making it possible to communicate with ships at sea, but the experience of WWI soon revealed that wireless was radically insecure. Information now flowed in ways that had never been possible before, but it radiated to the enemy as well as its intended addressee. All naval powers suffered more or less from primitive and insecure ciphers, but in many ways a worse problem than cryptography was traffic analysis, and above all direction finding. Ciphers could be made secure, or at least relatively secure, but nothing could stop the enemy locating, and often identifying, the transmitting station. The British concluded from their experience during WWI, and the regrettably wide publicity it gained after the war due to their successful cryptanalysis, that in a future war warships at sea would use wireless as little as possible. This was the policy of the Royal Navy, but it was never possible to avoid a good deal of signalling in port, and some at sea. To the surprise and delight of the Admiralty, however, the Germans in WWII continued to signal with much freedom, convinced of the security of their ciphers, and persuaded that short-wave wireless signals could not be fixed by direction finders. Admiral Karl Dönitz as Befehlshaber der Unterseeboote (commander of
submarines) adopted a highly centralised command style, requiring all submarines at sea to report themselves at least once a day, allowing the Admiralty to maintain a plot of their positions. Particularly in the early part of the Battle of the Atlantic, when the number of German boats at sea was still quite small, the Admiralty was able to divert convoys away from submarines and ensure that many convoys were never sighted or attacked.\textsuperscript{20}

Wireless made it possible for admirals like Dönitz; his opposite number Sir Max Horton, Commander in Chief Western Approaches in Liverpool; and Sir Dudley Pound in the Admiralty, to control ships at sea in a new style of command which was at once dispersed and centralised. Previously, naval command had been the opposite: an admiral at sea had to use his initiative without support, but he also had to keep his ships within visual range of the flag in order to maintain command over them. Now a master plot assembled all information in a shore-based headquarters: a CinC at sea in the old style could not collect information in the same way without compromising his own and his ships’ positions. In March 1942, Sir John Tovey, at sea with much of the Home Fleet to cover an Arctic convoy, was obliged to ask the Admiralty to take over direct control of his scattered cruisers and destroyers. The flagship had lost the plot; only with the information available in the Admiralty Operational Intelligence Centre was it possible to keep control of an operation spread over thousands of miles of sea, conducted by ships keeping wireless silence.\textsuperscript{21} The power of wireless made it possible to control the war at sea from a central point; the weakness of wireless made it unavoidable. The disaster to convoy PQ17, dispersed on the direct order of Pound in the face of a surface threat which turned out not to exist, is often cited as ‘proving’ the evils of over-centralised control, but there was no realistic alternative to this style of command. Pound’s mistake arose from the misreading of very secret intelligence (obtained by intercepting German overland cable traffic passing through Sweden), which it would have been very dangerous to transmit by wireless to a CinC at sea, and that had to be handled centrally.\textsuperscript{22} Though in this case there was a catastrophic error of judgement, it was the fault of the individual rather than the system. Indeed such an error was least likely to occur in the Operational Intelligence Centre, an outstandingly efficient organisation which accumulated all intelligence and information to create a unified picture of the war at sea. The German Navy with its divided commands and scattered institutions never achieved anything comparable. Dönitz’s tiny submarine command, with one or two staff officers handling hundreds of boats scattered across the Atlantic, is a remarkable example of a failure to establish a social network adequate to the technical instruments available. Had Dönitz had a proper staff, with the numbers and organisation to analyse and exploit the masses of information generated by modern war and modern communications, he might have discovered that High Frequency Direction-Finding Radar was locating his submarines; perhaps even that his ciphered signals were being read.
In all these cases, signalling technology was important, but the decisive factor was the efficiency of the social structures within which the signals were exchanged. One final example may be taken from outside naval warfare: the Royal Air Force’s fighter direction system based on the Chain Home radar. This is quite rightly seen as a critical component of the narrow victory of the Battle of Britain, but it is usually understood simply in terms of the technical achievement of the early radar system, unsuspected by the Germans. It is correct that the Germans did not realise that the radar existed until the campaign began, but that was because their own sophisticated radar operated on medium wave, and it had not occurred to them that a primitive radar system might exploit the long waves, at the cost of high power input and very large aerials. In 1939, the airship Graf Zeppelin made a series of secret night flights along the British East Coast listening for electronic transmissions. The German engineers heard nothing they identified as radar; only a constant hum on 50hz, which they took to be the background radiation of the national electricity grid. In fact this was exactly the frequency of the Chain Home system, whose operators watched Graf Zeppelin’s movements with interest. But it is a mistake to attribute the efficient British fighter direction to the radar alone. The real key to British success was the efficient integration of information from the radar chain (which faced outwards and therefore only covered enemy aircraft as they approached Britain) and the Royal Observer Corps (which reported aircraft movements overland with the aid of binoculars and telephones). This went to make up the plot that allowed the fighter controllers to direct the fighters, which had only about an hour’s endurance and had to be vectored very precisely if they were to make a successful interception. The most advanced components of the system were the very high frequency radiotelephones the controllers used to talk to the pilots in the air – but the secret of British success was not technological sophistication, it was a social organisation efficiently designed to get the right information to the right people at the right time. All its elements, except radar, had already been used in the air defence of London in 1917-18. By contrast, the German system established by General Kammhuber in 1943, when Germany in its turn was subject to enemy air attack, was lavishly wasteful of manpower but still failed to integrate all the necessary information in a single plot. German radar remained excellent, but the data it provided was not properly used.

Naval communication has always been a technical subject, and it is necessary to understand signals technology to understand communication at sea, but it is much more important to understand the social context of communication. Signals technology, especially modern technology, tends to promote the speed and volume of information exchanged, but these are very equivocal advantages in themselves. The essential is that the right information should reach the right person at the right time – without being accessible to the enemy in the process. Speed is not always necessary for this purpose, and volume is often a disadvantage. Wireless in the First World War, the radiotelephone in the Second, and now the internet have each in turn
made possible a huge increase in the volume of signalling. Each generation has found this a boon for everyday use, and filled the airwaves with administrative detail. As Cyril Northcote Parkinson observed, work (or in this case communication) expands to fill the space available, and what expands is not urgent operational traffic but routine administration.25

There is nothing intrinsically wrong with this, for navies are large and complex organisations needing lots of administration. The dangers were twofold: that disorganised volume drowned the urgent and the important, and that the more signals were made, the more material was presented to enemy intelligence. Hard experience forced wireless and then radio users to impose procedures to filter and classify signals, so that the routine did not drown out the important, and messages were routed to reach only those who needed to see them. Hard experience, moreover, soon revealed that convenience and bandwidth were bought at the expense of security. Navies that had very recently learned the blessings of the airwaves had to learn to do without them, practicing wireless, radio and later radar silence in order not to betray their presence. A newly communications-dependent culture had to learn to do without communicating for long periods. A command system structured on the assumption that a central command could maintain contact with scattered ships at sea, found it necessary to forgo contact for long periods.

Today, navies are once again luxuriating in a new communications technology, the internet transmitted over satellite links, which allows a huge increase in the volume of traffic. Once more, the attention of senior officers is distracted by a mass of administrative detail, while people of all ranks and positions fail to see the messages which they need to see, when they need to see them. The known insecurity of the internet leads to the over-use of security classifications, which simultaneously degrades security and overwhelms officers with trivia. Once more, command systems are being created, like Dönitz’s, which depend on constant signalling and discount the security risks involved. Though dispersed rather than centralised, they render the navies that commit to them just as vulnerable to detection as his submarines were. Moreover the internet has a new weakness of its own, which wireless and radio possessed only to a limited extent: it is an open technology, accessible at many points to the outside world, and one in which many ordinary people are as expert as the military, if not more so. The more dependent navies become on the internet, the more vulnerable they make their expensive ships and advanced weapons to the skills of the teenage hacker. Here, it may be, is a fresh confirmation of the lessons of history. Each generation of signalling technology brings new possibilities of command and organisation, but these possibilities can only be realised by social systems that are organised and disciplined to exploit them, and they come at the price of new and initially unsuspected security dangers.
Notes

1. It is of course possible nowadays for computers and equipment to exchange information without human intervention, but only as instructed by human operators.


20. Headrick, *The Invisible Weapon*, pp. 247-248; WJR Gardner, *Decoding History: The Battle of the Atlantic and Ultra*, Basingstoke, 1999, pp. 105 & 124-128; P Beesly, *Very Special Intelligence: The Story of the Admiralty’s Operational Intelligence Centre 1939-1945*, London, 1977, pp. 54-55. To be exact, the Germans were aware of the possibility of long-range High-Frequency Direction-Finding (H/F D/F), but underestimated its efficiency. Until late in the war they do not appear to have known at all about the development of ship-borne short-range H/F D/F, using the very high frequency ground wave, which became of great value in the defence of convoys.


Sea-power is of enormous importance. Look at it this way. Suppose we were an island, would we not be absolutely secure from attack? As it is we must try to think of ourselves as islanders; we must abandon our land and our houses, and safeguard the sea and the city.

Pericles, 432 BCE

The Persian Fleet from 499-480 BCE

War at sea can be traced back for more than five millennia, but for at least half this period naval warfare most closely resembled warfare on land. Ship’s crews attempted to grapple and board their opponents, while arrows and javelins were used at a distance to weaken opposition before the crews engaged in hand-to-hand fighting. In effect, warships before 650 BCE were designed for land battles fought at sea. The introduction of light, fast warships with the bow-ram, during the late 7th century BCE, led to what was effectively the first revolution in naval affairs.

In the Eastern Mediterranean, pirates and trading communities alike used a 50-oared warship, the pentecontor, to ram and capture or sink other ships at sea. Speed, manoeuvrability and robustness were the main driving factors for the new ramming tactics, and it was not long before a smaller warship with two banks of oars, the bireme, was developed. By the middle of the 6th century BCE, practical experience had shown that a long thin warship with three oar banks could out-run and out-manoeuvre the smaller biremes and pentecontors. And so the trireme evolved as the optimum solution for naval ramming tactics.

The trireme remained the standard warship for at least 200 years with minor advances in technology enabling gradual improvements in performance. A typical trireme was between 38 and 41 m long with a beam of 4 m at the hull and 5.5 m at the outrigger, and a draught of 0.9 to 1.2 m. It had 170 oarsmen arranged in three rows, one staggered above the other, with each oarsman wielding their own oar either 4.25 or 4.5 m long. A captain, 15 sailors, and 14 marines were also onboard adding up to a standard crew of about 200. Additional marines, if carried, could be used to board other ships or as a part of a landing force. Each trireme had a typical sprint speed of 9 knots (for up to 30 minutes), and could average 6 knots over long distances. A dismountable sail was carried onboard for longer journeys to take advantage of
favourable winds. The sail would be disembarked prior to action to minimise the ship’s weight. Their lightweight construction and lack of storage space, especially for water, meant that a trireme would be brought ashore on a gentle slopping beach each evening so that the crew could eat, drink and rest. Trireme operations were limited to fine weather as they were unstable in choppy seas and there are several instances of fleets being lost in a storm.²

Scholars have uncovered evidence suggesting that technical development of the three banked warship occurred gradually over the course of the 6th century BCE. The technology alone did not revolutionise naval warfare, however. The development of Persian sea power between 530 and 500 BCE was fundamental to the transformation process. It is likely that the earliest triremes were developed by the Egyptians and/or Phoenicians. Triremes, however, did not become the mainstay of Mediterranean maritime forces, including the Greek fleets, until after 525 BCE.³

The Persian empire of 490 BCE was vast - stretching from India to Thrace and from Libya to the Caspian Sea. The empire was organised into large administrative areas, called satrapies, which exacted tribute and military levies to meet the Persian king’s strategic objectives. The Mediterranean maritime satrapies were just one part of this vast empire. It was the combination of the Persian’s funding and their

Figure 2.1: The Persian Empire, 490 BCE
When the ‘King of Kings’ and the *Statogos* Ruled the Waves

strategic goals which led to the development of massed trireme fleets. When the Persians conquered the maritime powers of the Eastern Mediterranean (Phoenicia, Ionia, Cyprus and Egypt) they did not seek to unify the territories culturally, rather they built upon the local hierarchy and traditions. The Persians,

aimed at leaving in place local customs and religion, and even forms of political rule and semi-autonomy, as long as the lands paid tribute to the king and were loyal to him. A ‘Persianisation’, matching the Romanisation known from the Roman imperial period, was neither intended nor desired.⁴

The maritime forces of the Eastern Mediterranean were thus remodelled and expanded to become several national fleets (one for each maritime region) under the combined leadership of the appointed Persian naval commanders.

These new Persian trireme fleets were capable of challenging and defeating other fleets at sea, of projecting military power to influence events ashore, and of protecting Persian sea communications. They were in effect the world’s first navies, and their successes convinced the mainland Greeks that they too needed trireme fleets to defend their interests.

The Eastern Mediterranean has a long tradition of sea communications; geography making it easier to communicate, move people, or trade in large quantities of commercial goods by sea rather than overland.⁵ The Mediterranean Sea was thus the information super-highway of the Classical Period. Archaeological evidence has confirmed that by 500 BCE, mainland Greek communities were being excluded by the Persian satrapies from their traditional trading routes to Egypt and the Black Sea. Without access to grain imports and without markets for their olive oil and wine, the commercial Greek cities (especially Athens, Aegina, and Corinth) would have suffered rapid economic and political decline. The effect of the incorporation of the Mediterranean maritime powers into a Persian ‘coalition’ (that is, those who gave ‘earth and water’ to the Persian ‘King of Kings’) was that the lesser Mediterranean powers were forced to decide whether to join the Persian coalition (Medize) or to resist Persian expansion and contest control of the sea in their areas of interest.

The famous Greek historian, Herodotus, saw this choice between medizing and resistance as a simple struggle between slavery and freedom. This has been accepted literally by many classical and modern scholars, with the Persian Wars (490-479 BCE) seen as a clash of civilizations, between east and west, where ‘a much larger, more autocratic Eastern empire serially tried to squash small, freer Greek cities’.⁶ Recent studies based on Persian sources, however, have uncovered much evidence to suggest that Persian rule was relatively moderate and that their expansionist policies were intended to impose peace on a troubled world, ‘harmony in exchange for humility; protection for abasement; the blessings of a world order for obedience and submission’.⁷
Each city or district of the known world could be idealised as either within the realm of ‘truth’ under the Persians, or as the agents of anarchy and darkness outside Persian control. The King of Kings, Darius, (reigned 522-486 BCE) saw himself as ‘a force for good’, claiming that:

Much of the evil that had been committed, I turned into good. The countries that fought each other, whose peoples killed each other, I fixed, by the grace of Ahura-Mazda, so that their peoples did not kill each other, and I restored each one to its place.8

But how did this image of the benign King of Kings translate into reality? There are many instances where the traditional political and cultural structures of the conquered territories and populations were left unchanged under Persian rule, but there is also evidence for the introduction of imperial controls and the exercise of administrative authority. This apparent freedom was bounded within the confines of the Persian dominion. The creation of the Persian Navy is instructive in this regard.

The Persian Navy in 500 BCE was not the haphazard grouping of regional navies under local leaders that had previously existed, but a royal fleet of triremes paid for and constructed under an initiative of the imperial authorities to meet the strategic interests of the Persians. Although the experienced ship’s captains and sailors from the regional navies were retained, all senior naval command was under Persian officers. At the same time, the local people would pay taxes to support the fleet and levy oarsmen to help man it. Overall, many of the subject population would have gained socially if not financially through their employment with the Persian fleet; the option of working as a small cog within the imperial system leading to certain rewards that were not available to those who avoided Persian controls. Even though Persian rule was not overly bloodthirsty, the royal power did often come down with a vengeance in those situations when the imperial desires were resisted. Herodotus tells the story of a son appointed as a judge and forced to sit on a bench covered with the skin of his own father who had been executed for corruption.

The Persian Navy was formed for each specific mission from what were apparently a number of permanent territorial commands. Each maritime satrapy constructed, manned and supplied a fleet of triremes, the actual numbers depending on the resources available. All or part of these fleets could be drawn upon as situations demanded to conduct distant operations under naval commanders appointed by the king. When King Xerxes (reigned 486-465 BCE) invaded Greece during the Second Persian War (480-479 BCE), he assembled a total force of 1380 triremes with over 25,000 men. These ships appear to have operated as five separate fleet units consisting of an Egyptian fleet (200 ships), a Phoenician fleet (300 ships, including Syrians), a central fleet (330 ships, including Cyprian, Cilician, Pamphylian, Lycians), an East Greek fleet (270 ships, including East Greek Ionians and Dorians, Carians
and Aegean Islanders) and a northern fleet (280 ships, Aeolians, Hellespont and Thracians). This does not include the 1800 or so auxiliaries, including pentecontors, 30-oared vessels, other light vessels, provision ships, and horse-transports, which were required to support the Persian fleet and land forces on campaign.

This is not to suggest that the Persian Navy consisted of standardised ‘Persian’ triremes with uniform crews. Each trireme differed in some respect from the others in the fleet, mostly due to ship construction, the ship’s age and condition, or the experience of each crew. Thus, the Phoenicians and Egyptians provided fleet units constructed and crewed in their own traditions, while the Eastern Greek fleet along with the neighbouring central and northern fleets were armed in the Greek style. Herodotus states that the Greek triremes at Salamis were heavier than their Persian counterparts, and also confirms that there were significant differences in speed between the triremes within each fleet. In light of this evidence, the Persian Navy can be visualised as a coalition of navies working as a force for good under the control and direction of the Persian King of Kings. Indeed, using modern terminology, it was the ‘maritime partnership’ of the 5th century BCE.

Let us now examine several case studies that highlight aspects of naval command, control, communications and intelligence (C3I) during the Classical Period.

The Ionian Revolt

The Ionian Revolt was triggered by the actions of Aristagoras, the tyrant of the Ionian city of Miletus. Having failed once to capture the Aegean Island of Naxos on behalf of the Persian king he decided his future would be better served if he cast-off his allegiance and instead become the leader of a rising democratic movement in Ionia. Although legend has it that Aristagoras received instructions to change sides from his father-in-law, who was resident in the Persian court at Susa, it is more likely that Aristagoras saw that his prestige with the court was declining, and that his position in command of the Persian East Greek fleet could be used to advantage. Aristagoras convinced the fleet to revolt, at one stroke giving the Ionian rebels control of the sea and denying its use to the Persians.

The conflict lasted from 499 to 493 BCE, Aristagoras, with the help of the Ionian cities in the vicinity of Miletus, managing to overthrow many of the Greek tyrants and replace them with rule by the people. Ironically, this growing democratic movement was probably linked to the rise of the Persian Navy in East Greek waters. As the Persians built more triremes and employed more oarsmen, the political influence and power of the poorer elements in Greek society, those who manned the oars, also grew. Unfortunately, the Persians desire to be a force for good often meant that they supported the status quo, and hence they continued to favour the Greek tyrants even though their own policies contributed to social and political change.
Aristagoras knew that Persian forces would plan to reconquer the Ionians, so he travelled to mainland Greece to convince them to support the revolt. The Spartans refused but the Athenians and Eretrians agreed to send ships.\textsuperscript{10} They joined a force of Ionians that disembarked near Ephesus and marched upon the Persian satrapy capital at Sardis. The Persians, having sent most of their army to besiege Miletus, were surprised by this early example of ‘Operational Manoeuvre from the Sea’. The Greeks pillaged the town, then burnt it to the ground, but the Persian forces regained the initiative and forced the Greeks to withdraw. Caught by a Persian army before they could return to the coast, the Greeks were defeated.

The burning of Sardis was a political victory for the Greeks nevertheless. Much of Asia-Minor and many of the offshore island cities threw off Persian rule. The revolt spread to include most cities of East Greece, the Aegean, the Hellespont, Propontis and Cyprus. Determined to crush the rebellion, the Persians assembled large land forces and reconquered the coastal cities piecemeal. The cities located on the offshore islands remained safe so long as the rebel fleet remained the only naval force in the area. But by assembling its Phoenician and Egyptian fleets the Persian Navy was able to move inexorably westwards; gathering up the contributions from other maritime satraps as it went.

As the Persian fleet of 600 triremes moved closer to Miletus, the rebel East Greek fleet of 363 triremes attempted to challenge it directly. The decisive defeat inflicted by the Persians at the Battle of Lade in 494 BCE decided the issue. Thereafter, Miletus was captured, the rebel leaders overthrown and the remaining rebel cities quickly defeated. Always open to peaceful settlements, the Persians removed the tyrants whose abuse of power had helped ignite the revolt and replaced them with democratic leadership. After the Ionian Revolt, the Persian General Mardonius overthrew the East Greek tyrants who were under Persian rule and replaced them with more democratic institutions. By such reconciliatory actions, the Persians were able to regain control of the Ionian Sea and quickly rebuild the East Greek fleet.

**Command**

At the strategic level, during the Ionian Revolt Darius (the King of Kings), commanded the Persian forces from his palace at Susa in modern day Iran. He used his official bureaucracy to order the respective satraps to raise, train and deploy the forces necessary for operations. Artaphrenes, the Persian satrap at Sardis who was responsible for the defence of Asia Minor, commanded on behalf of the king at the operational level. It was he who, after the initial crisis and the burning of Sardis, used his land forces to recapture the rebel coastal cities. Darius also appointed three of his most experienced Persian generals, Daurises, Hymaees and Otanes, to command the maritime operations which recovered Cyprus, Caria, the Hellespont and the offshore East Greek cities.
The Persian command structure relied upon clear directions and decisive delegation. As a message from the king to the operational area might take three months to deliver, the operational commanders relied upon their own initiative to meet the broad Persian objectives. All senior commands were given to Persian royal family members or a small group of experienced generals from a few elite families; essentially a Persian ‘band of brothers’. The social bonds between Persian commanders would have minimised misinterpretation of the king’s orders. Darius frequently sought advice from his royal advisors, essentially the same group of family members and experienced generals, and he was quick in removing commanders whenever they did not meet the high expectations of this elite command group.

At the Battle of Lade, operational command of the Persian fleet rested with Artaphrenes and Otanes, but the Persian forces included the Phoenician, Egyptian, Cilician and (the reconquered) Cypriot fleets. At the tactical level, ship command was delegated to the most experienced captains from each of the Mediterranean maritime states: ‘Every naval unit was under officers native to the country supplying the ships’. In this manner, the Persians were able to use people who were the specialists in their own areas of expertise to the advantage of their empire. The Phoenician, Egyptian, Cilician and Cyprian commanders would have been well rewarded with special privileges. The most important issue for the Persians, however, was how to control the trireme captains.

Control

Each trireme carried up to 40 marines to act as the ship’s fighting complement. In the Persian fleet ‘there were Persian, Median, and Sacian marines on board every ship’, no matter what nationality the ship’s captain and its crew. Thus the marines, if necessary, had the ability to suppress by force any tendency by the crew to resist Persian commands. Herodotus takes this further when he states that the ship’s captains were,

not there as military commanders, but were just as much slaves as their fellow soldiers, since all power and authority over the various national units was vested in the Persian commanders.

The rise of Aristagoras to operational command of the Persian East Greek fleet before the Ionian Revolt, suggests that Herodotus’ extreme view is incorrect. The influence of Queen Artemisia of Halicarnassus, who not only captained her own ship but also commanded four others, demonstrates that non-Persian collaborators were at times recognised as effective members of the Persian command team. On the other hand, Aristagoras’ role in leading his fleet to rebel presumably would have convinced the Persians to apply stronger controls in future.

Tactical control of the Persian fleet was undoubtedly limited, with the combination of national units with independent ship commanders hindering the development of standardised tactics. Moreover, while non-specialists held all higher commands
standard instructions for control of the fleet could not be adopted. As such there was no Persian naval doctrine, and fleet tactics were akin to a general melee with individual trireme captains jostling with their opponents to gain advantage, and success depending on prowess in ramming, grappling and boarding.

At the Battle of Lade, however, we do have evidence that the East Greeks had started to develop methods to control their fleet in battle.\textsuperscript{13} Unfortunately for them, these combined tactics were resisted by some fleet elements and did not become doctrine. Before the battle operational command of the rebel fleet was given to the Phocaean leader, Dionysius. Even though he had only brought three ships with him, he was considered the most experienced in naval tactics:

Each time he took the ships out in column formation, he had the rowers practise the \textit{diekplous} [a manoeuvre to break through enemy lines], with the marines armed, and then for the rest of the day he would keep the fleet at anchor. He made the Ionians work all day long. For seven days they were obedient and did as they were told, but they were unused to this kind of hard work, and the hardship and heat exhausted them.\textsuperscript{14}

Whereas most naval battles of the time involved two fleets charging at each other in line abreast, the \textit{diekplous} required a fleet to use a column (line-ahead) formation to break through the opponent’s line. The \textit{diekplous} was an effective tactical formation, but required well-trained crews to operate in a coordinated manner. At Lade, Dionysius led his fleet into battle in a series of \textit{diekplous} columns but was unable to maintain control of all elements. The Samian triremes on the left flank fled the battle rather than fight, the Lesbian triremes followed as did many other Greeks. Only the Chians and Dionysius’ Phocaenans fought well, and the battle was irretrievably lost.

\textbf{Communications}

It is fair to say that communications during the Ionian Revolt were decidedly low-technology. Modern observers may see this as a major disadvantage, but in reality the inherent delays meant that the fundamentals of good communications were paramount. Strategic instructions, for example, had to be clear and precise, delegations had to be broad, limits of authority well defined, and the Persian imperial strategies had to be well understood by all commanders throughout the empire. Without good communications, the Persian Empire would not have been able to effectively wage wars on its periphery. Of course, one of the advantages of the long delay in strategic communications was that any operational or tactical failures by Persian commanders did not directly impact on the King of King’s image as a ‘good warrior’.\textsuperscript{15} The king could always appoint another Persian commander to secure the desired effects in subsequent operations. Should the king become more closely involved other problems might arise. When King Xerxes personally led the
invasion of Greece in 480 BCE, he also commanded at the operational level. This gave him more control and improved communications with his subordinates, but also increased the logistic burden of operations as the court with all its appendages had to accompany him. The Persian Navy’s subsequent defeat at the Battle of Salamis inevitably led to some loss of royal prestige. Although Xerxes’ reputation was tarnished, at least in Greek eyes, Persian royal propaganda did manage to minimise the naval defeat and emphasise the burning of Athens.

Pre-battle communications were primarily based on direct conversation between commanders and ship’s captains and, on occasion, even the enemy. Before the Battle of Lade, the Persian commanders dispatched loyal Ionian tyrants as messengers to their fellow citizens in the rebel East Greek fleet. They presented an offer not to punish the rebels if they returned their allegiance to Darius. Such practices confirm that small boats, also known as *keles*, were able to move between the two fleets without interference. More important messages were usually sent by fast trireme to out-run enemy patrols. Often these messages would be of political importance, the triremes acting as a reminder of the sender’s sea power and helping to reinforce the political message.

As the ships within a fleet operated close to one another, shouting between vessels was often the most effective means of tactical communication. But such a method would have proven impractical in action. The combination of blaring trumpets and battle cries, bosuns screaming out in an effort to keep time, hundreds of oar-blades hitting the water and bronze rams hitting wooden hulls would have effectively drowned out any attempt to maintain fleet cohesion through verbal orders. In practice, once battle had begun the Persian commanders could not influence the outcome, each trireme captain operated as an independent unit in accordance with the prearranged battle plans.¹⁶

Problems of close tactical cooperation were compounded by the various languages used within the Persian fleet. In addition to Persian, the Phoenician, Egyptian, Cilician, Carian, Lycian, Pamphylian and Greek (Cyprian, Dorian, Ionian and Aeolian) languages were used on board individual triremes. The Persian commanders and most of the ship’s captains probably also communicated in Aramaic, as this was the general administrative language of the western parts of the Persian Empire.

**Intelligence**

The King of King’s had access to one of the most effective strategic intelligence organisations of ancient times. The king, members of his court, and his counsellors were all expert in gathering intelligence from the empire’s dignitaries and foreign visitors. Herodotus describes several of these audiences to emphasise the cultural differences between the Persians and the Greeks, but they also confirm the sophistication of Persian intelligence methods.
The Persians did not only rely upon second-hand information. They also sent ships to explore and report back on unknown regions, and dispatched officials as messengers throughout the lands that they wished to explore and perhaps conquer. Before the Ionian Revolt, King Darius dispatched a Greek, Democedes, with 15 eminent Persians to explore the coastline of Greece in two Phoenician triremes. They took with them a huge merchant ship full of valuables to be used as gifts. At the time, although the main communication routes within the Persian empire were tightly controlled, there were very few restrictions on the movement of important persons between the cities and regions outside of Persian control. The custom of hospitality (in modern parlance - diplomatic immunity) guaranteed the safety of high-ranking visitors throughout much of the Eastern Mediterranean, and it was only in exceptional circumstances that standard rights were revoked.

The Persians frequently used loyal foreigners as their agents. Spies were also often used to gain operational or tactical intelligence concerning the enemy’s fleet, including the condition of their ships and the efficiency of their crews. Every afternoon at least some members of the trireme’s crew would likely leave the beached ships in search of supplies or companionship. It is more than likely that a sizeable group of non-combatants gathered around the beached ships to bargain, sell or offer their services. Before the Battle of Lade, the Persian commanders discovered how many ships the Ionians had and ‘were worried at the prospect of failing to defeat them’. This was valuable intelligence, but not hard to come by when the opposing fleets were drawn up on beaches almost within sight of each other. When Greek spies were captured attempting to gather intelligence about Xerxes’ preparations for the invasion of 480 BCE, they were purposely shown around the Persian fleet in an effort to intimidate them.

Marathon, Artemisia and Salamis

The Persian naval expedition of 490 BCE was intended to crush Athens and Eretria for their support of the rebels during the Ionian Revolt. A Persian fleet under Datis and Artaphrenes managed to capture Naxos and destroy Eretria, but their attempt to out-manoeuvre the Athenian army failed when part of the Persian expedition was destroyed at the Battle of Marathon. A Greek traitor is said to have used a shield to reflect the sun’s rays as a prearranged signal to the Persian fleet, but this did not influence the outcome of the battle.

Although King Darius planned another operation to punish Athens, its execution was postponed by an Egyptian revolt. Darius died from an illness in 486 BCE, his son Xerxes inheriting the throne. King Xerxes took several years to put down the Egyptian Revolt, but he then returned to the Greek affair. In an effort to gain royal prestige, Xerxes decided to lead the invasion himself. This was to be as much a military parade demonstrating the might of the empire, as a combined land and
maritime operation aimed at the destruction of Athens and the subjugation of the Greeks. In the meantime, the Athenians, under the leadership of the ‘Strategos’ Themistocles, had constructed a harbour at Piraeus and adopted a maritime defence strategy. In only a few years their fleet grew from 20 to 200 triremes.

In 479 BCE, Xerxes’ invasion began when his army crossed the Dardanelles from Asia Minor into Europe, on two bridges made of boats. Herodotus says that the army numbered over 2.5 million men, an extraordinary figure especially when we add an equal number of servants, camp followers and other non-combatants. The exact number of combatants will probably never be known. We do know, however, that 70,000 troops were later left behind, under the Persian commander Mardonius, to garrison northern Greece and continue the campaign. From a logistics standpoint this figure appears to be much more feasible.

Xerxes’ invasion fleet initially numbered over 1380 triremes with another 1800 auxiliaries, and these vessels supported the land forces as they marched along the Thracian coastline. Many of the Greek cities in northern and central Greece gave earth and water to the Persian king as ‘the broad human tide’ comparable to ‘the unconquerable swell of the seas’ approached them. In opposition, a coalition of Greeks established defensive positions at the pass of Thermopylae and nearby in the vicinity of Artemisia. These positions protected the land and sea routes into southern Greece. At the naval Battle of Artemisia, the determined resistance of the Athenians and their Greek allies initially gave the Persian fleet a rude shock, until the collapse of the Thermopylae position forced the Greek withdrawal to Salamis. At Artemisia, the use of a circular defensive formation (the kyklos) had enabled the Greeks to defeat a larger force of triremes, but the Persian fleet’s numbers could not long be held back. The Persians advanced into Attica and burnt Athens, only to find that the Athenians had fled and that every able-bodied man had joined their fleet at Salamis.

By late September the Persian fleet numbered less than 600 ships, having lost some in storms and in action, while the Greeks could muster almost 370 triremes to oppose them. To tempt the Persian fleet into action, Themistocles sent a false message stating that the Greek fleet was going to flee during the night. In response, Xerxes sent the Egyptian fleet unit (about 120 ships) to the west of Salamis to block the Greek retreat. After staying on guard at sea all night, the remaining Persian ships were surprised by a Greek attack as they entered the Salamis Strait. As Xerxes watched from a nearby vantage point, the ensuing action became a major defeat for the Persian Navy, with many triremes sunk or captured and their crews either drowned or killed. To the Greeks, this was a victory to be remembered for all time, but to the Persians it was a relatively minor set-back. Xerxes left an army under Mardonius to continue the operations in Greece the following year, while he returned with the surviving Persian fleet across the Aegean to Ionia. Xerxes spent the winter months at Sardis before he was forced to return to Persia to help put down another rebellion, this time in the important city of Babylon.
The situation in Greece remained on a knife edge after Salamis. With Mardonius’ army encamped in medizing central Greece and a sizable Persian fleet positioned on the Ionian coast, the coalition Greeks remained on the defensive. Unfortunately for the Persians, Mardonius was soundly defeated at the Battle of Platea in August 479 BCE. With the threat to the Greek mainland gone, the coalition Greeks could man their ships and return to attack the Persians in the Aegean and Ionia. Shortly thereafter the Greeks defeated the Persian fleet in Ionia at the Battle of Mycale.

The Greek Fleet from 479-431 BCE

The Athenian Navy dominated the Greek fleets throughout the classical period. Initially allied ships and fleets worked under Athenian command as part of the Delian League, but over time the allied Greeks contributed funds (tribute) rather than ships, and the funds were used to build, crew and maintain the Athenian Navy. During the 460s and 450s the Delian League fleets often numbered more than 200 triremes, while by 431 BCE the Athenian empire had over 300 triremes. Many trireme captains used private funds to ensure not only that their ships were well-crewed, but also that they looked the part.

Triremes remained the warship of choice, but subtle changes in design did occur between 479 and 431 BCE. Essentially, as the Athenians learnt from the success of their fleet tactics they largely abandoned boarding in favour of the ram. A later historian vividly described successful ramming tactics:

The Athenians perceiving confusion among the barbarians, drove ahead against the foe, ramming some of their vessels and shearing off the oar banks of others; and since their rowers could now no longer operate, many of the Persian triremes turned broadside onto the enemy’s rams and in consequence again and again suffered crippling damage. Because of this they stopped backing water, instead putting about and retreating in headlong flight.24

The psychological impact of Athenian triremes should also not be overlooked:

And why [is] a trireme which is crammed with men a frightening spectacle for enemies and a pleasant sight to allies? Is it not because it sails quickly? … Is it not because the crew sit on the benches in order, moving their bodies forward and backward in order?25

As the 5th Century BCE progressed the Athenian triremes became lighter and faster, while the number of marines was significantly reduced. The trireme’s dimensions did not change significantly, but its crew tended to become more specialised (see Table 2.1), with designated professionals replacing part-time levies. The crews of the Athenian triremes became more professional due to a combination of their extended operations each campaigning season, and their regular payment from the Delian Leagues coffers. The poorer elements of Athenian society, those who were
<table>
<thead>
<tr>
<th>Crew</th>
<th>Duties</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Captain (<em>trierchos</em>)</td>
<td>In command. The office was not simply a military commission - it was a liturgy, the most important in the Athenian state imposed upon its rich citizens. Over time the captain became financially responsible for his ship and command was delegated to the first officer.</td>
<td>1</td>
</tr>
<tr>
<td>First Officer (<em>kivernites</em>)</td>
<td>The ship’s administrative assistant. Initially the helmsman, but with the growth of the Athenian fleet they became the actual commander.</td>
<td>1</td>
</tr>
<tr>
<td>Officer of the Stem (<em>prorates</em>)</td>
<td>Deputy to the first officer. He was located on the stem, whereas the first officer stayed on the stern near the helmsman.</td>
<td>1</td>
</tr>
<tr>
<td>Paymaster (<em>pentekontarxos</em>)</td>
<td>The ship’s paymaster and occasionally hired mercenaries for the crew.</td>
<td>1</td>
</tr>
<tr>
<td>Petty Officers (<em>toixarxoi</em>)</td>
<td>Overseers of the oarsmen. One commanded on either side of the ship.</td>
<td>2</td>
</tr>
<tr>
<td>Carpenter (<em>naupigos</em>)</td>
<td>Carried out repairs and maintenance when the ship was far from its home port.</td>
<td>1</td>
</tr>
<tr>
<td>Signalman (<em>keleustns</em>)</td>
<td>Called the pace to the oarsmen and was also the ship’s steward.</td>
<td>1</td>
</tr>
<tr>
<td>Flute-player</td>
<td>A poor citizen or slave. He helped the signalman keep the timing of the oarsmen and entertained the crew.</td>
<td>1</td>
</tr>
<tr>
<td>Bakers</td>
<td>An unusual addition to the crew, but there are accounts of bakers attending deployments, such as the expedition to Sicily in 415 BCE.</td>
<td>1 or more</td>
</tr>
<tr>
<td>Trained Sailors</td>
<td>Specialised seamen.</td>
<td>varied up to 5</td>
</tr>
<tr>
<td>Marines</td>
<td>Included both heavy armed soldiers (<em>hoplites</em>) who fought from the deck when the ship drew near the enemy, and bowmen who wore down their enemies at distance. Numbers varied depending on each campaign.</td>
<td>4-18 <em>hoplites</em> 2-4 bowmen</td>
</tr>
</tbody>
</table>

*Table 2.1: The Crew of an Athenian Trireme, c. 431 BCE.*
an important constituent of Athenian democracy, were often employed within the fleet. Over time, as the allied Greek ships disappeared, allied Greek seamen moved to Athens to gain regular employment on Athenian ships.

During the Persian Wars the Athenian triremes were constructed for speed and manoeuvrability, with narrow central decks which did not cover the rowers. Although designed for ramming enemy ships, they were also capable of being modified for man-power intensive amphibious operations. The Athenian Strategos Cimon is said to have added decks, positioned above the oarsmen, for the joint land and sea operations of the Eurymedon campaign. The Greek ships were ‘somewhat squat’ compared with the Persian equivalent, which had ‘towering poops [and] lofty decks’ and therefore better designed for boarding but heavier and far less manoeuvrable. Commenting on the naval Battle of Sybota, fought in 433 BCE between the Corcyreans and the Corinthians (both supported by their allies), the historian Thucydides highlighted the general acceptance of Athenian naval tactics:

The fighting was of a somewhat old-fashioned kind, since they were still behindhand in naval matters, both sides having numbers of hoplites aboard their ships, together with archers and javelin throwers. But the fighting was hard enough, in spite of the lack of skill shown: indeed, it was more like a battle on land than a naval engagement.27

It is probable that other Greek navies and the Persian Navy continued to use both ramming and boarding tactics, and hence carried a sizeable force of marines, until the middle of the 5th century BCE. For much of this time the Persians avoided sea battles due to the tactical advantage held by the Athenian ships, but they continued to conduct military operations in the littorals whenever the Athenian fleet was not present. From around 450 BCE, a number of Persian victories at sea suggest that their naval tactics may have changed to reflect the dominance of ramming tactics. Even so, it is unlikely that many of the Persians or the Peloponnesian Greeks ever achieved the Athenian’s level of professionalism.

One of the most interesting aspects of Athenian sea power was the close relationship between the fleet and democracy. The fleet was the bulwark of democracy, not only in Athens but elsewhere in the Delian League, and at the same time it was democracy that made the fleet powerful. The safety of each Greek city depended heavily on its military might, on land as well as at sea. But as the power of the Athenians grew, Athens changed from hegemony into an imperial capital, and the Athenian empire relied more and more upon the utility of its naval power:

... of the mainland cities which Athens controls, the large ones are ruled by fear, and small by sheer necessity; there is no city which does not need to import or export something, but this will not be possible unless they submit to those who control the sea. Furthermore, it is possible for the rulers of the sea to do what land powers cannot always
do; they can ravage the land of more powerful states. They can sail along the coast to an area where the enemy forces are few or non-existent; and if the enemy approach they can embark and sail away; in this way they get into less difficulty then those operating on land. 

The Delian League

In 479 BCE, the Coalition of Greeks (Hellenes) defeated the Persian forces in mainland Greece and gained physical and moral supremacy in the Aegean Sea. While the Greek land forces could defend their part of the continent, it was the fleet of the Greek Coalition which moved from the defence to the attack. This fleet, under the Spartan Strategos Pausanias, destroyed the remnants of the Persian Navy in Ionia, Cyprus and the Hellespont during 478 BCE. Pausanias, however, had already begun to reveal his natural arrogance, and was becoming unpopular with the Hellenes. No longer willing to accept Spartan naval command, the allies asked the Athenians, who contributed the largest number of ships, to take over:

So Athens took over the leadership, and the allies, because of their dislike for Pausanias, were glad to see her do so. Next the Athenians assessed the various contributions to be made for the war against Persia, and decided which states should furnish money and which states should send ships - the object being to compensate themselves for their losses by ravaging the territory of the King of Persia. At this time the officials known as ‘Hellenic Treasurers’ were first appointed by the Athenians. These officials received the tribute, which was the name given to the contributions in money. The original sum fixed for the tribute was 460 talents. The treasury of the League was at Delos, and representative meetings were held in the temple there.

Thus was the Delian League and its navy formed. Initially the League was a loose coalition, each Greek state remaining independent. Although Athens was the League’s hegemon, all its member states had an equal vote in the ruling council. Strategic direction was debated in this council and enacted upon by the appointed Strategos. Almost immediately, however, it became clear that the council was only a rubber-stamp and that the real power resided with the Strategos. Each year he used the League’s funds to assemble a fleet, and then decided where and when to attack. Moreover, as Athens provided the largest contingent in the Delian League Navy, the Strategos was always an Athenian.

The Delian League gained sea control in the northern waters off Thrace and Hellespont, after the Strategos Cimon captured the Persian fortification of Eion on the Thracian coast in 476 BCE. Three years later he overwhelmed a group of pirates who had been terrorising the central Aegean from the island of Scyros, turning the Dolopian inhabitants into slaves and establishing an Athenian colony in their place.
These successful campaigns presented the Delian League with a dilemma. As the Persians had by now been defeated throughout the Aegean, the only way to continue ravaging the Persian king’s lands was to attack further east, in Cyprus, Asia Minor, Phoenicia and Egypt. On the other hand, by the 460s BCE it was clear that several members of the League no longer felt threatened and had no desire to contribute towards an unlimited war against Persia’s eastern satrapies.

Dependent on tribute to finance the continued operations, the Athenian Strategos found that the Delian League Navy was just as efficient against ‘internal enemies’ as it was against the Persians. As early as 472 BCE, Carystus, a city on the southern tip of Euboea, had been compelled to join the League on the grounds that it was enjoying the advantages of the League (protection from pirates and the Persians) without taking on any of the responsibilities. Despite having sworn to remain in the League forever, two years later the Naxians, having seen the Persian threat in the north decline, attempted to leave the alliance. The subsequent revolt became a symbol for the manner in which the Athenians dealt with any state attempting secession. For, once defeated, Naxos was forced to tear down its walls, and lose both its fleet and its vote in the council. As Thucydides recorded:

Naxos left the League and the Athenians made war on the place. After a siege Naxos was forced back to allegiance. This was the first case when the original constitution of the League was broken and an allied city lost its independence, and the process was continued in the cases of the other allies as various circumstances arose.\endnote{31}

Having suppressed the dissenters within the Delian League, the war against the Persian king continued.

The Eurymedon River Campaign

The Eurymedon River campaign was fought in c. 466 BCE and was to be one of the first joint amphibious operations conducted by the Delian League Navy outside the traditional Greek sphere of influence. The Strategos Cimon sailed east with 300 triremes (200 Athenian and 100 allied ships), and his first move was to besiege the city of Phaselis, in Asia Minor, which refused to admit his fleet or to revolt against the Persian king:

... he devastated their land and attacked the city’s walls. However the Chians who were serving in his fleet and were old friends of the people of Phaselis tried to pacify Cimon, and at the time shot arrows over the walls with papers attached to them telling the people inside what they were doing. Finally, Cimon came to terms with them, on the condition that they paid him ten talents and took part in his campaign against the barbarians.\endnote{33}
The League’s forces subsequently engaged the Persians in a succession of different actions near the Eurymedon River. Tithraustes, a son of King Xerxes, commanded the Persian fleet, while the Persian land forces were under a separate commander named Pherendates. By contrast, command of the Delian League fleet was unified under Cimon. Prior to sailing Cimon had strengthened his fleet with hoplites who could be used both at sea and ashore, and the combination of a simple command structure and the ability to adapt the available forces provided a significant advantage. Plutarch describes the first naval action, in which the Athenians captured 200 Persian ships:

Cimon … put to sea prepared to bring the enemy to battle if they tried to avoid it. At first the Persians retired up the river to avoid being forced into action, but when the Athenians bore down on them they sailed out to meet Cimon. Phanodemus credits them with 600 ships and Ephorus with 350. At any rate, in the naval battle they certainly achieved nothing worthy of such a strong force, in fact, they immediately turned tail and ran for the shore. The leading crews abandoned their ships and took refuge with the land forces, which were drawn up close by, while the rest were overtaken and killed and their ships destroyed.\(^{34}\)

Almost immediately, his troops ‘still hot from their fighting in the naval battle’, Cimon’s forces disembarked and attacked the Persians ashore. After a fierce struggle the Athenians threw back the enemy ‘with great slaughter and captured the army and its camp which was full of all kinds of spoil’.\(^{35}\)

After this victory, the Greeks went after 80 Phoenician triremes intending to reinforce the Persian fleet. Cimon took them by surprise, before they had heard of the fate of the main fleet, destroying every ship and killing most of the crews:

This blow so dashed the (Persian) king’s hopes that he accepted the terms of that notorious peace, whereby he agreed to stay away the distance of a whole day’s ride from the Greek seaboard of Asia Minor and not to let a single warship or armoured vessel (a ship with a ram) sail west of the Cyanean and Chelidonian Islands.\(^{36}\)

During the Eurymedon River campaign, the Delian League forces moved seamlessly between action at sea, in the river and on land. The Greeks maintained control of their forces throughout the battle despite their extreme exertions and maintained a momentum of action that gave the Persians no respite. The spoils taken during the Eurymedon River campaign were extensive. They were more than enough to pay the cost of the Delian League fleet, while they also paid for Athenian public expenses such as the construction of the southern wall of the Acropolis. However,
the member states of the Delian League did not gain financially from the victory and continued to pay their allocated share of tribute. Indeed, as discontent grew among its allies, the Athenians tended to prefer tribute payments in place of an allied naval contingent.

In 460 BCE the Egyptian satrapy revolted and requested aid from Athens and the Delian League. The Athenian Strategos Pericles led 200 triremes, originally intended to attack Cyprus, to assist the Egyptians. Pericles attempted to cooperate with the rebel Egyptian fleet, but his operations were in the end unsuccessful. After four years the Persian commander, Megabyzus, was able to combine the rebuilt Persian Navy with strong Persian land forces and crush the Egyptian rebellion. The greater part of the Greek fleet was captured.

After this defeat, in 454 BCE the Athenians moved the treasury of the League from its temple on Delos to the Acropolis at Athens; arguing that it was necessary to safeguard the tribute from Persian raids. It is not recorded what the Delian League council had to say about the transfer (if it still met), but any power they once had was by now usurped by the Athenian assembly. The Delian League by deed, if not by word, had become the Athenian Empire.

With the Delian League Navy having transformed essentially into an Athenian Navy, its triremes were constructed, crewed, maintained and based in Athens’ port of Piraeus. The trireme captains and crew were recruited from Athens and its allies, while the Greek allies provided funding. Thus, unlike the Persians, the Greeks did not need to place armed men on board to control the activities of their ship captains and crews. The Athenian assembly gave strategic direction and appointed a Strategos with wide-ranging powers. Thucydides tells us how Athens maintained its control of more than 200 member states:

Of all the causes of defection that connected with arrears of tribute and vessels, and with failure of service, was the chief; for the Athenians were very severe and exacting, and made themselves offensive by applying the screw of necessity to men who were not used to and in fact not disposed for any continuous labour. In some other respects the Athenians were not the old popular rulers they had been at first; and if they had more than their fair share of service, it was correspondingly easy for them to reduce any that tried to leave the confederacy. The Athenians also arranged for the other members of the league to pay their share of the expense in money instead of in ships and men, and for this the subject city-states had themselves to blame, their wish to get out of giving service making most leave their homes. Thus while Athens was increasing her navy with the funds they contributed, a revolt always found itself without enough resources or experienced leaders for war.
The Persians followed up their victory in Egypt by sending a fleet to re-establish their control over Cyprus, and the Athenians sent out 200 ships to counter them. The Greeks won a victory, but were never able to control the seas outside the Aegean for any length of time. Thereafter the struggle between the Athenian and Persian Navies around Cyprus degenerated into a form of Cold War.

**Command**

Despite command at the strategic level nominally resided with the council at Delos, it was the *Strategos* in Athens who was actually responsible for both strategic and operational command of the Leagues’ forces. Since the Athenian democratic assembly exercised more control over the appointment of the *Strategos* than the council of the Delian League, the *Strategos* were more concerned with placating the Athenians than the allied Greeks. This arrangement gave the *Strategos* great flexibility in command, and as long as they gained victories with few casualties and offered employment in the fleet to the Athenian masses, they were the great men of their time.

The *Strategos* was nevertheless bound by the instructions he received from the assembly. The Athenian squadron of ten triremes present during the Battle of Sybota in 433 BCE, although allied with the Corcyrean fleet, operated under its own ‘rules of engagement’:

> The Athenian ships would come up in support of the Corcyreans whenever they were hard pressed and would so help to alarm their enemies, but they did not openly join the battle, since the commanders were afraid of acting contrary to the instructions they had received at Athens.  

The *Strategos*’ power was also limited by the ability of the Athenian naval administration to raise, train and sustain the fleet. When operating against Persia, the Delian League fleet could seize booty to help fund their operations, but like most maritime forces they were not capable of occupying cities or territories on a long term basis. This is why it was important for the Delian League to add member states by invitation, coercion or conquest, and for these states, especially those adjacent to Persian territory, to levy infantry that could hold the ground taken from Persia. Thus it can be seen that the capture of Phaselis was integral to the Eurymedon campaign, and that when the Delian League Navy operated outside the Greek sphere of influence it could not sustain the level of land forces required to overcome the Persians. In many ways, the Delian League became a reflection of the Persian Empire; the central power allowing some freedoms to its cities and territories but imposing a tribute and military levy in return.
Control

Tactical control of the Delian League fleet is evident from the growing professionalism of the force. The rapidly assembled Athenian fleet of the Persian Wars evolved into a disciplined force not only capable, but also experienced in naval fleet tactics such as the diekplous and the kyklos (encircling the enemy). The Athenians exercised a form of naval doctrine, in practice if not in written form. A combination of training and high-tempo operational employment allowed the Strategos to direct the fleet in battle and rely upon each ship’s captain to know what was expected of them. In turn the trireme crews became an influential group within the Athenian assembly, and the navy element within the assembly frequently supported the Athenian Strategos’ policies. At the start of the Peloponnesian War in 431 BCE, Pericles was convinced that the Athenian Navy would be victorious because:

... we have acquired more experience of land fighting through our naval operations than they have of sea fighting through their operations on land. And as for seamanship, they will find that a difficult lesson to learn.41

Communications

The Delian League Navy’s communications were again low-tech, but at least there were no language barriers to inhibit tactical communications within the fleet. Moreover, the Strategos had much closer communications with the Athenian assembly than Persian commanders had with their King of Kings. Instructions from the assembly were sent by messenger on board a fast trireme, taking only three to five days to reach the Strategos when he was operating anywhere in the Aegean. This was an advantage if the circumstances changed rapidly, but caused problems when the Athenian assembly vacillated. Such was the case during the famous Mitylene debate of 428 BCE. With the Athenian fleet off the rebel city of Mitylene on the island of Lesbos, the assembly ordered that all adult male prisoners were to be put to death and the women and children enslaved. The following day, however, the assembly took into account the fact that the Mitylene had fought alongside Athens, as part of their empire, for almost 50 years and ordered a second fast trireme to travel day and night with a message to stop the execution of the prisoners.

In addition to the triremes, keles continued to be used by the Greeks for communication between fleets, land units and cities. For example, in 433 BCE the Corinthian’s sent messengers by ship to Athens to present their case, concerning their dispute with the Corcyreans, in front of the Athenian assembly.
Intelligence

The Greek sphere of influence was largely defined by the sea communications of the times. Within that sphere, Greek mariners and commercial travellers traded much more than prestige goods and commodities: they traded knowledge and such knowledge was the basis of the Greek intelligence system.

The Athenians, as with the Persians, often relied on deceptive strategies, and espionage as a political tool. Agents spied on rival city-states, providing the Athenians with information on military strength and defences. Spies moved between naval camps and bases relatively freely, and although they normally passed on their information personally they also used various forms of hidden communications.

Unlike the Persians, the Greek intelligence was openly discussed within their formal assembly as well as in their markets, places of work and even on the streets. Greek intelligence was open-sourced. To the Greeks information was unrestricted and the free interchange of intelligence was an essential component in the correct functioning of their democratic institutions. As Socrates observed, ‘There is only one good, knowledge, and one evil, ignorance.’

Indeed, the human aspects of naval communications have changed little over time, despite major technological developments and hence much of what we may learn about C3I in the Persian and Greek fleets of the 5th century BCE is enduring.

Notes

5. For example the overland route from the Ionian coast to the King’s palace in Susa was a three-month journey; see Herodotus, Book 5 Paragraphs 50-54 (5.50-54). Refer to R Waterfield, (trans), Herodotus: The Histories, Oxford, Oxford University Press, 1998.
6. Quote from VD Hanson, ‘Persian versions. Myth and reality in wars between West and East’, Times Literary Supplement, May 18, 2007. Hanson is one of the scholars who continue to support
the ‘Triumph of the West’ approach, see VD Hanson, Why the West has Won, New York, Faber and Faber, 2001, pp. 27-59.


9. Herodotus, 7.89-99. There has been much discussion on the size of Xerxes’ fleet but these figures are probably right as far as we know.

10. Athens sent 20 triremes while Eretria sent another five, Herodotus 5.99.

11. Herodotus, 7.96.


13. The rebel East Greek fleet in 494 BCE consisted of; 100 triremes from Chios, 80 from Miletus, 70 from Lesbos, 60 from Samos, 17 from Teos, 12 from Priene, 8 from Erythrae, 3 from Myous and 3 from Phocaea; Herodotus 6.8.


17. Herodotus, 6.9.

18. For much of the classical period the Athenian word strategos (translated in modern Greek as ‘general’) was used for both military and naval commanders. Hence in this paper strategos is translated as ‘admiral’. The classical nauarchos (translated in modern Greek as ‘admiral’) was second in command of a Greek fleet. Jordan Borimir, The Athenian Navy in the Classical Period, A Study of Athenian Naval Administration and Military Organization in the Fifth and Fourth Centuries B.C., Berkeley, University of California Press, 1975, pp. 117-130.


20. At the Battle of Platea the Persian forces did not greatly outnumber the Greek forces, so an estimate of 70,000 is about right, see Herodotus, 9.29.


23. The Coalition Greek fleet numbered approximately 368 triremes at Salamis, and included 180 Athenian, 40 Corinthian, 20 Megarian, 20 Chalcidian, 30 Aeginetan, 15 Sicyanian, 16 Lacedaemonian, 10 Epidaurian, 7 Eretrian, 7 Ambracian, 5 Troezenian, 4 Naxos, 3 Hermionean, 3 Leucadian, 2 Styrian, 2 Cean, 1 Cynthian, 1 Crotonian, 1 Tenian and 1 Lemnian. Herodotus, 8.43-47.


27. Thucydides, 1.49.


29. Thucydides 1.96.

31. Thucydides, 1.98.

32. Thucydides, 1.100-102; Plutarch, *Cimon*, 12, 13. The Eurymedon River is located in Pamphylia in Asia Minor. The actual date of the Eurymedon River Campaign may lie anywhere between 469 and 466 BCE, although we prefer the later.


34. Plutarch, *Cimon*, 12; we favour Plutarch’s version over that of Diodorus Siculus, 11.60.3.


36. Plutarch, *Cimon*, 13. The terms of the Peace of Callias between Persian and Athens, 449/448 BCE, are given in Diodorus Siculus, 12.4.5.

37. Thucydides, 1.109-110; and Diodorus Siculus, 11.71-77.


40. Thucydides, 1.49.

41. Thucydides, 1.142.

3. Miscommunications and Missed Opportunities: Sino-Spanish Maritime Relations, 1571-1604

Andrew R Wilson

The standard characterisation of the maritime history of China’s Ming Dynasty (1368-1644) is one of early glory and aggressiveness followed first by stagnation and then the precipitous decline of both the maritime sector and of Chinese naval power. In other words, a dynasty that had once sent great armadas of hundreds of ships and tens of thousands of men as far as the coast of East Africa in the early 15th century was by the mid-point of the 16th century incapable of effectively responding to piracy along its own coast. There is a technological corollary to this story-line: where China was at the apex of nautical technology at the beginning of the dynasty only to decline into a militarily backward state dependant on foreign technology in a desperate battle to stave off its inevitable defeat.

As with all conventional wisdom there is some hint of truth to this narrative. With the end of the great voyages commanded by Admiral Zheng He in 1433, the Ming state, by which I mean the central government in Beijing, did step back from the maritime realm. The reasons for this maritime retreat are many. The expense of the missions and the costs of re-capitalising the fleet strained central government coffers already depleted by land campaigns and the construction of a new capital. The re-emergence of the Mongol threat shifted the strategic focus from the coasts and maritime trade routes to the north and north-western land frontiers. This shift was further compounded by the transfer of the Ming capital from Nanjing in the trade-oriented lower Yangzi region to Beijing, a city vulnerable to predators from the steppe. This move and the re-opening of the Grand Canal as the main means of grain transport from the Yangzi region to the North China plain naturally de-emphasised maritime trade and naval issues among the Ming ruling elite. In addition, strategic defeat in a campaign to annex much of modern day Vietnam was further compounded by the innate hostility of the Ming’s Neo-Confucian bureaucrats to both military adventurism and expensive central government projects directed and staffed by court eunuchs, like the Zheng He voyages.¹ This ‘perfect storm’ of circumstance did, in fact, lead the Ming state to retreat from the sea and cede some of its technological edge, notably in the construction of very large multi-mast vessels. This retreat is best typified in a series of edicts. One in 1500 that made it a capital offence to build a ship with more than two masts. A second decree of 1525 called for the destruction of all ocean-going vessels and the imprisonment of Chinese engaged in overseas trade, and another writ in 1551 made it illegal for Chinese to sail ships
of more than one mast for any reason. What could be more indicative of a myopic
disdain for foreign trade and intercourse and of a great opportunity lost than the
Ming Dynasty’s retreat from the sea?

In actuality, however, even with the end of the Zheng He voyages and the various
maritime trade and shipping limits that were subsequently imposed (albeit
imperfectly and selectively enforced at the provincial and sub-provincial levels),
Ming China had a dynamic maritime trade sector and large coastal and ocean-going
commercial fleets. The governors of the coastal provinces also maintained very
large numbers of naval vessels for counter-piracy and general defence missions,
including the repulse of Portuguese traders in naval engagements off Guangzhou
in 1521 and 1522. In fact, the limits that Beijing placed on the size of commercial
vessels was an acknowledgment of the technological prowess and vibrancy of the
maritime sector as well as a realisation that in this period the greatest threats to
Chinese maritime security came from the Chinese themselves. The size limits
placed a ban on private Chinese vessels large enough to carry enough cannon to
out-gun Ming defenders. From the beginning, Ming leaders appreciated the murky
distinction between trade and piracy, and consistently sought to either co-opt or at
best contain the maritime economy and China’s large sea-going population.

The relative lack of historical attention that the mid-to-late Ming maritime sector
has garnered can be explained in two ways. First, the official histories of the Ming
rightly focus on those matters which were of pressing concern to the imperial court
and to senior officialdom. Lower order issues did not routinely demand the court’s
attention. For example, provincial and sub-provincial officials along the Chinese
coast were responsible for the construction, maintenance, manning and provisioning
of coastal defence vessels. Barring a cross province security challenge, as with the
Wokou Crisis in the mid-16th century, there was no need for central coordination
of or accounting for the Ming Navy. In other words, there was no Ming equivalent
of the British Admiralty, a centralised administrative structure for managing (or
even counting) the fleet. As a result, the maritime sector is conspicuously absent
from the official Ming histories. While beyond the scope of this study, a thorough
inquiry into the memoirs of coastal officials and the local gazetteers of the major
maritime trading regions would provide a clearer picture of the size and capabilities
of both the merchant and naval fleets. If we can judge by late Ming sources, such
as Li Zhaoxiang’s Longjiang Chuanchang Zhi and the anonymous Qing-era (1644-
1911) account entitled Minsheng Shuish Gebiao Zhen Xiying Zhanshao Zhitu Shuo,
the Chinese throughout this period built a dizzying array of naval and merchant
vessels. As for the later source, it is worth noting that the Qing was as officially
hostile (if not more so) to the maritime sector as was the Ming, but even their very
stringent maritime bans could at best only hope to contain commerce—licit and
illicit—along the China coast. The second reason for the historiographical elision
is that the neo-Confucian literati who compiled the Ming histories were hostile
to military expenditure, overseas adventurism, and to state involvement in the
commercial economy. Their accounts therefore either downplay or deride the scale and nature of the Ming state’s interest in overseas trade and naval issues. Neo-Confucian historians were particularly harsh in their appraisal of the Wanli emperor (1572-1620) who was an enthusiastic proponent of all of the aforementioned taboos and to whom we will return shortly. Ironically it was these neo-Confucian literati, whose power base lay in China’s lower Yangzi and Southeast coastal regions, who benefited most directly from China’s maritime trade and who for obvious reasons wanted to keep the state at one remove from their home turf.

Looking past the conventional wisdom and the official histories, it is possible to see the endurance of a robust maritime sector in the mid- to late-Ming periods. We can also see that when faced with profound maritime security threats—the Wokou Crisis of the 1550s and 1560s and Hideyoshi’s invasion of Korea (1592-98)—the Ming could rise to challenges and deploy significant military power, especially naval forces. In the case of the Wokou, the military surge was mostly an indigenous Chinese response, with some aid from regional as well as European partners. The threat that Hideyoshi posed to Korea, and ultimately to Ming primacy, required something on a much larger scale necessitating the Ming to reach out, both economically and technologically, to relatively new players in the Asian scene—the Dutch, Portuguese and Spanish. This outreach reflected a fundamental shift in both the regional economy, especially the marked rise of American silver flowing into the region, and in the technological balance as European innovations in gunpowder weaponry played a crucial role in the campaigns. These shifts were not nearly as lopsided as generally believed. In its dealings with all the actors involved, whether Asian or European, the Ming rightly acted as the hegemon and treated all others as junior partners. This was only natural given that the gravitational pull of the Chinese market rendered all but the Japanese beholden to good relations with Beijing. Likewise in the arena of technology, the flow of military sophistication was not merely from West to East. Chinese technological prowess in nautical technology, mass production of gunpowder weapons, and the Ming military’s ability to adapt and to improve upon European models (which the westerners then adopted), made this a good deal for Chinese and Europeans alike.

In the late 16th century we can discern the early foundations of a mutually beneficial exchange of trade and technology between coastal China and the Spanish Philippines and the implications that this commercial relationship had on maritime security. Despite some early missteps, the profitable communications between Manila and Ming China yielded significant benefit to both sides in the near term. For the Spanish, an inconsistent but constructive dialogue with China helped them to consolidate and defend an initially tenuous hold on the Philippines. As for the Ming, it is difficult to imagine their victory against Hideyoshi without Spanish silver. The achievement of a long-term mutual security partnership was ultimately prevented by miscommunications and the inability of each party to fully comprehend the maritime security implications of the relationship. The massacre of as many as
20,000 Chinese merchants and tradesmen in Manila in 1603 marked the end of the most productive era for Sino-Spanish relations as well as the culmination of three decades of miscommunications and missed opportunities.

**Early Sino-Spanish Interactions**

By the time Ferdinand Magellan reached the Philippine Archipelago in 1521, the Chinese had already enjoyed a long history of trade with the islands in ocean products, cloth, medicines, metalwork, silks and porcelains. The Ming court also carried on tribute relations with at least two Philippine kingdoms, Sulu and Pangasinan, and received its first Suluan tribute mission in 1372. After 1433, however, the maritime world rapidly disappeared from the court’s attention. For the next one hundred and fifty years the Philippine Archipelago was a cultural and economic backwater without a significant role in Ming foreign relations. Nonetheless, Chinese and Southeast Asian merchants continued to circulate and, when official attention returned to the region, it would follow the paths established by commerce. Beginning in the 16th century, there was a huge out-migration from mainland China in response to the economic incentives provided by the arrival of Europeans. The Portuguese, Spanish and Dutch arrived in East Asia hungry for the products of the orient and, especially in the case of the Spanish, flush with New World silver. The Chinese, both merchants and officials, responded quickly and aggressively to this opportunity. These new European arrivals would occupy a space outside the traditional Chinese tributary system: a fact that made for more flexible and more volatile relationships between the Chinese and Europeans.

Prior to the Spanish conquest of the Philippines, the Chinese population in Manila was negligible. In May 1571, when Miguel Lopez Legaspi arrived in Manila Bay to establish a base of operations, he reported about 150 Chinese in the native town. By 1603 more than 20,000 Chinese lived in Manila. While the expansion of the Chinese population under early Spanish rule was abetted by the lifting of the Ming Dynasty’s ban on overseas trade in 1567, it was the lure of trade with the Spanish that truly attracted Chinese immigrants. By the 1590s, Manila trade had become one of China’s most important foreign trade relationships.

The annual Acapulco galleon was met by a fleet of Chinese junks from the ports of Guangzhou, Xiamen and Fuzhou, laden with luxury and consumer goods, part of which were consumed by the local Spanish community, while the remainder were sent to Mexico and Spain on the return of the galleon. In the 1590s, Antonio de Morga, a soldier, bureaucrat and man-of-letters, described the scope and variety of the Chinese trade at Manila:

Raw silk in bundles, of the fineness of two strands, and other silk of coarser quality; fine untwisted silk, white and of all colours, wound in small skeins; quantities of velvet, some plain and some embroidered in all sorts of figures, colours and fashions, others with body of gold

...
and embroidered with gold; woven stuffs and brocades, of gold and silver upon silk of various colours and patterns; quantities of gold and silver thread in skeins; damasks, satins, taffetas, and other cloths of all colours; linen made from grass, called lençesuelo; and white cotton cloth of different kinds and quantities. They also bring musk, benzoin and ivory; many bed ornaments, hangings, coverlets and tapestries of embroidered velvet; damask and gorvaran tapestries of different shades; tablecloths, cushions and carpets; horse-trappings of the same stuffs, and embroidered with glass beads and seed-pearls; also pearls and rubies, sapphires and crystal; metal basins, copper kettles and other copper and cast-iron pots; quantities of all sorts of nails, sheet-iron, tin and lead; and salt-petre and gunpowder. They supply the Spaniards with wheat flour; preserves made of orange, peach, pear, nutmeg and ginger, and other fruits of China; salt pork and other salt meats; live fowls of good breed and many fine capons; quantities of fresh fruits and oranges of all kinds; excellent chestnuts, walnuts, and chicueyes (both green and dried, a delicious fruit); quantities of fine thread of all kinds, needles and knick-knacks; little boxes and writing cases; beds, tables, chairs and gilded benches, painted in many figures and patterns. They bring domestic buffaloes; geese that resemble swans; horses, some mules and asses; even caged birds, some of which talk, while others sing, and they make them play innumerable tricks. The Chinese furnish numberless other gewgaws and ornaments of little value and worth, which are esteemed among the Spaniards; fine crockery of all kinds; canganes, or cloth of Kaga, and black and blue robes; tacley, which are beads of all kinds; strings of cornelians and other beads, and precious stones of all colours; pepper and other spices; and rarities, which, did I refer to them all, I would never finish, nor have sufficient paper for it.6

In addition to being its best suppliers, the Chinese contributed to the success of the galleon trade in other ways. Many of the galleons plying the Pacific were built with the aid of Chinese shipwrights in Manila and Cavite. Some of these ships displaced as much as 2000 tons, and required massive amounts of hardware, rigging and sails produced either in China or by local Chinese craftsmen.7 Of all the peoples of East Asia, the Chinese probably had the most experience as shipwrights, especially for vessels of the size required by the Spanish. The Chinese also provisioned the galleons. On the return voyage to Acapulco, the hundreds of crew and passengers dined on Chinese rice and fowl, including pressed-duck. They also drank tea and ate mandarin oranges to prevent scurvy. The Spanish also relied on the Chinese for the basic essentials to defend their fledgling colony such as the 'iron, saltpetre, lead, tin, and other very necessary articles for the provision of the camp at Manila.8
It was not only material goods that the Chinese brought to Manila, it was talent as well. Free of competition from indigenous craftsmen and practitioners, the Chinese became the principal professional class in early Manila and were in high demand for their skills as physicians, masons and printers. Chinese worked as tailors, shoemakers, smiths, sculptors, painters and locksmiths and were responsible for most of the material culture of early colonial Manila. Whatever colonial Manila needed, either materially or in manpower, China could provide. Agriculturists, stevedores, masons and other skilled craftsmen could migrate from China to fill market demand. Since China had the largest and most complex economy in the world at the time, where trade in skills was as equally important as trade in goods, there was a pre-existing system of internal migration of labour. If a Southeast Asian colony (especially one as close as the Philippines) could ‘plug-in’ to this massive market, they would almost immediately be flooded with desirable (and undesirable) Chinese labour. The obvious problem facing the Spanish during the initial surge of Chinese immigration was reconciling their commercial interests with their fear of being overwhelmed by the Chinese. A constant refrain in official Spanish correspondence was to strike the right balance.

To pay for these goods and services, the Spanish exported huge amounts of silver from their Mexican and Peruvian mines. In 1597 alone, it was estimated that nearly 35 metric tonnes of silver (or more than 8,500,000 taels) entered China via Manila, exceeding the total amount produced by Chinese mines in the preceding 50 years. This sum likely amounted to more than twice the entire Ming tax revenue for that same year. For China, the material consequences of foreign trade were spectacular. The discovery and exploitation of overseas markets for Chinese products, dominated by tea, porcelains, and silks, catalysed commercial expansion along the southeast coast. Demand created a boom in the trade networks of coastal China as suppliers scrambled to provide Fujianese and Cantonese merchants with exports. Demand raised prices and created fortunes for the ambitious, talented and lucky, leading to a significant change in Chinese culture and society in the late Ming era.

While many Spanish were delighted to enjoy such a lucrative trade with China, despite the warnings about the drain on the empire’s silver reserves, others hoped to find a spiritual market in China. Throughout the history of the Spanish Philippines there was a consistent interest in Christianising the Chinese empire. Some, like Andres de Mirandola, a soldier on Legaspi’s 1569-70 expedition, thought that the military conquest and Catholic conversion of China was inevitable. Other Spaniards, notably the Franciscan Friars who came to dominate large portions of the Philippines, argued that the good and fair treatment of the Chinese in the islands and commerce with China was the best way to gain entry into the empire. As a result, the Church, being predisposed to the view of the friars, frequently took the side of the Chinese in disputes with the colonial authorities.
While very profitable to many of those involved, early relations between the Chinese and the Spanish were not, however, without tension. Spanish reconnaissance ships fired on Chinese junks during the first Spanish trip to Luzon in 1570. Twenty Chinese were killed in the skirmish and the Spanish seized their cargo. The attack on the Chinese dismayed the commanders of the expedition, Juan de Salcedo and Martin de Goiti, both of whom were under orders to attract the Chinese rather than expel them by force. Fortunately, Salcedo had the opportunity to improve relations with the Chinese only a few days later when the Spanish set aground in Manila Bay. Salcedo heard of several Chinese who had been imprisoned and tortured by the native Moro chieftain, Raha Sulayman. The Chinese had run afoul of Sulayman in a trade dispute and the chief was exacting his vengeance on the hapless merchants. Salcedo released the Chinese survivors and later took great pains to protect the Manila Chinese when the Spanish attacked Sulayman’s stockade fortress. According to Salcedo, the Chinese were thrilled to trade with the Spanish who apparently possessed more wealth, desirable products, and charity than the natives:

[The Chinese] became great friends with us, and gave us letters of security, which consisted of white cloths that they had with them, upon which were painted the royal coat of arms. They promised to come next year to this river of Panay, and to establish trade with the Spaniards. All that the Chinese asked was given them, which pleased them much, and they were shown the best possible treatment.

In this early encounter were planted many of the seeds of later Sino-Spanish distrust and miscommunication. Chinese merchants had a long history of manipulating local chiefs who were ignorant of China and Chinese officialdom. By giving letters of security to the Spanish that were emblazoned with the royal or imperial coat of arms, the Chinese merchants convinced the Spaniards that they were about to begin a fruitful commerce with the Ming empire. As long as the Spanish and the Chinese court were ignorant, local merchants could proceed unfettered; however, this established a volatile precedent for Sino-Spanish relations. The Spanish soon began to fear the designs of China and its overseas subjects. Nonetheless, the first two decades of substantive Sino-Spanish interaction were fruitful and the trading relationship they established in Manila had tremendous consequences. Nonetheless, during the late sixteenth and early seventeenth centuries a series of conflicts and misunderstandings between the Spanish and the Chinese, combined with the growth of Chinese piracy in the South China Sea, created an atmosphere of crisis and distrust. Ironically, this uneasy relationship was born out of an abortive attempt by Chinese and Spanish officials to cooperate in the eradication of piracy, and the capture of a mutual enemy.
Lin Feng’s Assault on Luzon

The first major opportunity for Sino-Spanish coordination in the maritime realm came with the 1574 attack on Manila by the Chinese pirate Lin Feng. In 1574, a Ming offensive against Lin, commanded by Hu Shouren, the Fujian Regional commander, cost Lin Feng several ships and forced him to retreat to Taiwan and thence to the Pescadores. Reeling from this defeat, Lin captured a Chinese merchant junk returning from Luzon. Seeing the silver and gold the merchants had acquired in Manila and hearing of the rather shabby nature of the Spanish defences, Lin and his fleet embarked from their base and headed south to Luzon, apparently with the intention of ousting the Spanish and establishing a base at Manila. While en route to Luzon, Lin encountered another ship—this time a Spanish scout—which he pillaged and burned.

On the morning of 30 November 1574, Lin’s men, numbering several hundred, landed at Manila and attacked the town, but were repulsed by superior Spanish firepower. In the aftermath of this first attack, a leading member of the Chinese trading community, a man known to the Spaniards as Sinsay, approached the Spanish governor to assure him that Lin was a pirate and not a Chinese official sent to conquer Manila for the Ming. In addition to these assurances, Sinsay also offered his services as a translator and advised the Spanish on how to prepare for a second attack, which came on 2 December as hundreds of pirates poured into Manila and besieged the citadel, but were again driven off. Even after the Manila repulse, Lin Feng was determined to establish a base on Luzon, presumably because the islands were beyond the range of the Ming navy. Accordingly he left Manila bay and sailed north along the coast of Luzon to Lingayen Bay where he built two heavily fortified settlements and proceeded to extract materiel wealth and supplies from the surrounding area. Back in Manila, Juan de Salcedo was put in charge of a punitive expedition against the pirates. The expedition set out from Manila in March 1575 with over 200 Spaniards and 2500 natives. The Spanish enjoyed some early success, catching the pirates unawares, setting fire to a good number of their ships, and capturing one of Lin’s forts. But Lin’s men were able to retreat to the second fort, where they managed to hold off the Spanish forces for the next four months and make preparations to break the siege.

Meanwhile, the Chinese authorities had been alerted to Lin’s attack on Manila. In April 1575, a Spanish ship encountered a Chinese embassy commanded by Wang Wanggao, a military official in the service of the governor of Fujian province, Liu Yaohui. Wang was dispatched to find Lin Feng, and either capture him, convince his subordinates to mutiny, or, if all else failed, to offer him a pardon. Wang was delighted by the recent Spanish successes and promised the Spanish governor, Guido de Lavezares, all manner of imperial favours if they managed to capture or kill Lin Feng. Lavezares, seeing this as an excellent opportunity to improve relations with the Chinese and to further the cause of Christianity in
China, readily agreed to hand over Lin in the event of his capture. The governor was understandably pleased when Wang suggested that some Spanish priests accompany him on his return to Fuzhou.

Wang, two Augustinian friars, several Spanish soldiers, a translator and Sinsay the merchant departed on two of Wang’s three ships in June. The group spent the summer in Fuzhou where the friars were well-received by the Ming governor, to whom they presented requests for permission to proselytize in China. The promising start to Sino-Spanish relations, however, quickly collapsed. Pirate attacks along the Chinese coast by groups associated with Lin Feng raised doubts about Spain’s military efforts. Governor Liu hastily re-dispatched Wang and the Spanish envoys to collect more information and join in the attack on Lin Feng if necessary. Wang was put in charge of a small force of junks and men. Sinsay was also given official rank and they were accompanied by another soldier Shao Yue, rumoured to be a former pirate himself.

The expeditionary force proved to be too little and too late. Even before the Chinese embassy could return to Manila, they learned that Lin had managed to re-build his fleet during the siege and take advantage of a lapse in Spanish vigilance to elude the blockade. The joint Sino-Spanish campaign failed to suppress Lin and he continued to harass the Chinese coast for at least another year. Eventually, with no help from the Spanish, the Ming navy succeeded in undermining Lin’s power-base by winning-over his lieutenants, and the once-feared corsair disappeared without a trace.

Back on Luzon, the Lin Feng incident was adversely affecting Sino-Spanish relations. The Chinese emissaries were incensed that the Spanish had let the pirates escape and castigated them for their incompetence. They also rejected further Spanish petitions to send missionaries to China. All the congeniality and offers of rewards from Wang Wanggao evaporated. Chinese displeasure with the Spanish was answered by Governor Francisco de Sande’s poor opinion of the Chinese. According to de Sande, who had replaced Lavezares in August, Wang was arrogant, disingenuous and corrupt, using his mission as a chance to profit himself, falsifying reports of Lin’s death, and extorting excessive gifts from the Spanish authorities.

When Wang finally left Manila he was accompanied by two friars who wished to press their case with the Ming court. In de Sande’s account, when Wang found he could not extort bribes from the two penniless priests he marooned them on an island off the coast of Luzon.

Although there is no reason to doubt Governor de Sande’s portrayal of Wang Wanggao, it is likely that the new governor was also expressing embarrassment and frustration over the Lin Feng affair. De Sande’s opinion of the Chinese was probably coloured, if not eclipsed, by his anger at finding himself berated by a Chinese official for military ineptitude. Furthermore, Wang and Governor Liu had successfully manipulated Spanish aspirations and ignorance to achieve their own goals. What Wang did not tell the Spanish in Manila was that no matter how friendly
he or the governor may have been toward Christianity, the permission to proselytize in the empire could only be granted by the emperor. Thus neither side emerged from the Lin Feng affair with a favourable impression of the other.

It is obvious that Chinese coastal officials had a great deal of experience in manipulating and co-opting ‘barbarians’. The Spanish, however, were unfamiliar with the rules of the game and their first encounter with official China was a bitter one. Governor de Sande was so disgusted by the behaviour of the Chinese that he viewed the mandarins as irredeemably evil people, declined a later offer from Governor Liu to establish a Spanish enclave on the Chinese coast, and began making plans for the military conquest of China.23 While de Sande’s ambitious military proposals were rejected by the Spanish throne, which wanted peaceful and prosperous ties with China, subsequent Spanish policies exhibited an increasing wariness of the Chinese.

Sino-Spanish Relations during the Imjin War

The high-water mark of mutually beneficial exchange of trade and technology between Ming China and the Spanish Philippines came during the six years of violent struggle over the fate of Korea waged between Ming China, its Korean ally (the Choson dynasty) and Hideyoshi’s Japan. The 1592-98 war, commonly referred to as the Imjin War, was perhaps the largest and bloodiest conflict of the 16th century. War on this scale and for these stakes obviously had larger regional implications: a fact that was not lost on Chinese, Japanese, Koreans and Europeans alike. All of the armies involved were equipped with small arms and cannon either purchased from Europeans or adapted from European designs. Foreign observers and advisors, most notably Portuguese and Dutch, chronicled and in some cases participated in the campaigns. Moreover, given the logistical and financial demands of carrying on a protracted war on a massive scale none of the combatants could afford to neglect foreign trade as a source of materiel and of silver.

Early in the struggle it also looked likely that the war in Korea might spill over into Southeast Asia. For example, in 1591 and 1592, Hideyoshi made a first southern feint by dispatching emissaries to Manila to demand Spanish obeisance to him and support in his war against Ming China.24 Not long after, the Ming emperor, Wanli, promised King Sonjo of Choson that he would also marshal aid from Siam and the Spanish Philippines, among other regional powers.25 While little materialised from these gestures in terms of formal alliances, it does show a cognisance among the major players of the international implications of the war in Korea along with a recognition that each party was likely to be heavily reliant on foreign trade to finance their efforts and on foreign military expertise and technology to outdo their adversaries on land and at sea. The Spanish, for their part, managed to avoid direct involvement in the war, and seemed to hold the greatest concern over Japanese aggression to the south, including the capture of Taiwan as a flanking manoeuvre around the Ming. It would seem, then, that the Spanish chose
to lean to the Chinese side, although some in Manila advocated for siding with Japan. Spaniards certainly had cause to fear the Chinese. Governor Gomez Perez Dasmarinas was murdered in October of 1593 by Chinese mutineers on board his galley bound for a military campaign in the Moluccas. This was followed the next year by the arrival of a delegation of Ming officials in Manila, the purpose of their mission being unclear, but some Spaniards speculated that its goal was to gauge the likely success of a Chinese invasion. The decision to lean toward the Ming seems to have been based primarily on the economic calculations of their lucrative trade with China. The Spanish at this point were also contemplating a campaign against the Kingdom of Champa in modern-day Cambodia. That campaign would require good relations with the Chinese as it was along the China coast that their flotillas were required to travel and, as noted above, they were almost completely dependent on the Chinese for the raw materials of war. While they managed to keep their distance from the actual fighting in Korea, the Spanish nonetheless contributed significantly to the Chinese victory.

In the 1590s, the Ming dynasty was not a moribund state tottering toward an inevitable demise, as some have characterised the late-Ming and especially the reign of the Wanli emperor. Rather the Ming was one of the more dynamic states in Asia. Its economy was booming, not least because of foreign trade, and the Ming possessed a potent military that had proven its mettle already and was in the process of rising to the challenge of Hideyoshi’s invasion, the greatest of the three great campaigns of the Wanli emperor. The degree of tactical and organisational innovation that took place in these wars revealed the military realities that would characterise 17th-century warfare across the globe and especially in the ‘gunpowder empires’: professionally-led mass infantry armies equipped with standardised firearms, supported by artillery, cavalry and naval forces, all of which were dependent on immense and complicated logistical structures. Silver was the basis of this new military power and this fact was not lost on the Ming emperor who was intent on securing cash for his armies. The emperor’s ambitions, especially his military campaigns, were, however, under constant assault from the anti-statist neo-Confucian elite, not merely because they were proactive and required enhanced fiscal extraction (that is inserting the state into the southern economy which was the southern elites stock in trade), but also because they allowed Wanli to promote and reward military officers rather than mainstream bureaucrats.

Ming China was victorious in its military campaigns through a combination of superior leadership (men who Wanli elevated over civil officials), numerical advantage, and innovation that included the wide-spread adoption of firearms, gunpowder artillery, and the professionalisation of officers and enlisted ranks. In the final naval engagement of the Imjin War, the Battle of Noryang Point (16 December, 1598), a combined Sino-Korean force of 150 ships and over 15,000 men routed a larger Japanese force with superior seamanship and gunnery. The Ming’s success in this particular battle and in the larger war is difficult to imagine
in the absence of a vibrant maritime economy and in the absence of emergency measures. The most controversial of these fiscal expedients was the 1596 mining-intendant system, which tasked court eunuchs (state officials, under the guise of mining intendants) to extort silver bullion directly from local elites and merchants and otherwise insinuate the state into the southern bullion economy. Profoundly flawed and divisive though it may have been, in the near term the intendant system placed central government officials at the nexus between foreign trade and the domestic market, which as noted above were reportedly the conduit for nearly 35 metric tonnes of silver entering Ming China annually from Manila alone. A fuller appreciation of the centrality of Sino-Spanish trade during the Imjin War on the part of the Ming court may also explain a remarkable, albeit ultimately fruitless, series of overtures from the governor of Guangdong to the Spanish in mid-1598 with offers of establishing a Spanish trading post in the vicinity of Guangzhou.

Even after victory over the Japanese had been assured, the demands for a consistent tapping of the bullion economy continued. This brings us to the last vignette of miscommunication and missed opportunity.

The Search for Mountains of Gold

Early in 1603, Zhang Yi, a commoner with ties to the Chinese merchant community in Manila, and Yan Yinglong, a minor military official, responded to calls by mining-intendants for information on possible revenue sources. They reported a mountain, Jiyishan on Luzon’s Cavite peninsula, that they claimed could produce 100,000 taels of gold and 300,000 taels of silver a year. Eunuchs in Fujian then relayed this tale of taels to a receptive audience in Beijing. This would be an ‘end run’ around the local and commercial interests of the southern literati that had been blocking the implementation of the mining-intendant system. These claims of mountains of gold and silver may sound ludicrous in hindsight, but since ‘mines’ and ‘mining’ were already being used as veneer for direct bullion taxes the term ‘mountain’ might merely be a euphemism for the stockpiles of bullion that seasonally arrived in Manila that the Ming could ‘mine’.

As one would expect from the controversy surrounding the intendant system implemented during the Imjin War, the plan was promptly attacked on both practical and moral grounds by the anti-eunuch and anti-statist neo-Confucians. Opposition or no, that spring the court ordered Gao Cai, the eunuch in charge of the Mining Tax Bureau in Fujian, to dispatch an embassy to investigate. The expedition included the officials, Wang Shihe, the vice-magistrate of Haicheng, Fujian, and the military official Gan Yicheng, as well as Zhang Yi, the commoner who had initiated the scheme. The delegation arrived on 23 May in Manila where they were received by Governor Pedro Bravo de Acuña, who gave them permission to proceed to Cavite in search of the mountain.
The mandarins made a powerful impression on the Spanish: clad in ornate robes, each official was attended by dozens of servants and assistants, chair and flag bearers, musicians, soldiers and clerical staff. Their processions wound through the streets of Manila, visiting Spanish officials and administering justice to the local Chinese. Geronimo de Salazar y Salcedo, a local official, reported that the visitors meted out punishment, including flogging and the hand-press, to at least four locals, three Chinese and one indio. Finding neither gold nor silver in Cavite, the officials returned to Manila and thence to Fujian. The following year both Zhang Yi and Yan Yinglong were executed for proposing such a ludicrous scheme and fell victim to the larger collapse of the intendant policy that began in 1604. In a tragic vindication of the neo-Confucian critique, both men were also blamed for sparking a riot by and a retaliatory massacre of the Chinese in Manila.

If the embassy was indeed the proximate cause of the massacre, I would argue that the mandarins’ behaviour was largely to blame. Their conduct, specifically their punishment of local Chinese residents, shows that they did not conceive of their authority as limited by political boundaries. To the Spanish, whose assumptions about the nature of empire were grounded in expansion, conquest, and exploitation, the mandarins posed a distinct threat. Since they were ignorant of Chinese assumptions about extrality, the mandarins’ behaviour was only explicable as an attempt to assert Chinese suzerainty over the Philippines. It did not help that the Spanish had difficulty distinguishing between the actions of individual Chinese and the Ming state: a confusion that Wanli’s tax initiatives compounded by blurring the line between official and private, and by including Zhang Yi as a member of an official embassy. Whatever caused the human tragedy that followed, the failed mission was a final blow to Wanli’s attempt to circumvent the Ming tax system and siphon bullion directly into Beijing’s coffers.

For the Chinese community in Manila, the crisis created by the mandarin’s visit contributed to growing hostility between themselves and the Spanish. Chinese imperial intervention in the silver trade not only failed to secure more revenue, it
worsened the lot of Chinese merchants and hindered commerce. The harsh Spanish policies that followed contributed to a general feeling of persecution and unease among the Chinese. This, in turn, damaged Sino-Spanish trade in the near-term. Back in China, Wanli’s anti-statist adversaries had finally blunted his efforts to permanently insinuate the state into the maritime trade sector. Ironically this made anti-statist local elites in China partners in the Spanish colonial enterprise. Not only did they provide the markets that the Spanish sought to tap, but their opposition to Ming imperial adventurism or court intervention in the bullion economy forestalled any possible Ming designs on the Philippines. In the relative peace of the 1600s few saw the merits of continuing the emergency measures implemented during the 1590s, especially when the political environment had swung away from the statist agenda with its demands for revenue to the southern literati who wanted the keep the state out of the southern economy. The short-term fall in bullion supply following the 1603 riot in Manila was compounded by a disastrous retreat from innovative fiscal policy. By the 1630s, the Ming court would ironically find itself revenue-poor and militarily weak in the face of growing northern threats while ruling over a domestic economy that was both huge and directly tied to the immense global movement of wealth.

In terms of its impact on Sino-Spanish relations two brief excerpts from the bitter and bellicose exchange between the Philippine Governor Pedro Bravo de Acuña and the newly posted Governor of Fujian should suffice. First from the Fujian viceroy:

> It is long since anyone has dared to give offence to this kingdom; and although the Japonese have endeavoured to disturb Corea, which is under the government of China, they have been unable to succeed therewith, and have been driven from the said kingdom, and Corea has remained in great peace and quiet, as the people of Luzon know well from what has been told them. … If the Castilians show justice to the Chinese, send back the Sangleys [Chinese merchants] who have survived the war, and pay the money due for the goods taken from the Sangleys, there will be amity between this kingdom and that, and merchant vessels will sail there every year. If not, the king [the Wanli emperor] will not permit merchant vessels to make the voyage, but will command a thousand vessels of war to be built with a force of soldiers—relatives of the deceased, and inhabitants of the other nations and kingdoms that pay tribute to China; and, without having mercy upon anyone, they will make war, and afterward the kingdom of Luzon will be given to that people which will pay tribute to China.⁴²

de Acuña responded:

> As for the statement that the letter is sent to let me know the greatness of the king of China and of his realms, and that they are so great that he governs all upon which the moon and the sun shed their light; and
the other statement that he desires me to be acquainted with the great wisdom with which that kingdom is governed, vast as it is, and that no one should dare offend it, and referring to the war in Corea—to this I answer that the Spaniards have measured by palmos, and that very exactly, all the countries belonging to all the kings and lordships in the world. Since the Chinese have no commerce with foreign nations, it seems to them that there is no other country but their own, and that there is no higher greatness than theirs; but if he knew the power of some of the kings with whom my sovereign, the king of the Hespañas, carries on continual war, the whole of China would seem to him very small. The king of China would do well to notice that from here to the court of Hespaña the distance is five thousand leguas; and that on the voyage thither are two kingdoms, Nueva Hespaña and Peru, whose territory is so great that it is almost equal to that of China, without mentioning very large islands in those seas. At the same time I know that the kingdom of China is governed with much wisdom, and all the people here know, and I know, of the war in Corea.43

Conclusion

In the years following this exchange, Sino-Spanish relations fell into a stagnant equilibrium.44 The galleon trade continued to be lucrative, but not on the scale of the late 16th century and, given the very modest Spanish presence at this far edge of the empire and the slowly declining fortunes of the empire itself, there was neither the means nor the will to transform the colony into anything more than a place to proselytize to the natives and trade silver for Chinese goods. After 1604, the Ming was definitely disinclined to be forward leaning in its relations with the Spanish. Over time, the surfeit of internal crises and foreign threats that culminated in the dynasty’s fall in 1644 meant that they could have done little about it even if neo-Confucian officials had been even remotely in favour of formally reaching out to the Spanish.

That there were opportunities to develop a long-term mutually beneficial trade and security relationship between Ming China and the Spanish Philippines should by now be obvious. Both sides benefitted enormously from trade, which required open and secure sea lines of communication, which in turn put them both in the pirate suppression business. Both Chinese and Spaniards also had cause to fear and to resist Japanese southward aggression. Were the Japanese to oust the Spanish from Manila it would have been deadly for the enclave and catastrophic for the Chinese economy. This is why I have highlighted the 1590s as the high-water mark of the relationship. In the midst of the Imjin War, both sides (albeit not everyone on each side) were aware of the mutual threats they faced and the mutual benefits of a healthy trading relationship. The Spanish and the Ming were also sufficiently distracted so as to not be overly concerned that the other was a likely adversary. As we can see in the exchange above, the defeat of the Japanese ironically allowed
the Chinese and Spanish to once again view the other as a potential enemy. Thus, it should be equally obvious that the opportunities mentioned above were ultimately squandered in an atmosphere of distrust compounded by poor communications.

That conclusion, however, hinges on the feasibility of these radically different states being able to form and manage such a relationship.

The 1590s may simply have been an anomaly, acts of expediency dictated by the scale of the crisis in Korea. After all, the natural conduits for Sino-Spanish communications, the military men governing the Philippines and the mandarins governing the Chinese coast, were almost all hostile to the enterprise. China’s Neo-Confucian bureaucracy was fundamentally opposed to state intervention in the economy, to foreign military adventures, and to allowing court eunuchs to circumvent their authority. With the anti-statist faction ascendant and the mining-intendant scheme completely discredited, there seemed little hope on the Chinese side for re-initiating the dialogue with Manila after 1604. The Spanish governors and military officers (other than the religious orders that lobbied stridently for good relations) viewed the Ming with a mixture of fear and contempt. Any Chinese embassy to Manila could easily be seen as a scouting party for an invasion, a notion of which the Fujian governor did not disabuse them in the letter excerpted above. Given this mutual antipathy and the mutual surety of their respective superiority it would seem unlikely then that a constructive relationship was even possible, except on an ad hoc basis. If it were to work the Ming officials would have had to admit their dependence on foreign trade and especially on Spanish silver. The Spanish would have had to recognise that they were a second-tier, if not third-tier, player in maritime East Asia. This would have been wise as such status allowed them to keep a safe distance from the major crises and this recognition would have tempered ludicrous notions of waging a successful war against China. In other words, both needed a more realistic appraisal of their respective capabilities and limitations as well as their mutual dependences and interests. That this would have been difficult goes without saying, but that the relationship worked, albeit imperfectly, for a brief time in the 1590s shows that it was possible.
Notes

1. The fundamental paradox of the Ming Dynasty, as well as all Chinese dynasties from the Song period onward, was that they had autocratic inclinations but minimal capabilities. This meant that what the state could not control directly, it either had to delegate oversight to a trustworthy stakeholder, as all of these dynasties accomplished by handing the ideological baton off to the neo-Confucian literati, or attempt to stifle through imperial edict. When it became obvious that maritime trade could not be shoe-horned into the tributary system and/or run as a government monopoly - the basic mission of the Zheng He voyages - the Ming chose to try to keep overseas trade at a low enough level that would neither strain government spending nor present a serious security problem.

2. This first text contains descriptions and dimensions for the large vessels built at the imperial yards in Nanjing whereas the Qing text contains illustrations, dimensions and schematics for the smaller coastal defence ships constructed in Fujian province. See also Song Yingchang’s *Jinglue fuguo yaobian* for memorials on coastal defence measures and strategies and Hu Zongxian’s *Chouhai tubian*: a source dealing with defence against the Wokou in the 1550s.

3. There is some evidence to indicate that a warming of relations between the Ming and the Portuguese, who as noted above had been repulsed in the 1520s, culminating in Beijing accession to a Portuguese trading enclave in Macao, were rewards bestowed upon the Europeans for their help against the Wokou.

4. Hideyoshi’s ultimate goal was to conquer Ming China rather than be a servant to a Chinese hegemon.

5. China’s foreign relations apparatus was significantly more flexible than the traditional ‘Tribute System’ would seem to allow. Officials in Beijing could and did interact with foreign powers outside of the ritual hierarchy of the tributary construct. Moreover, the majority of China’s foreign relations took place on the fluid frontiers of the empire, far from the moralising centre. But even in this realm Chinese officials approached foreign relations within a different conceptual framework than the Europeans who arrived in Asia in the 16th century. This was usually within the realm of the rarely documented informal relations between China and maritime Asia: a more constant and more localised sphere than the tributary system. It was also less constrained by ritual and bureaucracy: although it regularly involved China’s coastal governors, governors-general, and military officials as well as the pirates, merchants, colonials and the indigenous peoples of Southeast Asia.


10. This number is arrived at by using a standard weight of 40g of silver per tael. This is a conservative estimate as tael’s varied in weight from a low of about 33g to a high of 40g. JP Geiss, ‘Peking Under the Ming’, PhD dissertation, Princeton, 1979, pp. 157-158.
11. In addition to these vast quantities of silver, the Manila trade also introduced New World crops that had an enormous impact on Chinese agriculture and demographic development. J Spence, ‘Food,’ in Chinese Roundabout: Essays in History and Culture, New York, 1992.


15. Zaide, Documentary Sources of Philippine History, vol. II, no. 48, p. 84.


26. The mutual distraction of both parties, Ming with Korea and the Spanish with Champa seems ironically to have allowed them to get along better during the Imjin War.

27. There were some Spaniards who nonetheless hatched schemes to take advantage of the Ming’s distraction in Korea. Don Francisco Tello petitioned Felipe II for permission to use Chinese cannon-making expertise against them:

I have found here an invention of the Sangleys for founding artillery. It is easy of accomplishment, and as there is much metal in the royal warehouses I am having fifty pieces of artillery made, which will take a ball of one to three libras’ weight, the size most needed here. After these are finished, I shall not fail to go to China to attack the Sangleys.


28. The available evidence suggests that Spanish technological and tactical acumen did not play a significant role in the Imjin War, this is not surprising given Don Francisco’s note above. It was primarily the Dutch and Portuguese that had the greatest impact on the actual fighting. Here, however, Kenneth Swope has challenged the conventional wisdom on simple West-East technology flows by showing how advanced and innovative Chinese gun-making was in the late 16th century. He suggests a much more dialectical relationship and multi-directional flows of military technology, a fact that Don Francisco seemed to appreciate. KM Swope, ‘Crouching Tigers, Secret Weapons: Military Technology Employed During the Sino-Japanese-Korean War, 1592-1598’, The Journal of Military History, vol. 69, no. 1, January 2005, pp. 11-41.

29. See in particular the work of Ray Huang, especially, 1587, A Year of No Significance: The Ming Dynasty in Decline, New Haven, Yale University Press, 1982 and ‘Lung-ch’ing and Wan-li Reigns,

30. For the most comprehensive account of these wars and their costs see Kenneth M Swope Jr, ‘The Three Great Campaigns of the Wanli Emperor, 1592-1600: Court, Military, and Society in Late Sixteenth-Century China’, Doctoral dissertation, University of Michigan, 2001.


33. The fiscal apparatus of the Ming state was ill-suited to the challenges of the 16th and 17th centuries and reformers like Zhang Juzheng, who had gained the favour of the emperor in the 1570s, tried in vain to overhaul the revenue apparatus by rationalising agricultural taxes and re-asserting the primacy of the state over local elites. Zhang’s reforms failed in the face of stiff opposition from many corners: local officials resisted the expansion of the centre, court eunuchs opposed Zhang’s personal power, and Neo-Confucians rallied against any increase in the state’s extractive capabilities. Eunuch mining tax collectors enjoyed only limited success in meeting the extraordinary demands of the wars of the 1590s and may have done more harm than good by contributing to greater factionalism in the empire.

34. Kenneth Swope estimates that the Chinese spent between 7 and 8 million taels on the Imjin War. Tapping into just 10 per cent of the bullion flow from Manila would have significantly offset that debt. Personal communication.


36. Coincidentally this amounted to roughly 10 per cent of the average annual bullion flow.


41. While tensions may have been building in the four months between the May mission and the October riot, I am not fully convinced that blame for the riot and massacre was not skilfully attributed to the mission by its opponents.


44. While beyond the scope of the present study, the same pattern of suspicion and violence that resulted in the 1603 riot was repeated in 1639, when Chinese corvée labourers attacked Manila and prompted a general riot. The Spanish responded by killing as many as 30,000 Chinese and forcing the survivors to flee. The final major conflict between the Chinese and the Spanish occurred in 1662 when the famous Ming loyalist and ruler of Taiwan, Zheng Chenggong, demanded that the Spanish submit to his rule. The Spanish had previously cooperated with Zheng by refusing Manchu demands that they exile Zheng’s partisans from the Philippines, and by satisfying his requests for provisions, but, understandably, they refused his order to surrender. Zheng died later that same year before his emissary could deliver the refusal and his successors remained content with consolidating control over Taiwan.

45. The irony was that after all else had failed the last remnants of the Ming court could still rely on the maritime networks of the East and South China Seas to stave off total defeat for another four decades.
For the last century and a half, China’s enemies have defeated it by cutting its maritime communications and leveraging naval power to work their will. Despite its long coastline, successive Chinese governments paid little heed to maritime communications, and historians of China even less. Yet much of Chinese trade and tax revenues have long flowed by river and sea. The national security threat overturning the Confucian order that had dominated China for thousands of years came by sea. It came in the form of the maritime powers of the Industrial Revolution, Britain, France and Japan, which repeatedly and consistently defeated China in both Opium Wars (1839-42, 1856-60), the Sino-French War (1884), the Boxer Rebellion (1900), and both Sino-Japanese Wars (1894-95, 1931-45).

Ever since the late 19th century, the most modern parts of the Chinese economy have been concentrated on the coast. In the twentieth century, Japan undermined this economy by blockading these coastal cities. Japan defeated the Nationalists under Chiang Kai-shek (Jiang Jieshi 1887-1975) not only on the battlefield but equally importantly in the realm of economics. The Nationalists lost the support of their countrymen from their economic not their military failures, and these were attributable to the Japanese and the severance of China’s maritime communications. Although historians portray the Communist victory in 1949 as a triumph of land forces, a naval blockade of the Manchurian coastline contributed to the Communist victory in the decisive Manchurian Campaign and a Nationalist naval mutiny allowed the Communists to cross the Yangzi (Yangtze) River unopposed to conquer South China.

Thus, China’s enemies won by cutting its maritime communications, while the Communists emerged victorious in the Chinese Civil War after cutting those of the Nationalists. After 1949, the Communists deliberately cut China’s maritime communications with the outside world. This self-inflicted wound kept Chinese living standards artificially low. Only with the Deng Xiaoping (1902-97) era did China begin to restore its maritime communications with the outside and, in doing so, begin to restore its traditional percentage of world trade that it has yet fully to recapture. Finally, in our own day, China threatens to breach Taiwan’s maritime communications in order to conquer the island.

Until China’s naval shopping spree starting in the 1990s suggested an intent to develop a blue-water navy, the maritime dimension of Chinese history went unstudied – a major oversight given the centrality of maritime affairs to the course of modern Chinese history. How was this possible? I have a very simple thesis: We
missed it because they missed it. The current generation of Western historians of
China often takes its lead from what the Chinese study and publish, which, as in
most communist countries, is heavy on social history and light on criticism of the
Communist Party. Why then did the Chinese miss it?

I. China as a Continental Power

Prior to the 19th century, the security threats facing China were all continental and
military. The two major conquest dynasties, the Mongol or Yuan dynasty (1206-1368)
and the Manchu or Qing (Ch’ing) dynasty (1644-1911) both massed vast armies to
invade China from the north. The Manchus, the rulers of China’s last dynasty, which
was also one of its longest-enduring and territorially largest dynasties, had their
roots in a cavalry tradition of mounted archers. Upon taking power, the Manchus
focused on regime security, meaning the maintenance of Manchu minority rule
over an empire where the Han outnumbered them on the order of one hundred
to one. They divided their elite military units along ethnic lines, with their banner
forces – their praetorian guard – manned mainly by Manchus and Mongols, not
Han Chinese. Although the vast regular army remained overwhelmingly Han, it
focused on constabulary duties. Naval and maritime considerations did not figure
in Manchu calculations until their conquest of Taiwan in the 59th year of their rule
and then such considerations figured only temporarily.

This was because in recent memory there were no maritime threats beyond
pirates, who could not endanger the regime or even provincial governments.
Pirates preyed on traders whom Confucian thinking relegated to the bottom of the
social pyramid after scholars, farmers, and labourers. China’s other borders were
also secure. Mountains protected it to the west, while to the south the pattern of
migration always flowed southward. In other words, security threats in the south
concerned the Chinese threat to their neighbours. Trade went primarily overland
or on inland waterways. Likewise, prior to the Industrial Revolution, China’s
major cities lay inland, not on the coast. Historically, any security threats came
overland from the north.

The Industrial Revolution in Europe, however, brought a maritime dimension
to Chinese security that successive Chinese governments were very slow in
recognising. Although Western naval forces first defeated China in 1842 during
the first Opium War, not until 1874 was there a major foreign policy debate within
the Chinese government over the prioritisation of land versus naval forces. Those
favouring the prioritisation of land forces won the day, although China went on to
acquire a variety of capital ships that still put its navy among the world’s top ten
by the last decade of the 19th century. In the meantime, China lost a succession of
wars to Britain and France. Then a third maritime foe, Japan, sank the better part of
that new navy in the First Sino-Japanese War (1894-95).
Japan’s surprising victory overturned thousands of years of Chinese domination of East Asia. Japan adapted to the Industrial Revolution far more rapidly than China. When the Opium Wars indicated a rising Western maritime threat to China, the Japanese sent numerous fact-finding missions to Western Europe, Russia, and the United States. They concluded that modernisation, meaning the acquisition, exploitation, and creation of the most up-to-date technology, could not take place without Westernisation, meaning the reform along Western lines of the whole spectrum of civil and military institutions. These reforms, known as the Meiji reforms, allowed Japan to leverage maritime communications militarily to defeat China, and economically to enter the global trading system that produced the wealth to fund Japanese military prowess and further economic development. If Japan could understand the nature of the threat and develop an effective strategy, why was China not equally perceptive? Why did successful reform elude China arguably until the reforms of Deng Xiaoping, implemented a century after Japan’s highly successful Meiji reforms?

China has a very long-standing continental strategy for empire, focusing on the expansion into contiguous areas. This strategy relies primarily on population inundation backed up by force when necessary. For over one thousand years, the Han Chinese pushed numerous minority peoples to the imperial periphery. These people include the Hmong of Vietnam, known as the Miao in China, who originated on the Yangzi River in Central China if not even further north. Many other minority peoples, now living primarily in southernmost China also originated in central China, but, like the Hmong, over the last thousand years, lost successive battles to the Han Chinese, fleeing ever further southward.

China’s traditional strategy for empire also focused on the prevention of barbarian invasions, generally from the north. Historically, the Chinese excelled at economics, so that others valued their goods and repeatedly invaded to get them on favourable terms. The Western maritime imperialists of the 19th century were just the last of a long line of barbarian invaders seeking Chinese products. Note that maritime communications did not figure at all in this strategy for empire whose focus was entirely inward toward the Eurasian continent.

II. The Maritime Model for Empire

In contrast, the British strategy for empire depended on the dominance of maritime communications. Overseas trade created the wealth that provided both the rationale to acquire and the funding to administer an expanding empire. The navy then protected the sea lines of communication both to keep the domestic economy flourishing and the enemy contained. The resulting prosperity completed the circle to fund the navy and various continental allies, which together kept the maritime commons open to the British and the home islands closed to any enemies.
Maritime communications were the invisible spider’s web binding together the highly effective enterprise that made Great Britain a superpower and the British people unprecedentedly wealthy.

The American maritime theorist, Rear Admiral Alfred Thayer Mahan (1840-1914), recognised this nexus of global trade creating wealth, the maritime commons where the trade flowed, and the geographical conformation necessary to become a great maritime power. His British contemporary, Sir Julian Corbett (1854-1922), made the control of maritime communications the crux of his naval strategy and also emphasised the oceanic moat that provided maritime powers’ homeland defence. George W Baer, Alfred Thayer Mahan Professor of Maritime Strategy emeritus at the US Naval War College, combined these ideas to create a three-part framework for understanding oceans as a common, a highway, or a defensive moat.

Corbett explained the maritime dimension of national strategy. Maritime powers could fight far from home and keep any conflicts away from their own territory. Although he did not say so, this meant that their economies could continue to flourish to fund both domestic prosperity and expensive navies. Conversely, continental powers often became embroiled in battles on their own territory that undermined their domestic prosperity and inhibited their ability to fund their militaries, so that time, in the long run, lay with the maritime, not continental powers. Corbett predicated in his theories concerning peripheral operations on the asymmetric advantage of maritime powers, which could rely on their oceanic moat for protection against their continental foes. Their oceanic moat gave them the flexibility to use their navies to attack their enemies from unusual directions by opening secondary fronts in peripheral operations, which, in turn, indirectly aided fighting on the main front by sapping the enemy’s overall strength.

 Whereas the oceans opened the world to the maritime powers, geography hemmed in continental powers. Continental powers not only lacked the mobility of naval powers, but had to fund large and expensive armies for homeland defence. Corbett did not go into the domestic ramifications of this asymmetry, but these large armies also had civil-military implications. Countries with them often had governments where military opinion consistently trumped civil opinion and dissent of all kinds.

Corbett also developed the idea of a disposal force, meaning an expeditionary force that a maritime nation could afford to lose on a peripheral operation without jeopardising homeland defence. Having such a force again depended on the economic surplus generated by trading economies. This trade depended on the adherence to a growing body of international law regulating the relations among states and thereby reducing the need to resort to war. Maritime communications secured by naval dominance and a spreading adherence to international law underlay the British model for prosperity.
The Chinese, in contrast to the Japanese, fundamentally did not understand this model. From the 18th century until the death of Mao Zedong (Mao Tse-tung 1893-1976), successive Chinese governments rejected its many pieces and remained glued to their continental prism. They did not see their country’s prosperity in terms of expanding commerce with the West. Many rejected international law as a Western imposition that offered no benefits to China. Although they showed some interest in Western and Japanese military institutions, with the exception of the Nationalist Party which studied Western, Japanese, and Soviet institutions, other Chinese leaders showed little interest in any Western or Japanese civil institutions, which arguably held the key to successful modernisation. They saw their national security threat in terms of the overt military actions of others. Until well into the 20th century, China did not search out the institutional, conceptual, or economic differences that underlay the growing military gap between China and its rivals.

III. The Manchu Understanding of Maritime Communications

In the 19th century, China’s maritime adversaries repeatedly destroyed its fleet. In the two Opium Wars, the Sino-French War, and the First Sino-Japanese War, whenever the Chinese deployed naval forces, the British, French, and the Japanese rapidly sank them. This gave the impression to the Chinese of the irrationality of engaging in naval warfare and the unjustifiable extravagance of wasting precious resources acquiring expensive fleets. They did not perceive the web of maritime communications on which Britain’s maritime strategy for empire depended.

In all of these wars, the Chinese allowed the enemy to choose the time and place of engagements – mainly in coastal areas accessible by the sea. In none of these wars did the Chinese attempt the asymmetric strategy of using their navy to target, not the enemy navy, but the enemy logistical flow, or a strategy of drawing the enemy inland to fight far from its maritime re-supply lines. Such a strategy would have proved devastating to these maritime foes, whose land forces in theatre were tiny compared to China’s limitless supply of soldiers. In other words, the Chinese had no understanding of the importance of maritime communications to their maritime foes and so never targeted their vital and yet vulnerable lifelines. An understanding of this critical vulnerability would have led to an entirely different Chinese military strategy that, given the enormity of the Chinese theatre, with enough time, would have delivered victory.

China’s strategy of fighting on the periphery – meaning areas easily accessible to maritime powers – reflected its highly successful strategy for dealing with overland barbarian incursions from the north. It entailed major trade accommodations to appease barbarian leaders, followed by punitive expeditions for the insatiable. The Chinese developed this continental strategy to fight the nomads of Eurasia who possessed no particular theatre advantage. Rather, China had the interior lines of communication, superior technology, superior logistical flow, and far greater wealth with its economy based on settled agriculture. Those barbarians
who possessed a superior military organisation, such as the Mongolian horsemen or the Manchurian banner men, defeated the Han to create the two great conquest dynasties of the Yuan and Qing. Likewise, China’s industrialised 19th century maritime enemies had superior military organisations, both on the land and on the sea. They also possessed logistical and technological superiority, and were far more perceptive than the Eurasian nomads about targeting critical Chinese vulnerabilities. These maritime adversaries all leveraged and indeed depended on maritime communications to defeat China.

In the First Opium War, the British knew that taxes paid from South China to Beijing came in the form of rice tribute transported along the Grand Canal that could be easily cut where the canal crossed the Yangzi River not far from its mouth. So they deployed their navies to cut this financial lifeline to the ruling dynasty. Then they deployed their limited land forces to target the dynasty in Beijing. The Japanese likewise made the threat to capture Beijing central to their successful military strategy in the 1890s. In contrast, when Napoleon Bonaparte and later Adolf Hitler attempted to target the capital of another vast continental empire, Russia, they found, to their dismay, that the capital was not a centre of gravity after all. In China, however, the Manchus constituted a tiny ethnic minority entrenched in Beijing. Eject them from Beijing and they had few alternate locations where they could safely ensconce themselves.

**IV. The Nationalist Understanding of Maritime Communications**

At the end of the warlord period following the fall of the Qing Dynasty, the Nationalist Party reunited the country in a highly unusual military campaign originating from the south and sweeping northward in the 1920s. The focus of the Nationalist Party of Chiang Kai-shek and his many warlord foes remained continental. Although the Nationalists alone possessed a navy, naval forces never figured prominently in Nationalist military strategy. Chiang Kai-shek tried to avoid engaging any maritime foes as long as possible, principally Japan, which occupied Manchuria in 1931. Instead, Chiang focused on mopping up his continental foes, meaning the Communists. He was largely successful in 1934, when his campaign of annihilation sent the Communists packing on the Long March to one of the most inhospitable parts of China in Yan’an (Yenan). However, educated Chinese in the cities and particularly the university students in these cities, put enormous pressure on Chiang to cease fighting other Chinese, meaning the Communists, to fight the foreign foe, Japan, which was gradually expanding its occupation zone in Manchuria into the adjoining Chinese provinces. Although Chiang wanted to cement his control at home before adding the Japanese to his list of adversaries, the Chinese population did not leave him this choice. When fighting broke out between Japanese and Chinese forces outside of Beijing in 1937, it rapidly escalated into a nation-wide Sino-Japanese War.
Again, the Chinese failed fully to appreciate the maritime dimension of the conflict. Japan’s military strategy entailed a blockade of coastal China, occupying its coastal cities, and the pursuing the fleeing Nationalist forces up the Yangzi River from Shanghai to Nanjing (Nanking) and on to Chongqing (Chungking). The campaign was based entirely on following the maritime and rail lines of communication. Those Chinese who pushed the Nationalists into fighting Japan failed to understand that the Nationalist economy and its vital revenue base were maritime. Despite the ravages of the Great Depression, Chinese wealth was concentrated in its coastal cities and on the riverine cities along the Yangzi. These cities were modern and prosperous precisely because they were integrated into the global trading system that produced their wealth. Those who recommended fighting Japan at this time were blind to this critical vulnerability.

The Nationalists separation from their economic base undermined their ability to pay their armies and caused corruption to spiral out of control. The Japanese blockade of China, occupation of its coastal cities, and the offensive up the Yangzi River, forced the Nationalists to flee beyond the railhead to Chongqing. This had the economic effect of gutting the Nationalist economy. The Japanese strategy had the political effect of undermining the legitimacy of the Nationalist government because the Chinese blamed the Nationalists, not the Japanese for the ensuing economic implosion. The many descriptions of the extreme corruption in Nationalist China, while accurate in their horrifying details, fail to point out the underlying cause, which was not Nationalist policy but rather the direct consequence of Japan’s military strategy that severed the Nationalists’ maritime communications. The Japanese occupation of the Nationalist economic base had a second-order effect. Quite unintentionally by so weakening the Nationalists, the Japanese tipped the balance in the ongoing Chinese Civil War in favour of the Communists, who made propaganda hay out of the Nationalists’ economic problems. The Communists took advantage of Japan’s focus on urban China to organise the rural areas behind Japanese lines and beyond Japan’s ability to garrison China. The Japanese, by focusing on the Nationalist economic base and on fighting the Nationalists’ conventional forces, unintentionally inserted themselves as a buffer protecting the Communists from the Nationalists, who could not fight the Communists as long as the Japanese continued their offensive operations. The Communists used this breathing space to organise. Although the Japanese severing of the Nationalists’ maritime communications had dire consequences, most Chinese failed to appreciate the connection between maritime communications and the economic health of urban China.

After World War II (WWII), the Chinese Civil War also had a major and unrecognised maritime dimension. The post-WWII phase of the Chinese Civil War took five years. For the first four, the fighting concentrated in Manchuria, where the Russians closed Manchurian ports to the Nationalists. This maritime blockade had enormous implications. Russia and its satellite, Mongolia, surrounded Manchuria on two sides, while Chinese Communist forces were concentrated on the southwestern border.
This disposition of forces transformed Manchuria into a vulnerable salient deep into Communist-held territory and left the Nationalists with just two very vulnerable lines of approach along the two rail links from the south. If there had been no naval blockade, the Nationalists could have accessed Manchuria’s long coastline.31

The Nationalists failed to appreciate the importance of these maritime communications. Without them, their military strategy in Manchuria was not feasible. They fought hard, but the Communists eventually isolated Nationalist forces in Manchuria’s cities, cut the rail links between the cities, and waited for the urban economies to implode – with the Nationalists, not the Communists reaping the blame. The growing public outcry against economic malfeasance accelerated Nationalist defections, mortally discredited the legitimacy of the Nationalist government, and brought a Communist victory as a succession of Nationalist armies defected.32

The Communist strategy was very clever. Although the Communists, like the Japanese before them, created the economic implosion, in both cases the Nationalists, as the incumbent government, reaped the blame. The economic dimension of the Communist and Japanese military strategies that cut the lines of communication on which the civilian economy depended had the political consequence of driving a wedge between the incumbent government and its popular support base. The loss of popular support then had fatal military consequences in the form of defecting armies.

During the ensuing Cold War, the enemies of the maritime powers repeatedly used the strategy to great short-term strategic effect: undermine the economy and exacerbate disorder, blame the incumbent government for failing to stem the crisis and win hearts and minds in the process in order to seize power. This strategy also lay at the heart of the communist success in Vietnam.33 But taking power was as far as this strategic model went, again, for a lack of understanding of maritime communications and the maritime global economy. Prosperity, as Mahan so clearly appreciated, comes from integration into this maritime world, or globalisation as we call it in our own day. It comes from the maritime connections that allow the trade to flow and the economic comparative advantages to accrue. Mao’s clever strategy brought military victory but not prosperity.

The Nationalists also failed to appreciate the riverine dimensions of the Chinese Civil War. On their rapid flight south after their defeat in Manchuria in 1948, the Nationalists made no attempt to defend at the Yangzi River. Chiang did not even pay let alone use his navy, so the navy mutinied, allowing the Communists to cross the river unopposed.34 The Yangzi is one of the world’s greatest rivers, running all the way from Tibet to Shanghai. It is navigable much further inland than any other Chinese river, navigable by ocean liners 1000km inland and by smaller craft 2500km inland. It forms the geographic divide between North China and the Nationalist base of support in South China.35 According to General Albert C Wedemeyer (1897-1989),
commander of US forces in the China Theatre of WWII and member of various US missions to China during the Chinese Civil War, the Nationalists ‘could have defended the Yangtze River with broomsticks if they had the will to do so’. The Communists had no navy or air force, whereas the Nationalists had both, and the Yangzi was extremely wide and had few bridges. Joseph Stalin (1879–1953), Mao’s indispensable ally, did not even want the Communists to cross the river, evidently preferring a divided China. Yet the Nationalists made no use of the formidable natural barrier.

V. The Communist Understanding of Maritime Communications

Upon taking power, Mao Zedong was even less interested in maritime communications than Chiang Kai-shek. Mao hermetically sealed off China to follow an autarkic economic program that kept living standards low. By the late 1950s, grain harvests in China still had not reached 1930s levels, a period of endemic civil war. Chinese living standards only started recovering as the economic reforms of Deng Xiaoping restored China’s maritime communications with the rest of the world.

These reforms of the 1980s also restored the treaty port system of the imperial era under the guise of special economic zones. In the century preceding the Communist victory, China had conducted its trade through its treaty ports, so-called because of the many treaties regulating this trade under the rule of international, not Chinese law. These treaty ports constituted special economic zones, particularly hospitable to foreign investment and commerce because they operated under a hybrid legal regime. Their special legal system created the interface between China and the outside world that allowed a lucrative trade to flourish. The function of Deng Xiaoping’s special economic zones was the same: these zones served as China’s interface with the maritime world of global trade and operated under a westernised administrative system.

China greatly benefited from the restoration of its maritime communications. For the first time in two centuries, it seems to be on the rise with portentous implications for all. Whether the Chinese recognise it or not, this rise depends on China’s continuing maritime connections with the outside. Its increasing prosperity conforms to Mahan’s conception of the origins of national wealth and power.

But China cannot become a full-fledged maritime power without harmonious relations with all of its many continental neighbours. Corbett considered such a situation to be unlikely for a country with long land borders. As he observed, the ability of neighbours to deliver a devastating counter-stroke to continental powers prevents their adoption of his maritime strategy. His strategy envisions fighting on foreign, not home, territory by deploying expeditionary forces and funding continental allies with large armies so that the home economy whirs along to fund it all. Dangerous continental neighbours, however, preclude the independence at
sea required to become a full-fledged maritime power. Continental powers, unlike maritime powers, must constantly look over their shoulders to their bordering states. They require large armies for homeland defence, which rarely leaves them with adequate resources for a first-class navy.

China’s neighbours are numerous. Many are unstable. Historically, many have had hostile relations with China including Mongolia, Russia, Vietnam, and the recently independent countries of Central Asia. In the Communist period, relations with India were also tense. Two of China’s immediate neighbours, India and Russia, have aspirations to be great powers themselves, making them potential competitors not natural allies. Both Mahan and Corbett would argue that China’s long land borders mean it cannot become a full-fledged maritime power.

For maritime powers, the oceans serve as the moat forming the first line of homeland defence, the commons owned by no one but used by all, and the highway for global shipping and navies. Mao Zedong never believed that he needed a moat because the sheer density of China’s population precludes foreign conquest. For the same reason he scoffed at United States and Soviet threats to use nuclear weapons against China in the Korean War and during the border confrontations of the 1960s respectively. The Chinese appear to reject the conception of the oceans as commons accessible to all in that they have claimed exclusion zones far in excess of that granted by international law. Such claims suggest that the Chinese retain a continental perspective on oceans, viewing them as territory to be carved up and claimed. In recent years, China’s focus has been on oceans as highways – a belated recognition of the importance of maritime communications. The Chinese government has focused on naval communications with large investments in key sea-denial capabilities to exclude the United States from any future Taiwan Strait crisis. Commercially, the high-profile Chinese presence in the container shipping industry, demonstrates China’s understanding of the commercial importance of maritime communications.

Yet it remains unclear whether naval communications and civilian maritime communications constitute two separate tracks in Chinese thinking or are understood as an integrated whole. If the former, this raises the possibility for a national schizophrenia with the civil and military arms of the Chinese government potentially working at cross-purposes. Perhaps China’s military has one understanding and its civilians have another. It also remains unclear whether the Chinese at long last fully understand the maritime linkages between Chinese foreign and domestic policy. If Chinese deeds follow Chinese words, a hostile takeover of Taiwan may be in the offing. Does the military fully appreciate the economic consequences of a hostile takeover of Taiwan? Does the Chinese population fully understand the huge domestic economic trade-off of such a foreign policy? Although bringing the Taiwanese to heel after so many years would gratify nationalistic pride, it would set in motion a cascade of negative consequences.
An attack on Taiwan, complete with media images of civilians dying from hostile fire on the streets of Taipei – regardless of whether the United States or any other power intervened militarily – would put China at high odds of facing long-term international sanctions. China has a poor human rights record. An attack on democratic Taiwan would demonstrate that the current Chinese leadership is not benign but increasingly rich and assertive. It would flaunt the norms of international law that condemn attacks on those who pose no threat to others. It would also threaten the international legal order by signalling that international law offers no protection to small democracies in the face of a determined aggressor. The term, ‘small’ perhaps is inappropriate, since Taiwan has a population equal to that of Australia and many other countries. For all of these reasons, an attack on Taiwan will be answered at the very least economically.

Even if some countries continue to sell to China, many would not buy. Europe would probably seize the opportunity to go protectionist. Most Chinese goods can be produced by other developing countries, which would jump at the opportunity to take over some of China’s market share. These countries range from the many smaller powers on China’s periphery to India, which is poised to become a global power, to the many nations of Latin America. China is not the only country that can produce quality consumer goods at cheap prices.

Sanctions in response to a Taiwan Strait crisis would sever China’s maritime communications and undermine the economic underpinnings of its growing prosperity and military rise. Limitations on Chinese participation in the international trading system – in essence freezing it out of the free-flowing maritime communications – would also have regime stability implications that would limit the ability of the Chinese government to back out of a crisis.

Some would argue that no Chinese government would ever be so foolish as to jeopardise its brilliant economic growth rates with a manufactured crisis over Taiwan. Yet the historical record shows successive Chinese governments consistently underestimating the implications of risking their maritime communications. An underlying failure helping to explain the self-defeating strategies of the Manchus, the Nationalists, and the Communists in their dealings with the outside world was their inability fully to appreciate the maritime dimension of national strategy and national prosperity. Because the Chinese view their modern history in terms of the humiliations visited upon them by the maritime powers, they remain ambivalent concerning their relations with the outside world. On the one hand, they see the prosperity from China’s reconnection with the outside. On the other hand, they remain deeply suspicious of this maritime world.

A dispassionate review of the historical record would reveal that turmoil in China has been overwhelmingly domestic not foreign in origin, coming in the form of devastating civil wars, often called rebellions in Chinese history texts. In the 19th century, these included the White Lotus Rebellion, the Taiping Rebellion, the Nian
Rebellion, the Dungan Rebellion, to name but a few. Each one devastated entire provinces, some of which did not recover for generations. Since the Qing dynasty, the only foreign powers to deploy large armies in China were the Manchus, who founded the dynasty; the Russians, who deployed over 100,000 troops to occupy Manchuria during the Boxer Rebellion of 1900; and the Japanese in the two Sino-Japanese Wars. Only the Russians and their former colonies in Central Asia retain the occupied territories. These areas are vast, over five times the size of Japan. In contrast, the wars with the Western maritime powers, the Opium Wars and Sino-French War, were minor affairs, involving comparatively small numbers of casualties and directly affecting very limited coastal areas.

A dispassionate examination of the facts would reveal that the Chinese economy greatly benefited from foreign trade during both the imperial and Nationalist eras. Nevertheless, successive Chinese governments fixated on controlling and limiting that trade instead of taxing the commerce deriving from it and reinvesting such tax revenues in domestic economic development. The Nationalists were heading down this road, until the Japanese invasion derailed their plans. Only recently have the Communists taken up where the Nationalists left off.

It is unclear whether the Chinese pathology concerning the maritime world will colour future Chinese calculations. Perhaps China will revert to its traditional model for international relations with China at the centre, dominating its many smaller neighbours, benignly if they follow its lead or aggressively if they do not. Some key neighbours, however, are unlikely to go along with a Pax Sinica. India, Russia, and Japan are not small. They are unlikely to conform to this model willingly. Vietnam would be hostile. China’s relations with its own Muslim population as well as with its Muslim neighbours have always been tense. Even a reunited Korea might not go along. What then? Perhaps China will at long last join the international order and go the way of Meiji Japan minus the Pacific War interlude. Or is there something about rising powers that compels them to test the strength of the prevailing status quo to see whether they can superimpose one of their own creation and domination?
Notes


5. The traditional social pyramid is encapsulated in the expression ‘shi nong gong shang’, meaning scholars, farmers, workers, and merchants and listed in order of descending status. RJ Antony, Like Froth Floating on the Sea: The World of Pirates and Seafarers in Late Imperial South China, Berkeley, Institute of East Asian Studies, University of California, 2003, pp. 11, 15-53.


15. Mahan says:

   The profound influence of sea commerce upon the wealth and strength of countries was clearly seen long before the true principles which governed its growth and prosperity were detected … The first and most obvious light in which the sea presents itself from the political and social point of view is that of a great highway; or better, perhaps, of a wide common.


16. Corbett believed:

   The object of naval warfare must always be directly or indirectly either to secure the command of the sea or to prevent the enemy from securing it … Command of the sea … means nothing but the control of maritime communications, whether for commercial or military purposes.


17. Baer says:

   Ocean water can be crossed in all directions, so it can be a medium of trade, of military aggression, or of defense in depth. It can be a common, a moat, or a highway.’


18. Corbett quotes Francis Bacon, 1st Viscount St. Alban (1561-1626):

   This much is certain … he that commands the sea is at great liberty and may take as much or as little of the war as he will, whereas those that be strongest by land are many times nevertheless in great straits.


42. Mao’s dismissal of the effects of nuclear war reflect this point of view. Terrill, *Mao*, p. 268.


PART 2

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Strategic Communications
I would like to take you back more than 150 years, to the first two-thirds of the 19th century when the principles of command and control and the day-to-day operations of the King’s – then Queen’s – ships were somewhat less sophisticated than they are today. I am going to confine myself to the Indian and Pacific oceans, but the principles are worldwide. The command path, unchanged from the 1820s to the end of the century, originated in the Board of Admiralty in London and then passed through a commander in chief (CinC) of a station to an individual ship.

By the end of the French Wars, the Admiralty was an institution whose best days seemed to be over. Having been entirely responsible for the defence of the country for three centuries, the defeat of the French had negated this task. It was now clear that no one could threaten the United Kingdom. It therefore followed that the navy was going to occupy a much more modest position. And paradoxically, as one prominent naval historian put it:

> If there was any period in history when Britannia could have been said to have ruled the waves, then it was in the sixty or so years following the defeat of Napoleon.¹

However, as to the day-to-day conduct of business at the Admiralty, another eminent naval historian, wrote:

> The Board(s) met together for the collective dispatch of business. The First Lord, reduced in stature, no longer decided vital questions with his Cabinet colleagues beforehand, for there were few vital questions to be decided about the navy. A clerk appointed for duty read each letter (received) aloud to the Board, and the Board took a collective decision on it.²

As an aside, another facet of the post-war navy was the age of its commanders. The substantial reduction in the size of the post-war fleet and the ‘no redundancies’ policy for its commissioned officers led to a substantial backlog that was to take many years to clear. In 1843, for example, the average age of full admirals was 76, and the youngest rear-admiral was 53. Two years later, the 300 senior captains were on average over 60 years of age. In the mid 1840s, an officer aged 71 became CinC of the West Indies Station.
As for the Royal Navy itself, the fleet of 1812, manned by 130,000 men had, by the early 1820s, shrunk to one requiring a mere 20,000 men.

The CinC East Indies (soon to include China and that portion of the Western Pacific stretching from Kamchatka in the north and taking in the Fiji islands to the South Pole in his bailiwick, in addition to all of South East Asia and the Indian Ocean) was normally based afloat at Trincomalee, on the north east coast of what is now Sri Lanka.

Apart from the sail line of battleship as his flagship, the ships deployed to his command tended to be much less imposing. Until the late 1860s the largest was usually no more than a 6th rate, that is a sailing ship with a captain in command. She was often termed a frigate, although this was an ill-defined term. The tonnage was up to 500 tons and the crew normally numbered about 150. Smaller ships could be brig-sloops and sloops with corresponding smaller crew size and armament. Steam-powered warships were to make their appearance on the station in the late 1830s, first as paddle ships and later with propellers.

The island groups of the Pacific had been sighted by Westerners - explorers and buccaneers - for a century or more but no one had a clear idea of their exact geographic position, topography, inhabitants or economic potential because the visitors were on their way elsewhere. With the notable exception of James Cook, that is. The survey of the waters surrounding these islands and the production of readily available charts during the 19th century would constitute a vital role for the Royal Navy in the world’s economic development.

Throughout most of the period, there was not a great deal of interest being shown in London towards the Indian and Pacific Ocean islands. There was, though, a slowly developing requirement for the acquisition of bases, acting as storehouses for warships to replenish and refit, so that global sea power could be projected from them.

Both politicians and the Admiralty alike were quite unfamiliar with the vast areas they governed and administered, lacking first-hand knowledge of the countries, their peoples and their problems. For example, neither Prime Ministers Disraeli nor Gladstone had ever seen more of the Empire than was to be found in the British Isles.

It is therefore perhaps none too surprising that the Admiralty directives to their CinCs were vague on direction, apart from purely administrative matters. It is noticeable from the archive files that, even at this early stage, they were also obliged to bow to the wishes of the Foreign and, after it came into existence, the Colonial Offices.

Added to which was the sheer length of time it took instructions originating in London to reach the quarterdeck of one of HM Ships deployed, and of course a similar length of time for a report to be received back in Whitehall.

In an average scenario a round-trip for correspondence could well be in the order of eight or nine months. And this did not allow for the intermediate authority - in the case of what was later to become the Australia Station, the CinC in Trincomalee -
who had to be kept in the loop, for they were, after all, his ships, or at least some of them were up until 1859. More frequently though, with a typical detached cruise of one of HM Ships taking up to four months, communication with any higher authority was at best a haphazard and prolonged affair.

Given this, it was necessary to leave the senior officer present and his subordinates considerable latitude and personal discretion in the interpretation of their orders. We will consider some examples of this discretion later.

The ships available were, it should come as no surprise to learn, never anywhere near enough to cover the deployment requirements laid on them. The CinC East Indies had 10 or 12 ships in his command, some of which at least were always in indifferent material condition.

So far, I have outlined the chain of command and the difficulties in communication to the East Indies Station. In the late 1850s matters improved a little with the establishment in Sydney of a separate commodore’s command, termed the Australia Station.\(^5\)

In the case of this new Station, whose boundaries ran from Fiji in the east and took in all the Australsian territories, there were additional factors. These included the tendency of the governors of the colonies of New South Wales, and later New Zealand and Van Diemen’s Land to issue orders to individual commanding officers. In the initial stages of the development of New South Wales this was an acceptable practice, as the governors had been naval men and senior to the ships’ captains. When this was no longer the case commanding officers were probably within their rights to dispute and even reject orders given by non-naval persons. A fine distinction had to be made as to the extent of cooperation, but nevertheless here was a fertile ground for unpleasantness.

At the start of the period, the vast majority of commanding officers of ships had served during the American Revolutionary Wars. An officer of lieutenant or commander’s rank would therefore be a comparatively mature man. What we know of these individuals is based on their regular reports to their higher authority, which eventually ended up in the Admiralty. Fortunately, what looks to be a reasonably high proportion of these reports have survived. Some of the contents of the Admiralty’s ‘in’ and ‘out’ boxes are in the British National Archives and the National Library in Canberra. A fair number of the instructions to various flag officers are also available.\(^6\) What then were their day-to-day problems?

In the early 19th century there had been no pressing reason to explore the clusters of islands in the South Pacific. However, by the 1830s, the colony of New South Wales was starting to export wool to Europe, and European traders were starting in a small way to conduct trade with China from some of the Pacific islands, primarily in sandalwood. British and United States whaling too had become an important industry in the South West Pacific and eastern seaboard of Australia. The whalers had acquired the habit of enlisting local islanders as crew members, often with little or no pay. In
addition, beachcombers and assorted European outcasts, including an astonishingly high number of escaped convicts from the Australian penal colonies, were starting to make their homes in the islands, usually without too much friction with the locals.

But the principal sources of Pacific contact with the outside world at this juncture were the missionaries. These were predominantly from the Protestant faith, although the Catholic Church was also well represented. This development was part of a religious revival in England, which had elsewhere played some part in the drive to abolish slavery, the bicentenary of which was commemorated in 2007.

Conversion of the indigenous peoples to Christianity was a tiresome business and not void of danger. Competing religions did not help either. Captain Home, RN, gives us a good example. In 1844, while at Tonga, which, like the majority of island groups had not been claimed by any European country, he heard of the burning of a Protestant church, allegedly by Catholics, on Wallis Island. He set off in HMS North Star, a 6th rate sailing frigate, to investigate. He later reported to his CinC:

I am not aware, Sir, to what extent I am called on in my duty to attend to the religious affairs of any country, more particularly in lands which do not form part of the British dominion ...[but] ... I believe the works of our missionaries were intended to be supported and protected by the servants of Government, and that a Protestant church could not be wilfully burnt down in any part of the world where a man of war is stationed, without some enquiry being made. I wished to do this as quietly as possible, but to let the Priests know that they cannot have it all their own way.7

Whilst on the topic, John Williams was a Presbyterian missionary who was sent by the London Missionary Society out to the Society (now Cook) Islands in 1818, where he worked among the natives until 1834, when he returned to England.8 Four years later he returned to the Pacific, only to meet his death a year later on the island of Eromanga. His assailants then ate his body. The island was subsequently named ‘Martyrs Island’ but has nowadays reverted to the original name. Not surprisingly, there is no mention of this event in the tourist brochures put out by the Government of Vanuatu.

Again, the First China War of 1839 to 1842 was conducted for many months without London knowing – let alone approving – what was going on. After the British had established themselves in Hong Kong, the Royal Navy unilaterally took it upon itself to eradicate the South China Sea pirates. Between 1834 and 1851 they captured or destroyed about 150 pirate junks – at a considerable profit for the sailors, for a bounty of £20 was paid for each ‘piratical person’ killed or captured. Whether it was this incentive or just repugnance at the practice, warships ranged as far afield as Borneo, where in 1845 landing parties went ashore to destroy pirate lairs.
Later, the Second China War (1856-60) had been in progress for four months before those taking part received London’s approval for their actions.

I would now like to turn to the nuts and bolts of exactly how information got from London to the Pacific and back and the reasons why it took so long.

Originally, all mail to the East was carried by sailing ship, outwards from the United Kingdom via the Cape of Good Hope then usually returning home around Cape Horn, thus taking advantage of the prevailing winds. Transports hired by the Admiralty to convey convicts to the antipodes frequently carried official despatches, but this was of no use to the Royal Navy so long as the CinC was in Trincomalee.9

During the closing stages of the war with France, the Admiralty took over the carriage of mail, and by the late 1820s almost 40 mail packets were in service. Some were relics of the fleet of privately-owned post office ships, the remainder ex-navy brigs in civilian service. Each packet carried a naval officer, normally a lieutenant, who was in charge of the mail. One of the conditions of his employment was that he was to have first class accommodation and, when proceeding to or from shore, his boat was not to have fewer than four oars.

In the case of correspondence to India and therefore the CinC East Indies, the mail was still in the hands of the Honourable East India Company (HEIC), who had held the monopoly of trade between the United Kingdom and India for over a century. The Charter Act of 1813 had opened India to British private traders, but the HEIC continued to use their own trading ships. As late as 1834 a voyage to India took three months, while one returning to England sometimes took as long as six months.

Steam powered ships were in general service as early as 1825, when a committee in Calcutta offered an award to anyone whose steam-driven ship could make the voyage to the United Kingdom in less than 70 days. The challenge was taken up by the paddle steamer Enterprize of 500 tons and two engines of 60 horsepower. The ship failed to meet the deadline, taking 115 days, but had had the distinction of making the longest such voyage to date, under steam for about half the time, achieving 6 to 7 knots under steam and burning about 10 tons of coal a day.

However, the Cape route was proving to be too lengthy for small volume items of freight such as mail and so a drift towards a Mediterranean/Indian Ocean route, making a land transit of the desert between Alexandria and Suez, developed. Any earlier idea that it might be possible to build a canal through the sand between the two ports had been dashed when a feasibility study of the area by French surveyors concluded that the waters in the Mediterranean were thirty feet above those of the Red Sea. The use of locks didn’t occur to them apparently.

Moreover, the Red Sea is comparatively narrow with treacherous shoals along its eastern shore and prevailing winds that blow in opposite directions in the northern half and the south. It was therefore not a practical proposition to operate anything approaching a regular service from one end to the other by sail. In 1830, however,
the HEIC started to use the Red Sea route with a small steamer built in India – *Hugh Lindsay*, a ship of 411 tons with two engines of 80 horse power.\(^{10}\) She left Bombay for Suez, a voyage of 3000 miles, in March of that year. She had to carry enough coal to reach Aden, 1640 miles away, and had been preceded by a brig, loaded with 600 tons of coal, which was to be stored at Aden and Jeddah. The journey took 32 days, 21 days under way and 11 days coaling.\(^{11}\) The venture was such a success that from 1835, mail to the East was sent through the Middle East rather than by the Cape.

In 1840, the Peninsula & Orient (P&O) Line won a contract to take over the packet service originating in England and terminating at the Egyptian port of Alexandria. It is of interest that from the outset P&O employed only steamships in their fleet. Within three years, they were also to open an onward regular service from Suez to Calcutta via Bombay and Madras.

The logistics were daunting. Steam coal had to be shipped from South Wales in England to the Indian Ocean via the Cape; by the 1850s P&O employed some 150 sailing colliers for the purpose. Up to one third of the voyage time of a mail ship was spent coaling ship. Getting supplies of coal to Suez was a slightly different matter, with a herd of up to 3500 camels used to hump (no pun intended) the stuff across the desert from Alexandria. This procedure continued until 1858, when a newly-laid railway took over the task.

The carriage of mail and passengers to and from the Orient was equally cumbersome. Before the arrival of the railway, both had to undertake an awkward trip, leaving Alexandria by barge along a small canal to Cairo, then up the river Nile in a tiny paddle steamer and finally a horse-drawn wagon across 84 miles of desert. Mail was carried by camel in wooden boxes, colour coded for destination.

On arrival in India, despatches for the CinC East Indies would probably have been off-loaded at Colombo then taken, either by land or a despatch boat, to his flagship at Trincomalee. This accounts for some of the delays already mentioned.\(^{12}\)

As for Australia, the first two ships of a newly INAUGURATED regular mail line both arrived in Sydney via the Cape on 22 January 1857. They had taken 70 and 59 days. In this mail were Their Lordship’s instructions for taking possession of the Cocos Islands.\(^{13}\)

As far as I can find out, neither Their Lordships nor their correspondents appear to have sent more than one copy of their letters. This optimism seems to have been warranted, for only one mail steamer, the RML *Rangoon*, was lost, and in this instance the mail was saved.

I would now like to give two practical illustrations of events in the 1860s.

The situation in New Zealand had led to sporadic clashes between the white settlers and the native inhabitants. There had been intermittent fighting from 1851 until about 1870. The conflict was to involve the navy’s ships and the frequent deployment of naval personnel. Parties of sailors and marines, sometimes with a ship’s guns,
landed as Naval Brigades and fought alongside their army counterparts. A number of them lost their lives in fierce engagements. The Admiralty, unable to keep in touch with what was going on at the other end of the world, were concerned about parties of sailors fighting on shore, leaving their ships undermanned but there was little they could do about it.

The problem in communication was demonstrated in January 1862 when the Commodore of the Australia Station, Frederick Seymour, withdrew his ships and concentrated his force in Sydney. This was, as he said, because ‘in all possibility England is engaged on a war with the Northern States of America’. This was a consequence of the Trent Affair.

Fighting had broken out between the Union (the North) and Confederate States of America (the South). The North, following a policy of blockading the South, had boarded a British-flag ship, SS Trent, removing two Southern diplomats on their way to Europe. This led to a British ultimatum demanding an apology and the return of the diplomats. Preparations were made for war, and it was this knowledge that prompted Seymour’s actions, although I have been unable to find out how the news reached him. Matters remained tense on the Australia Station for several weeks until 6 March when Seymour received a report via California that ‘the surrender of the Southern Commissioners had settled the dispute between Great Britain and the Federal States of America’.

It is likely that the report had originated in London, crossed the Atlantic by cable then telegraph to California, thence by steamer to Australia. Final confirmation came on 15 March by the arrival of the mail from the United Kingdom which had left on 26 January, of course many weeks later. It was fortunate that there were no US ships in the area.

This situation also led to the re-deployment of the almost new screw corvette, HMS Orpheus, which had been about to sail for the Australia Station as the flagship for the new commodore, William Burnett, who was on board. She was detached first to North America, but with the dispute settled the ship then sailed from there for Australia, arriving in Port Jackson in July 1862. At the beginning of 1863, Orpheus left for New Zealand where, on 7 February, she made landfall near Manukau Heads, on the west coast of North Island, opposite Auckland. Outside the harbour entrance runs a bar, inside which are sand spits, and it was on one of these that she ran aground. Her engines were of no assistance being, in the phrasing of the time, ‘deranged’ by the force of the grounding.

The ship broached. All efforts to save her were in vain and within a few hours nothing was visible of her except for the stump of one mast and a few bare ribs. The commodore and 188 of his crew lost their lives and there were only 70 survivors.
Three days later the screw corvette HMS *Miranda*, which had also been in the area, was proceeding under steam to Sydney with 6 officers and 11 ratings from among the survivors. These were the more senior and experienced, and thus in a position to tell the authorities what had happened. On arrival in Sydney the 17 personnel boarded the mail steamer for the United Kingdom, via Suez. The first intimation in the United Kingdom that the wreck had occurred was when the news was reported by telegraph from Suez. This appeared in *The Times* of 4 April, which was 54 days, or 7 weeks, after the tragedy.

Having transferred in Alexandria to the routine mail packet, as there was still no canal, the survivors arrived in Southampton on 16 April. The obligatory court martial opened on 27 April, ten weeks after the disaster. Although called a court martial this was probably closer to what we would nowadays term a Board of Enquiry. The proceedings lasted three days, after which the senior surviving officer, Lieutenant Hill, and the other officers charged were all honourably acquitted, Hill being particularly commended for his ‘gallant conduct’.

As a poignant historical footnote, Hill returned to the Australia Station, where shortly after he was to lose his life fighting the Maori in New Zealand.

The era of freedom for the individual ship’s commander was coming to a close. Running slightly behind the ordinary mail, then overtaking it and finally providing the end to it was the Victorian equivalent to the internet. In the late 1820s an electric signal was sent along a cable for a distance of eight miles. An American code, Samuel Morse’s, slightly modified, was introduced for passing messages, and during the 1830s what was to be called ‘the electric telegraph’, using his signal system gradually spread in England. Next, a submerged – submarine – cable was laid to France, and by the outbreak of the Crimean War in 1854 it was in spasmodic use to communicate with the Royal Navy’s squadron in the Baltic. A year later a landline cable connected to the Crimea. Two years later there was an initially unsuccessful attempt to lay a transatlantic cable. Equally unsuccessful was a cable laid from Suez to Karachi in 1859.

Despite these early setbacks, it was not long before a direct submarine cable ran from Falmouth, through Lisbon, Gibraltar, Malta to Alexandria. In addition, by 1872 the CinC East Indies could communicate with the Admiralty by a land-line running through Persia (now Iraq). The telegraph did not get any further by the time of the outbreak of the Franco-Prussian War in 1870 and so the Admiralty, in informing the stations in the Indian Ocean, China and Australia of the news were obliged to use the telegraph connection as far as Galle, at the southern tip of Ceylon. From there on the news was to be disseminated by fast dispatch boats.

However, by late 1872 a combination of landline through the Netherlands East Indies, submarine cable to Darwin and the transcontinental telegraph made it possible for direct communication with the south eastern Australian colonies. Cables next spread to New Zealand and the other Pacific islands, but the trans-Pacific cable did not come into use until 1902.
The effect that this medium was going to have on the relationship that I have described between the Admiralty and its subordinates in the field was profound. A newly-arrived senior officer of the Australia Station, Commodore Frederick Stirling, who was familiar with the tentacles that were spreading across the globe, had this to say in a letter to the Admiralty in January 1871 dealing with the practice of kidnapping natives from the South Pacific islands:

I beg to call Their Lordships’ attention to the very unsatisfactory position in which the officers are placed who command ships attached on duty to the South Pacific Islands within this Station. He has nothing to guide him as to the amount of indemnity which he would consider be justified in imposing on Savages in cases which may recur: neither is he better informed with regard to the assistance and support due from him to the Consuls [bearing in mind that most of these island groups were not at this time British colonies] who are placed in very exceptional circumstances. As this is a subject of great importance I should be glad to receive full instructions from Their Lordships thereon.19
The use of the electric telegraph for official communications, particularly where a landline ran across a third country and thus was susceptible to interception, spurred the compilation of a comprehensive code book. From its contemporary description I am sure I was using a very similar publication as late as the 1960s. As a matter of passing interest, the security classifications in use in the 1850s were: ‘Confidential’, ‘Private and Confidential’ and ‘Secret and Confidential’. It was the cost per word of sending messages that was to lead to a form of verbal shorthand that was to become what we now know as signals.

I have called the telegraph the Victorian equivalent to the Internet. This is not strictly correct, as the invention was restricted to the equivalent of internet cafes – the various telegraph offices. Full service had to wait for another thirty years or so, until wireless, or what we now know as radio, became the norm in the first decade of the 20th century. Until then the tendency had developed for ships to remain in reach of the telegraph.

And so this brings us up to date. Anything since the introduction of wireless is merely a form of improvement – if you can call it that. However, I have the strong feeling that mid-19th century naval officers would be turning in their graves at the communication chains that now fetter the naval, let alone the defence, service.

Notes
3. Instructions to Sir Francis Augustus Collier CB KCB Admiral of the Yellow, 16 June 1848, The National Archives, Kew, (TNA) ADM13/3.
4. The National Archives, CO201/290 & CO/222.
5. Loring to Admiralty, 11 March 1859, The National Archives, ADM1/5713.
6. Many thousands of reels of microfilm were the result of the Australian Joint Copying Project of the post-World War II era in cooperation with the (then) Public Record Office in the United Kingdom. The naval files are a most valuable source for Australian naval historians and others.
7. Captain Home to Admiralty, 15 October 1844, The National Archives, ADM1/5231.
8. Also not annexed at this stage.
9. The National Archives, CO201/290 contains many letters on the subject.
10. That is the equivalent of 45 KW. My Peugeot 307 has an engine of 80kw.
13. HMS Juno to Admiralty, 2 May 1857, The National Archives, ADM1/5684.
14. It is clear from the correspondence that for at least some of the naval officers involved there was a great deal of sympathy for the Maori cause and dislike of the attitude of the New Zealand white settlers.
16. Seymour to Governor New South Wales, 10 March 1862, The National Archives, ADM1/5785.
17. John Bastock, Ships on the Australia Station, Frenchs Forest, 1988, has an account of this tragedy.
6. Communications to
Protect Communications:
British Trade Protection, 1906-1945

Norman Friedman

We may think that we know what happened to the Royal Navy in both World Wars when it faced U-boat attacks. Each time, convoy, the classic solution, was rejected out of hand because it was clearly defensive, and the offence is the stronger principle in wartime. Each time, in support of the offensive myth, destroyers rushed about impotently to try to find and destroy the sinister but invisible U-boats. Each time, the battle was won when a pigheaded Admiralty finally accepted the verdict of history and adopted convoys. Advocates of convoy struggled to explain that their concept was really offensive or at least something more than merely defensive. During World War I (WWI), it took a radical prime minister, Lloyd George, to force the reactionary Admiralty to see sense. Although other kinds of anti-submarine measures were tried, in each war most of the U-boats sunk were destroyed in convoy battles. This view of history had real consequences. During the latter part of the Cold War, when the US Navy advocated a very different approach to naval strategy, which seemed opposite to the wisdom of the convoy concept, the dismal history of past rejection of convoys was held very much against it, at least by many in the United Kingdom.

Against this satisfying narrative, we also know that history can be more complicated than it seems. Some historians even know that it is unwise to assume that those who made apparently illogical decisions – for example, to abandon convoy as a tactic – were nearly as foolish as they seem in retrospect. Was something more interesting happening?

This chapter suggests that it was, that the Royal Navy had something more in mind. Unfortunately very little record of its tactical reasoning, particularly in the period before WWI, seems to have survived. For example, we apparently have little or nothing of the papers (including student papers) of the Royal Naval College, which taught tactics. Moreover, some of the key concepts of the period involved communications intelligence, which is always handled in a very sensitive way, because disclosure easily ruins the source. Indeed, histories of the U-boat wars sometimes seem deliberately to downplay efforts that might suggest the exploitation of communications intelligence or ocean surveillance, as opposed to convoys. Even so, the tactics of the period seem to have left sufficient traces to make the recovery of some of the basic ideas possible. They suggest a vastly different approach than that embodied in the usual history.
It appears that the Admiralty invented what we might now call a network-centric approach to naval warfare, of which trade protection was one application. The invention was gradual and does not seem to have been discussed in detail as an alternative to other approaches, yet it also seems to have been unique to the Royal Navy, at least before 1914. The approach does not seem to be network-centric only because that term has been so vaguely defined. Instead, both approaches should be called picture-centric, because they concentrate on developing a tactical picture on which tactical decisions are based. That may not seem particularly special, but remember that these pictures extend far beyond the horizon of any one ship. They are produced by a network of sensors or contributors, and in effect they can give a ship an extraordinary capability. The Admiralty achievement is somewhat obscured, to our eyes, because the picture was held at the Admiralty and necessarily not produced cooperatively. Moreover, subordinate units at sea could not hold or develop the large-scale picture of the situation. That became possible only in recent years, with the advent of computers and broadband communication links. Yet the Admiralty’s experience attempting to use its tactical picture can inform us of what network-centric warfare can and cannot do, and of the style of warfare it engenders.

Note, first, that convoying was the traditional basis for trade protection in the age of sail, when raiders, not to mention pirates, were numerous and quite dangerous. The British even passed laws requiring merchant ships to travel in convoy in wartime and to submit to the implied naval discipline. Abandonment of this strategy was therefore not some casual change in emphasis, but rather a definite and substantial step. We begin in the 1860s, as sail began to give way to steam among the world’s merchant fleets. British naval officers began to write that convoying was no longer a practical strategy for trade protection. They seem to have considered this so obvious that they did not explain why. This was not a matter of deep secrecy. Rather, it was entirely natural – indeed, it exemplifies a major problem in naval historical research. Much of what we cannot find written down was not at all secret. It was obvious to those within the service. Those who had to understand a decision (like abandoning convoy tactics) were naval officers who found the conclusion entirely unremarkable. Those who would have needed explanations were outside the service, and they had no great impact on service decisions. Lacking a time machine, we have to try to reconstruct the reasoning of the time.

The primary issue was almost certainly numbers. The impact of steam caused a dramatic fall in the number of ships the Royal Navy could maintain. Moreover, inexpensive small ships lacked both speed and endurance – a radical change from the sailing ship era. Convoy is very much a matter of numbers, since every convoy requires a sufficient number of escorts. It seems not to have been appreciated that convoy had another virtue, that it made a raider’s task far more difficult by dramatically reducing the number of potential targets (from the raider’s perspective, a convoy is little easier to find than an individual ship). The evidence on this point.
is that there was no interest at all in disciplining merchant ships in war to steam in concentrated groups. Instead, the emphasis was on the way that steam had made convoying impossible.

It was certainly not impossible for raiders to operate, as CSS *Alabama* showed dramatically during the American Civil War - a point brought home to the Royal Navy by the very public damage suit brought by the US government postwar (the ship had been built and outfitted in the United Kingdom). Americans later claimed that one reason the British settled was that the US Navy demonstrated new cruisers which could outrun any British ship, hence could endanger British trade. Indeed, until the 1890s the standard US naval strategy in the event of war against Britain was trade warfare.

What could the British do? On the one hand, there was some hope that international legal measures would reduce the threat to trade; at times it seemed that the British government was actually willing to abandon its classic policy of blockade. The legal changes were tied to a Liberal view of property and of the illegitimacy of seizure of private property in wartime, a concept which survived into WWI. Senior British officers regarded abandonment of blockade (the ‘traditional rights of sea power’) as an insane abandonment of British national power, but given government policy they could not easily suggest that enemy powers would conduct their own illicit anti-trade operations. At the very least, the British were able to outlaw privateering, which in past wars had been a major source of raiders. Without privateering, enemy governments would have to rely on warships and on commissioned merchant ships, and that alone would substantially reduce the numbers the Royal Navy would face in wartime.

Even so, the navy had to face the likelihood that the seaborne trade on which their country depended could and would be held at risk. Large foreign merchant fleets included fast ships earmarked for wartime use. There was, for example, considerable publicity given to the Russian Volunteer Fleet of earmarked liners. Thus, there was continued interest in trade protection or anti-raider measures. If convoy was impossible, the obvious alternative was to attack the raiders at source, for example by blockading ports from which they might operate. Such ports might also be attacked and their facilities destroyed.

The advent of fast merchant ships seemed to mean that to be effective raiders also had to be fast long-range ships, and thus the masses of raiders of past wars might be much more difficult to create. Larger ships would probably operate from fewer ports, and they would be more difficult to replace if lost. The fleet could raid any unprotected port. As for protected ones, until the 1880s the Royal Navy had a viable port-attack force in its battleships, many of them described as coast defence ships (but really more coastal-attack ships).

These strategies began to collapse in the 1880s. As merchant fleets modernised, the number of potential raiders exploded. Governments began to subsidise large liners specifically so that they could be used as merchant cruisers in wartime. The two
main potential enemies of the time, France and Russia, acquired overseas ports that might be difficult to blockade (in the past Britain had enjoyed decisive advantages due to its position athwart the exits of the North Sea). Meanwhile, the rise of torpedo craft made direct attacks on ports far more difficult. A new trade protection strategy began to emerge.

We know something of what happened because at just about this time the Royal Navy created a formal staff in the form of the Naval Intelligence Division. Many of its products survive in the form of confidential printed papers. Among the staff papers of the late 1880s is a study of trade patterns. It shows that although in principle there are no roads through the ocean, the shipowners’ desire to avoid wasting fuel causes them to use particular trade routes, much as the trade winds had defined trade patterns during the age of sail. These routes, moreover, concentrate in particular ‘focal areas’. The implication was simple. A raider wandering the ocean would almost inevitably be drawn into the focal areas. Hunting the raider in the open ocean might be difficult or impossible, but cruisers patrolling the focal areas would have a good chance of finding him. This logic in turn helped set the size and shape of the British cruiser force.

There were 16 focal areas, some of greater importance than others. If it took, say, five cruisers to cover each, the Royal Navy needed about 80 cruisers. That sort of number was affordable – so long as potential raiders were converted merchant ships with limited fighting ability. The same sort of cruisers that could deal with raiders could also function effectively as fleet scouts. The combination of the two roles seems to offer a good explanation for the large British programs to build second- and third-class cruisers in the 1880s and early 1890s.

There was, however, a rub. Beginning in 1890, the French and then the Russians built small numbers of large armoured cruisers. As raiders, they could easily overcome any combination of small unarmoured cruisers. An attacker did not need many such ships, because no defender could be sure of exactly where they might operate. The defender relying on focal area patrols thus had to deploy equivalent ships in all the important focal areas, which inevitably meant substantial numbers of them. At the very least, each focal area would need an armoured cruiser plus a scouting line of smaller ones (it took a scouting line to cover any substantial area, because observers on any one ship had only a limited range of vision; scouts had to be within visual - and signalling - range of each other. Unfortunately, a fast armoured cruiser cost at least as much as a battleship. British policy was already to outmatch the combined battle fleets of Russia and France. Building, in effect, a third battle fleet to protect trade would be impossible, unaffordable. What could be done? The solution is the subject of this chapter.

Admiral Sir John Fisher, RN, became First Sea Lord in 1904. However his actions during his term of office are described, it is clear that he felt an extraordinary urgency for radical reform. Those who appointed him knew that he was impatient
with established practices. Navies tend to be conservative, for the excellent reason that adopting untried replacements for successful ones can be disastrous. So why appoint a known radical? What crisis was undermining the world’s most powerful navy? Anything short of such a crisis would not have demanded a Fisher, who was probably expected to be quite as divisive as he turned out to be.

The Royal Navy was facing a financial crisis, partly because the bonds that had financed its major expansion (under the Naval Defence Act 1899) were coming due at the same time that it was being forced to build all those expensive armoured cruisers. Usually the armoured cruisers were justified in terms of what the fleet needed to face in terms of foreign fleets supported by such ships, but the largely unspoken demands of trade protection presumably set the numbers. Worse might well be coming, because there was talk in foreign navies of building cruisers with battleship guns. Again, remember that the attacker needed few such ships to force a disproportionate response on the trade defender. It may also be relevant that Fisher had previously placed a much greater emphasis on defending British trade than had many other naval officers. In effect, he rejected the comfortable view that trade warfare had somehow been outlawed. As Controller, he had invented the modern destroyer as a way of dealing with the threat of French torpedo boats swarming in the Channel to attack British shipping. As First Sea Lord, he ordered a remarkable naval exercise to find out how well an enemy could destroy British shipping in the Channel, and how well the Royal Navy could defend that shipping (the exercise was never completely carried out, one might speculate due to resistance by more conservative officers who rejected its premise).

The outward indication of Fisher’s response to the armoured cruiser problem was the battle cruiser, which could outrun existing armoured cruisers and which greatly outgunned them. It cannot have been the whole response, however, because each battle cruiser was so much more expensive than an armoured cruiser. In itself, the battle cruiser did not change the numbers problem. There were still those 16 focal areas. Unless there was something more to the idea, the battle cruiser was merely a faster road to British naval bankruptcy. But Fisher knew about another new technology: radio, which made more or less real-time command and control possible.

At least since 1889, the Admiralty had functioned as an operational intelligence centre, at least during exercises. Intelligence centres had been built up around the British Isles, and probably also abroad (later they were located abroad, but just when they were created is not clear). Each collated information from ships arriving at the numerous nearby ports. Telegraphs made it possible for local centres to pass their information to the Admiralty. Without radio, the Admiralty could provide current tactical intelligence only to fleets almost immediately offshore (or, in the Mediterranean, near Malta or Gibraltar). However, even then the intelligence gave the fleets a far better chance of concentrating where they were needed. For example, a British fleet blockading France might be able to concentrate its multiple squadrons (facing different ports) in time to deal with a French attempt to concentrate forces.
Surviving annual exercise orders almost always include notes on how intelligence is to be collected and concentrated, each of the two fleets being provided with an intelligence collation centre.

Fisher took the next step. He understood that, using radio, an intelligence centre in the Admiralty could become the basis for commanding fleets at sea on a global scale. The centre in the Admiralty could, for example, deduce where a raider was operating. It could vector ships to go out and find it. The requirements for the hunters would be high speed and firepower and long radio receiving range. The new battle cruisers fit exactly this description. A classified Admiralty paper (1908) emphasised the way in which radio could be used to exploit the ‘mass of information’ the Admiralty collected. It is not too difficult to translate that into a new concept of maintaining and using an operational picture in a War Room at the Admiralty (which Fisher created).¹

The first battle cruiser, HMS Invincible, went to sea in June 1908. She is seen here at speed during the Battle of the Falklands.

The essence of the idea was to collate available intelligence from all sources to create and maintain something like a current picture (a plot) of where important ships were, throughout the world. Exactly how current depended on the sources of information, and it appears that the Admiralty used everything it could get. That probably included considerable agent information, reporting when ships left port and where they were supposed to be going, plus whatever could be gleaned from other sources. Evidence of interest in such intelligence is a ban on code-breaking in a pre-WWI exercise, on the ground that fleets are to work more by observation
(the implication is that enemy codes cannot always be broken, so back-ups are needed). Obviously the idea that intelligence mattered and that it should be collated was not unique to the Royal Navy. However, it seems that the idea of using a plot, created using intelligence as a sensor, as a command tool really was unique. It was so unique that many operating officers did not realise how the information should be used. For example, in December 1914 an attempt to intercept the German raid on the British coast failed because the commander of the intercepting force did not realise that he should steam, not towards the current reported enemy position, but rather towards a computed intercept position some hours in the future.

Because the War Room concept already existed (albeit used only on mobilisation) before the outbreak of war, the Royal Navy was able to exploit windfalls like the seizure of German codes. The Royal Navy was very careful after the war to act as though its wartime picture-keeping system had all been extemporised by gifted amateurs. The reality seems to have been that code-breaking really did exploit amateur skills (although some of those involved were probably pre-war professionals from within the navy), but that it was only one of many sources of information. The code-breakers, for example, were not allowed to see the compiled tactical picture held in the War Room. Complaints that the Royal Navy failed to create an integrated intelligence centre more likely mean that without free communication between code-breakers and others, information was not properly integrated (although the intention to integrate was certainly there).

There was one rub. The sensor the War Room used was intelligence, eventually largely radio intelligence. It was entirely possible that no other navy was maintaining a similar comprehensive picture of ocean activity. The connection between trade protection and ocean surveillance could not be advertised, because it would close off intelligence sources. It appears – without War College materials we cannot know for sure – that the concept of intelligence-driven trade protection was never discussed openly within the Royal Navy. Thus there seems not to have been any analysis of exactly what it required. In particular, there does not seem to have been much explicit discussion of the errors inherent in the data, hence the need for the intercepting ships to search the area in which the raider was likely to be.

Both the potential and the likely limitations of the War Room driven strategy seem to have been understood, at least at a high level. In 1909, the Admiralty tried to promote a program under which the Dominions would each finance its own fleet to contribute to Pacific trade protection. The fleet units each comprised a battle cruiser and several large fast cruisers (like the British ‘Town’ class of the time). The individual Dominion fleet units could also come together to form a Pacific Fleet to deal with any more classical naval fleet problem, such as that which the Japanese might eventually pose (Fisher sometimes considered battle cruisers useful alternatives to full battleships; sometimes he recognised that their thin armour might limit their value). Ultimately, only Australia chose to create the suggested fleet unit, which became the core of the RAN.
Given the trade protection concept, the meaning of the fleet unit is obvious. The entire fleet unit would be vectored to an estimated intercept position, based on collated intelligence. Because so much of the intelligence would be time-late (most merchant ships lacked radios, and a raider would move after hitting a merchant ship), it would take a scouting line to re-acquire the target. Once that had been done, the battle cruiser would deal with the raider. In addition to its fleet unit, the RAN bought destroyers and submarines to defend its base, because there was always the possibility that attackers would not be discovered in time to be dealt with by the fleet unit. Incidentally, Fisher was espousing much the same idea of using torpedo craft for local defence as a back-up to the fleet in the North Sea.

Note that the vectoring could never be precise, because information would be received intermittently and most of it would be time-late; there would also be errors. The picture-driven strategy probably accepted that many of the sorties would fail. Yet because of radio, it would be possible to redirect ships already at sea, improving their chances of finding raiders. It was also probably accepted that it would take time to hunt down individual raiders, and therefore that they would be free, at least for a time, to destroy trade. However, if the Royal Navy could block access to enemy ports, and if it could overrun enemy colonies supporting warships abroad (where blockade would be difficult), then raider numbers would be limited, and after a time the threat would be eliminated altogether. This was exactly what happened in 1914-15. The destruction of German colonies in Asia forced the cruisers there out onto the world’s oceans. Hunting began at once.

These ideas did not quite work out as planned, because in 1914 the Empire’s capital ships were all concentrated in the North Sea. German surface raiders caused enormous problems because the groups hunting them were often either not fast enough to run down intelligence data or could not search a wide enough area. The account of the hunt for the cruiser *Emden* is full of near misses where the hunters were perhaps 50 miles away. Even so, the problem was finite – and the intelligence-driven tactics ended it. In 1914, Germany had only a few fast cruisers, and only a few fast liners suitable for cruiser roles. By the spring of 1915 they were all gone. It may be significant that a post-war British analysis of intelligence collation argued that, had an intelligence centre been established in southern Chile, the British cruisers caught by von Spee at Coronel would never have been lost. The implication is that von Spee would have been tracked and superior forces concentrated against him. As it was, von Spee was destroyed in the single application of the battle cruisers’ original concept, at the Falklands.

Then the Germans turned to U-boats. By that time the Admiralty had much better sources of intelligence thanks to reckless German radio use. Not only was it reading German codes, it was often locating German ships by radio direction-finding. The Germans were apparently unaware not only of these activities, but also of the way in which the Admiralty War Room was maintaining an operational picture of their activities. We can see the fruits of the War Room in British successes in
intercepting German fleet operations in the North Sea: Jutland, for example, began when the British intercepted the German fleet on the far side of the North Sea. That the Germans could not imagine such a thing is shown by their designation of the battle as Skaggerak, implying that the battle was due to a British operation probing the Danish Straits – in effect a traffic accident. The Germans wrongly imagined that the British were there because they were contemplating landing an army on the German Baltic coast – a long-time fear that had no basis in reality, the British having rejected this concept as long ago as 1905.

The question was how to use the tactical picture to destroy the U-boat threat. The problem, which the British had discovered before the war, was that there was no means of re-acquiring the targets once they submerged. U-boats could not submerge indefinitely, so in areas nominally under British control they surfaced at night, when they were almost impossible to detect. They also tried to stay on the surface during the day whenever they were out of sight of ships (the appearance of aircraft made this much more difficult, and in effect crippled U-boat mobility). To reach their patrol areas U-boats had to operate continuously on the surface in areas the British did not control, diving whenever they spotted a British warship. The only British ships that could expect to catch surfaced U-boats were British submarines. Unfortunately they were not fast enough to exploit radio intelligence very efficiently, and they were not numerous enough to blanket the routes from Germany to potential operating areas. Moreover, they were badly needed to ensure that any German surface sorties were observed, as a backup to radio intelligence (for example, to deal with raids like those mounted in 1914-15 and also to deal with the supposed threat of invasion). Even so, submarines accounted for a substantial fraction of overall U-boat kills during WWI.

The U-boat tactical picture could also be used as a basis for evasion by merchant ships. A U-boat was not particularly mobile (such submarines are sometimes called ‘intelligent mines’), so a fast liner could be vectored out of its way. The late Patrick Beesley once pointed out that so few fast British liners were lost during the early U-boat offensive because of evasive routeing, which was possible in turn because they were unusual among merchant ships of the era in having radio. Such routeing of course also required that the War Room track the liner. In Beesley’s view, Lusitania was sunk due to poor staff work, which caused her not to be rerouted in time. All that could be done was to issue a warning to zig-zag because a U-boat was nearby. The ship’s master disregarded the warning, and she was sunk – needlessly. Presumably he refused to imagine that the Admiralty information was as good as we know it was. The Admiralty could never have afforded to explain to merchant commanders just how good its information was, hence how precisely its orders were to be heeded. Accounts of the Lusitania sinking thus treat the zig-zag order rather casually, and accept that the ship’s captain simply wanted to reach port on time.
Evasion could not save the bulk of merchant ships, first because they lacked radios and second because no human trackers could contend with the sheer numbers involved. During 1916-17, officers at Malta tried to save merchant ships by assigning them secret courses, which they hoped would evade submarines, but this sort of prearranged evasion proved ineffective.

Convoy was not revived because it seemed that too many escorts would be required. This was the same argument which had killed convoy in the 1860s – it now took something far more powerful and expensive to deal with raiders, and that something was in short supply. The assumption in 1915-16 seems to have been that the minimum convoy escort would be a destroyer. But destroyers were also badly needed by the Grand Fleet, which was the shield against a possible German naval attack on the British Isles, and for narrow-seas operations further south, against potential German surface raiders operating from the Belgian coast. Although the Royal Navy had a large destroyer force, much of it consisted of ships with very limited endurance and also with little seagoing capability; they had been designed to hunt French torpedo craft in places like the channel. Thus the sudden addition of over 60 large US Navy destroyers, when the United States entered the war in April 1917, made a tremendous difference to British perceptions. There were also arguments that convoying would make for inefficient use of ships, as ships already loaded had to wait for others, and for slower speeds in company (nor was it clear to naval officers that merchant masters could even steam in formation, never having practiced that pre-war).

Ultimately, convoy was tried because the war room strategy was failing. There was no means of re-acquisition. Fortunately it was discovered that it was now possible to deploy inexpensive escorts, for three reasons. One was that a submarine was far more fragile than a surface raider, so it took much less to be an escort – an armed trawler would do. Second, U-boats operated only within a few hundred miles of the British coast, because they could not find targets efficiently in the open ocean. Thus escorts did not need the sort of endurance that had been assumed in the past. That freed up the old coastal destroyers, which were hardly suited to fleet work, for escort. Finally, the blocking role of the Grand Fleet was vital, because the escorts never had to face serious German surface opposition. That again meant that weak, hence affordable, ships were sufficient.

Once convoys were in use, three further virtues became obvious. One was that concentrating merchant ships into groups emptied the sea, greatly complicating the U-boat’s task of acquiring targets, and forcing the U-boat into focal areas that could be patrolled. Another was that even when a U-boat found a convoy, it could not deal with so many targets in the available time. A third was that the intelligence could now be used for evasion, because every convoy had at least one radio-equipped warship in company, and because the numbers were now manageable by the War Room. This last virtue was not extolled post-war, because it touched on the still-secret advantages and techniques of the War Room. Yet it was probably more important as a means of preserving shipping than any other technique.
No Staff History of WWI anti-submarine warfare (ASW) was ever produced post-war. The usual explanation is that the navy had little interest in the subject, and that funds for historical research were severely curtailed in the 1930s. However, if wartime ASW was tied as closely as it seems to intelligence, it seems arguable that no such history would have been desirable.

The Royal Navy certainly accepted that U-boats had nearly defeated it. In the 1920s, successive British governments tried to gain treaty acceptance of the abolition of submarines, but that proved hopeless. The Royal Navy certainly continued to work on ASW technology, particularly asdic (sonar). Around 1930, the British government accepted that abolition was a lost cause, and there was serious analysis of what would be needed in a future war.

The Royal Navy accepted that in future it would escort merchant ships, so that its building plans generally took that role into account (indeed, much more than those of any other navy). However, it could not maintain a sufficient mass of escorts. It therefore also retained intense interest in intelligence-based interception tactics. The advent of asdic and of the depth charge seemed to show that fast surface ships really could search the area of uncertainty around an interception position. Thus tactics were devised for cases in which a submarine was located within an area, and early in World War II (WWII) destroyers were assigned alternative armaments as units of ASW Striking Groups. It turned out that asdic, at least as it existed before
and during the war, was not the desired search sensor; its search rate was far too low. The great role of the War Room, it turned out, was to support evasive action – which saved many merchant ships. The great convoy battles were fought once so many U-boats were at sea that evasion was no longer possible. It is in the sense of supporting evasion that Ultra signals intelligence was so important during much of the Battle of the Atlantic. We now know that through early 1943 the Germans were reading British convoy codes, so that they were aware of evasive movements, and often able to move patrol lines of U-boats to counteract them.

Eventually it became possible to revert to the offensive use of such intelligence. In 1943, largely in defiance of British warnings that such attacks could compromise Ultra, the US Navy began to use carrier aircraft to attack U-boats, particularly supply boats, whose planned rendezvous positions had been revealed by intelligence. All of the previous tactical problems had been solved. The U-boats were easy to reacquire because they had to surface to be re-supplied, and hence were quite visible. Moreover, the aircraft could form scouting lines which could compensate for errors inherent in the intelligence sensor. We now know that the Germans became suspicious that their codes had been compromised, but did not abandon their coding system.

By 1945 the Germans were using snorkels. Radio intelligence was still available. Now target reacquisition depended mainly on using sonobuoys, although there were also snorkel-detection radars and attempts to sense the snorkel exhaust (developed post-war until the rise of diesels at sea made such exhausts useless as submarine indicators). The new detectors generally did not give a submarine’s position precisely enough for depth bombing, so in effect they were associated with new homing torpedoes. The association was not explicitly tied to an information-driven strategy, and the value of sonobuoys and homing torpedoes was presumably intuitively obvious. However, sonobuoys are not wide-area search devices, and they are useless in the presence of large groups of ships such as convoys. Their true role is in the exploitation of ocean surveillance data, which in 1945 meant signals intelligence and radio direction-finding. Much the same can be said of passive homing torpedoes.

On the other hand, the Germans realised that searching for ships in coastal areas was unlikely to succeed in future, so before WWII they too became interested in intelligence-based operations. Such operations required a means of re-acquiring targets, in the form of a scouting line of U-boats – a wolf pack. The scouting line, once concentrated on a particular target, also solved the problem of target saturation (too many ships for any one U-boat), and numbers could often overcome a weak escort. It also helped that the U-boats could operate surfaced, hence highly mobile, when they attacked at night – until radar cancelled that tactic. The German strategy required a shore-based headquarters which maintained a tactical picture of merchant ship activity in the Atlantic, its main sensor being code-breaking. It followed that U-boat operations were radio-controlled from shore, hence that a
considerable amount of signal traffic was involved. That traffic in turn became the main source of information to the Allied system trying to track U-boats. Both the generation of intelligence and the use of radio were inevitable on each side, the question being which would exploit its position more efficiently.

From a current perspective, the intelligence-based tactics on each side should more properly be described as picture-based, that is, based on a tactical picture maintained largely but not completely by collating intelligence data. The Battle of the Atlantic became a duel not just between opposing U-boats and convoy escorts, but between opposing tactical picture-keeping centres. Picture-driven forces differ radically from more conventional ones, and they employ different tactics.

The key issue is numbers. The sea is vast and trackless. How do you find ships? One way is obviously to spread hunters out over all likely trade routes. That requires immense numbers. Convoy is a way of reducing the numbers by associating the defenders with the prey. As the steam age progressed, the Royal Navy found itself affording fewer and fewer ships of sufficient performance. Even convoy seemed unaffordable. Unfortunately, because the reasoning was not explicit, there was no way to say ‘well, it was unaffordable under those particular conditions, against that particular threat, but now the situation has changed radically’. Moreover, convoy really would have been pointless as a defence against fast armoured cruisers. It really did take time to understand the limitations as well as the potential of the U-boat. It also took time to devise weapons capable of sinking submerged U-boats.

Picture-based tactics were a way of concentrating small numbers of very effective hunters against raiders. Such tactics accept that the raiders will have their way for a time, before they are found and destroyed. One question is how quickly that will happen. In 1960, in connection with a largely picture-based strategy, the US Navy declared in a then-classified publication that for the first three months of a war the Soviet submarine force would have its way, sinking about 100 merchant ships a month. By the end of the three months it would be gone. The 300 sunken merchant ships were considered an acceptable price. The great question for any picture-based strategy is whether the price paid in losses while the enemy is being intercepted is acceptable. The price clearly was not acceptable in WWI, because the loss rate of U-boats before convoy was far too low to matter. Much the same turned out to be true in WWII. But that was not necessarily the case.

In the 1960s NATO simply could never afford enough escorts capable of dealing with the new generation of fast submarines, particularly nuclear ones. NATO-style ASW relied heavily on long-range sensing and other exotic tactics such as choke-point barriers. Only in a few cases, in which losses were entirely unacceptable, could escorts be provided to reduce vulnerability to submarine attack (otherwise a concentration of ships would merely make the submarine more effective). Moreover, as submarine capability grew, it was by no means clear that any concentration of escorts would suffice to deter attack. In the only known case of a nuclear submarine
facing escorts, in 1982 HMS *Conqueror* had no difficulty sinking the Argentine cruiser *Belgrano*. Claims that the submarine was then held down by depth-charging are scarcely credible.

The post-war picture-based techniques were associated with, among other things, ASW aircraft. The association was natural. Any picture-based strategy is reactive. It vectors hunters out to attack the targets it detects. The hunters need range and speed. Battle cruisers were fast, but a P-3 or a Nimrod maritime patrol aircraft is a lot faster. Detection tends to be transient, so the datum to which the hunter goes is stale by the time it arrives. There is a relationship between how quickly the expanding area of uncertainty can be searched and how far away the hunter can begin the search. The one thing which is clear is that patrol aircraft are misnamed; they are submarine interceptors.

Picture-keeping is always about more than interception. The US Navy began work on its SOSUS (Sound Surveillance System) net about 1952. By 1957, a panel on surprise attacks saw SOSUS mainly as a means of warning the US government that the Soviets were about to attack, the theory being that it would detect the pre-war surge of Soviet submarines into the North Atlantic (it is not at all clear that any such surge was ever contemplated by the Soviets). SOSUS could also, it was hoped, detect missile submarines off North America, supporting ASW directed at them. Further afield, it could help US battle groups evade attack, and ultimately it could direct US attack submarines towards possible prey (a nice echo of the battle cruiser story).

Picture-based tactics were not the only alternative to convoy, nor were they ever the sole ASW strategy. Other contributions were attack at source (for example, mining the exits from enemy bases) and blocking forces across choke points (such as WWI submarines operating in the North Sea).

Picture-based strategies concentrate their users on ways of gaining information. When the British faced German surface raiders during WWII, they were interested in anything which could fix the raider's position so that interceptors could find it. That need explains the orders to all merchant ships – which by this time generally had radios – to report when they were approached by a raider or potential raider. Histories of WWII describe anti-raider hunting groups formed, for example, to deal with the German 'pocket battleship' *Graf Spee*. Each group had to be powerful enough to deal with the raider, so there could never be very many such groups. Moreover, each had to be fast enough to respond to interception orders. What is generally left out is the need for a central operational command with access to a more or less current picture of events at sea to direct the hunters. Yet that is what the Royal Navy had created before WWI, and what it used during WWII.

Another way to say this is to note how often British historians describe the Admiralty as an operational, rather than administrative, wartime headquarters. Operational command requires some means of understanding the operational situation. That means was an Operational Intelligence Centre which maintained current tactical
pictures, such as a plot of known and suspected U-boat positions. Command was necessarily exercised from ashore. The plot idea was clearly spread to related navies. There was a reason, for example, that early in the war the chief of the RAN exercised his responsibilities from ashore rather than from a flagship. His ships were his instruments to deal with enemy raiders, but his tactical plot told him where to send them.

To an analyst, the great tragedy is that the British felt they had to be so careful of the security of their system that they could not stand back and analyse its properties, so they were apparently unable to explain to themselves the rise and fall and revival of, for example, convoy. Given the level of secrecy involved, and the loss of so many records, that may be an unfair charge. However, it does have an important modern resonance. The way in which networked versions of warfare are typically described is anything but secret, but it also seems to avoid the sort of intuitive understanding which we need. Perhaps looking at historical analogies can help.

Notes

1. I am grateful to Dr Nicholas Lambert for sharing his insights into Admiral Fisher’s invention of the Admiralty War Room.
7. The Struggle for the Australian Airwaves: The Strategic Function of Radio for Germany in the Asia-Pacific Region before World War I

Peter Overlack

The installation of wireless telegraphy will obviously prove of no slight importance to any future development of German naval power in the Pacific.¹

German military communication plans prior to 1914 had clear implications for the British Pacific Dominions. A number of contemporary Australian leaders, often educated at British and some at German universities, possessed a world view. The commander of the Australian Navy, Captain William Rooke Creswell, wrote in his 1907 memorandum for Prime Minister Alfred Deakin that German activity in Morocco was designed to gain a position as a counterpoise to Gibraltar, ‘the desire to acquire a good point of observation ... and overlook the Cape route’. The Mecca railway could place a Turkish army in Egypt, ‘rendering quite conceivable the closing of the Canal, and severance of our line of communication’. More specifically, German attempts to establish a foothold in Persia, the Baghdad Railway project, and various schemes in Asia Minor ‘are all directed to effect a through line to the East as a direct communication with Germany’s Eastern possessions’.²

German expansion on the imperial ‘periphery’ was significant and caused considerable disruption of international relations. It was considered essential to obtain those communication and naval bases around the world that were indispensable for future expansion after mainland Europe had been secured in an inevitably successful war. This optimism lasted as late as 1917 when a memorandum by Admiral Adolf von Trotha pointed out that Germany would need to control the entire Indian Ocean coast of Africa to contain Britain in the Suez and Red Sea areas. With Turkey dominant in Arabia, Germany could then control the trade routes from East Asia and the British Dominions.³ In conjunction with similar operations affecting the Atlantic trade routes, Britain’s economic survival would be completely dependent on German goodwill. It is within this larger picture of overall long-term global planning that German activity in the Asia-Pacific region is significant.

The Asia-Pacific region ranked second in importance to North America for German economic and strategic interests before World War I. That radio and cable connections were a major consideration in German operational planning in the region is shown by the large archival holdings on the subject. The German Government was keen to extend radio connections between Germany’s Pacific possessions using a reliable
connection with the naval base at Tsingtau in northern China. The military-political importance of the network was repeatedly emphasised. How naval communication might be facilitated from land-based stations features prominently.

While a continent like Australia offered a rich commercial market, more importantly for the German Navy and its wartime task of sinking shipping in the Asian-Pacific region, a land-based Telefunken system would have definite advantages over the British Marconi system favoured by the Commonwealth Government. With the vast potential of the Australasian market, it was inevitable that the two great radio-telegraphy companies working with similar technology eventually would come into conflict. By the beginning of 1909, of some 1500 radio-telegraphy stations worldwide, 673 had been constructed by Telefunken, 550 by Marconi, and the remainder by smaller companies. The following years saw aggressive competition by both companies, with 161 new stations being constructed by Telefunken alone between January 1909 and July 1910. The underlying theme of the whole Marconi-Telefunken encounter was Germany’s attempt to increase its own strategic advantage by securing a Telefunken monopoly of Australian land-based radio-telegraphy stations, whose transmissions would be easy to receive in wartime and thereby assist implementation of commerce warfare in Australian waters by use of both naval forces and armed merchant auxiliaries.

From Cable to Radio: Growing Defence Concerns.

Anglo-Australian concerns about cable communications and radio in wartime had a lengthy history. In 1904, Colonial Secretary Lyttleton advised the Governor-General that the British Government was contemplating the adoption of a general scheme of telegram censorship in wartime:

In the case of a maritime war, the importance of an early and complete censorship might be very great ... in the defence of the Empire as a whole as well as ... particular Colonies.

It was essential for the safety of British naval forces and the consequent safeguarding of trade and Imperial interests that a scheme should exist whereby a rigid system of censorship could be established over all cables under British control within a few hours of the despatch of a telegraphic order from London. While such censorship might cause inconvenience and temporary loss to trade, this had to be weighed against a ‘possible naval disaster and the consequent loss of command of the sea’. Only by this means could information on the movements of merchant vessels be withheld from enemy cruisers. By the end of the year, appropriate measures had been authorised by Brigadier-General Finn, commanding the Commonwealth Military Forces, and approved by the Defence Minister in January 1905.

Already in August 1901, the British Colonial Secretary had issued a circular on the Navy’s use of Marconi apparatus:
As it is most important that in time of war communication by wireless telegraphy should be conducted between HM ships and British possessions abroad on the same lines.7

With growing defence awareness, local press opinion was mixed on the virtue of the idea of a German cable from the Dutch Indies to New Guinea, let alone requests that its extension be granted a landing site on the Australian mainland.8 Senator Staniforth Smith, writing in the Sydney Daily Telegraph, commented on the proposed extension of the cable from the German Caroline Islands to Herbertshöhе in New Guinea, that:

It is a palpable fact that the commerce of New Britain does not justify the expense of a cable, but as Simpson Haven is to be a German naval base, it is not hard to understand the motive of cable extension ... it is to be hoped that the Commonwealth will consider the matter seriously before entering into any arrangements ... German activity in the Pacific should act as a warning to Australian Ministers to keep their eyes open.9

In 1908, there was considerable activity beginning in May when the Postmaster-General called for tenders for the construction of stations at Cape York, Thursday Island, Goode Island, Port Moresby and Fremantle. Those at Port Moresby and Fremantle were to have a minimum range of 350 miles, while for Thursday and Good Islands it was 50 miles. At these distances it had to be possible to receive signals at the guaranteed speed of working during any hour of the day or night, and in any climatic condition. Preference would be given to installations capable of rapid tuning to any wave from 100-600m or upwards.10

It was not doubted in Australia that the German initiative to establish radio connections between its colonies would have an important bearing on Britain's communication dominance of the Pacific and its consolidation for defence requirements. Consul-General Dr Georg Irmer regularly reported to Berlin on discussions in Parliament. Independent of the efforts of the various Dominion Governments, the British Admiralty now had decided to provide a number of ships of the Australian Squadron with Marconi systems, which complicated the situation for Telefunken.11 Irmer's report also advised that, according to newspaper reports, a Mr Sutton in Melbourne had invented a new system that currently was being tested by the Australian military. A critical assessment by WA Gosche, an electronics engineer working for Telefunken's Australian agents Staerker & Fischer subsequently followed. Gosche also cleverly used the 1908 visit of the American Fleet to promote the advantages of Telefunken, used by the Americans, over the Marconi system in the Royal Navy.12
Another opening for Telefunken finally appeared in 1908. Following Irmer’s initial report, the German Naval Attaché in London also directed his Navy Office’s attention to the Commonwealth’s decision to build further stations at Melbourne or a suitable point on the Victorian coast, King and Flinders Islands in Bass Strait, and Georgetown or Launceston in Tasmania. The proposals were to be presented to Parliament by the beginning of December 1908. The advantage for Telefunken was that the conditions stated the stations were not bound to using a specific system, and there were only a few technical specifications laid down. Why was the German Navy so interested in a commercial venture? It must be kept in mind that the waters from Sydney through the Bass Strait to Fremantle were designated the main area of attack by cruisers of the East Asian Squadron against Anglo-Australasian shipping in wartime.

Events in any case developed propitiously, as Telefunken’s Berlin office had received directly the submission requirements for the tenders to erect stations in Launceston, Melbourne, King Island and Flinders Island, and a response had been despatched promptly to be submitted by its Sydney agents Staerker & Fischer. The company’s letter to the Foreign Office pointed out that the North German Lloyd steamer Bremen, which travelled to Australia several times a year, carried a Telefunken system, and at this particular time was underway with a company engineer aboard, who could assist with the bid. The Navy Office expressed ongoing interest in Telefunken’s success and the possible military advantages.

In May 1910, the Chief of the East Asian Cruiser Squadron, Vice-Admiral Erich Gühler, recommended that in view of the construction of the network of Anglo-Australian stations in the Pacific, the cruisers should be fitted with the most up to date apparatus. Of particular importance was the installation of radio on the Lloyd postal steamers, the fastest of which carried guns in their holds and were to be converted into auxiliary cruisers in wartime, and their provision with a code which would permit them to be in contact with the East Asian Squadron’s cruisers at any time. With the looming threat of British action promoting Marconi, a new sense of urgency was to be found in Berlin. The Navy Office acknowledged that steamers fitted with radio would be ‘the focal point of the intelligence system for wide areas’. From the Navy’s viewpoint, interception of transmissions from Telefunken land stations was of great importance.

At this point a strong word needs to be said about German intelligence operations. Ernest Scott wrote in the official war history that no enemy had anyone in their pay within Australia to act as spies. Differentiating between ‘agents’ and ‘spies’ may be considered splitting hairs. Consul General Richard Kiliani, formerly in Singapore where his contribution to the Intelligence System brought frequent praise from the Navy, held that post in Sydney until 1914, and had many Australian friends in government, commercial, and social circles. These contacts assisted him considerably in his intelligence tasks. Extensive evidence of the activities of prominent businessmen Walter de Haas and Oscar Plate, who have been falsely exonerated by historians on the basis of lack of evidence in Australian archives, lies in the German files.
The 1909 *Dreadnought* scare centred around the battleship construction race and anti-German sentiment. The *Sydney Star* emphasised the importance of the new technology in an article complete with a map of the Pacific showing the ranges of Anglo-Australian and German transmitters. The strategic importance of radio to Australia was shown by the constant messages between Melbourne and Sydney transmitted by the Navy, as well as the long-range implications of communication between land stations and warships at sea. With the system a network of stations could be established by which ‘the approach of any hostile fleet would immediately be communicated to Australia.’ The degree of sensitivity exhibited by the Admiralty was reflected in its refusal of a request to photograph the Marconi apparatus. *The Star* commented that

> Under present circumstances a hostile fleet could hide among the islands for months waiting for a chance to swoop down on Australia’s shores. It is of Imperial, as well as Commonwealth, concern that we should know what is happening in ... the South Pacific ... radio-telegraphic installations will be a source of great protection to Australia.²⁰

*The Sydney Morning Herald* was concerned that German enterprise had taken the lead in the Pacific, and considered this a clear indication of which way the wind was blowing. From the standpoint of both commerce and defence, it was plain that the Dominions would have to keep wide awake. If it were true that Germany in the North Sea were a menace to Britain, then Germany in the Pacific was scarcely a source of reassurance to Australia:

> German diplomacy looks a long way ahead, and the installation of wireless telegraphy will obviously prove of no slight importance to any future development of German naval power in the Pacific.

The main lesson for Australia was that of initiative and preparedness, but while Australians held conferences, Germany was preparing for the future.²¹

In August 1909, radio expert Captain Cox-Taylor gave a lecture to the United Service Institution in Sydney on the value of radio in war, particularly as it related to coastal defence. It was generally accepted that the most likely form of attack would be a surprise raid, and Australia’s geographical position and extended coast made this a difficult factor against which to guard. Wires could be cut, and visual signal stations could only report what they saw. If all ships trading in Australian waters were required to carry radio, it would be most unlikely than an enemy could approach unseen.²² This reinforced the need for a British system.
The German Push

In September 1909, Consul-General Irmer provided Chancellor Theobald von Bethmann Hollweg with a detailed report on radio-telegraphy in Australia, with his own assessments of German prospects for entering the market. It was proposed to construct a large station on the east coast which would enable contact with Cape Leeuwin and New Zealand, and smaller stations in Papua, Darwin, on Cape York, Brisbane, Sydney, Melbourne, Tasmania, Adelaide, and north of Perth. Also of interest was the proposal, under the Navigation Bill, for the compulsory outfitting of all Australian-registered coastal passenger vessels with on-board stations. While it had not yet been decided which system of radio-telegraphy would be chosen for the land stations, Irmer was pessimistic that in the existing atmosphere of anti-German feeling the Australian Government would choose Telefunken, even though in tests it had provided the best results.23

Precisely one month later, he reported that the government was to obtain an opinion from leading British scientists and technicians as to whether the Australian tender should be restricted to Marconi, or opened to general competition. This would decide the possibility of introducing the Telefunken system once and for all. There were still problems to overcome, such as the open preference of the commander of the Australian Station, Vice Admiral Poore, for the Marconi system. Although Irmer conceded that questions of such importance would not be decided in Melbourne but in London, he would exert his influence on Telefunken’s behalf.24 Subsequently London removed the prohibition on naval ships communicating with other than Marconi stations. This enabled British ships on the Australian Station now to communicate with Commonwealth stations outfitted with other than Marconi - meaning, hopefully, Telefunken - systems. Given this opportunity, Irmer strongly recommended that a competent technical adviser be sent out from Germany to advise the company. There was a great opportunity for Telefunken to secure ‘a market whose winning is worth the greatest effort’. The matter concerned the introduction of the Telefunken system into all of Australa, New Zealand and the entire Pacific island region.25 The German Navy was particularly concerned that Telefunken gain a front-runner position in the competition for the installation of a radio-telegraphy system in Australia and the British Pacific possessions overall. In October 1909, the Senior Officer of the (German) Australian Station reported to the Admiralty Staff regarding Defence Minister Joseph Cook’s concern to speed up the installation of a network of stations around the Australian coast, which were of considerable defence significance in view of the intention to install onboard radio on the Australian navy’s new destroyers.26

On 18 December 1909, the Radio-Telegraphy Conference comprising representatives of Australia, New Zealand, the Western Pacific High Commissioner, Fiji, the Admiralty and the Pacific Cable Board decided on the establishment of an ‘all red’ British-controlled route. The main decision was to establish high-power stations
at or near Sydney, Doubtless Bay (New Zealand), Suva, and Ocean Island (Gilbert Islands); and medium-power stations at Tulagi in the Solomons and Vila in the New Hebrides. The German Naval Attaché in London, writing to Naval Secretary Alfred von Tirpitz early in February 1910, considered that ‘as Doubtless Bay and Suva are in addition connected by cable to Brisbane, the whole positioning of these stations increases in importance’, covering as they did a strategic triangle of the Pacific.

The possibility of Telefunken gaining a foothold spurred the Marconi Company into action. In early December, Irmer expressed concern at the support given it in Parliament by the ‘imperialist’ Member, Bruce Smith. In addition, Marconi had the technical advantage that at the time, only Marconi outfitted steamers came to Australia. This resulted in the situation that ‘in non-technical circles almost nothing is known about the Telefunken system.’ Irmer recommended that it would be a great advantage if the vessels of the North German Lloyd and the German-Australian Steamship Company were outfitted with Telefunken systems in view of the upcoming coastal navigation legislation. It also needed to be publicised in the local press that German ships were using the Telefunken system to draw attention to it and its advantages. Irmer commented that:

I have people here who could in one way or another have such information published in the Australian press. It would also not be impossible to have the matter raised in parliament itself.

He also requested information on Telefunken in English for widespread distribution.

In February 1910, the German Post Office advised the Foreign Office that Telefunken was making strenuous attempts to participate in the construction of planned Australian stations. The formation of a subsidiary company was in progress, which in the view of the Post Office was essential in order to gain any substantial foothold. To assist in the overall perceptions of German expertise, the outfitting of German steamers on the Australian run with Telefunken systems had begun, and in fact the contract for postal steamers to East Asia and Australia now required a German system to be installed. Irmer, in Sydney, was to continue strongly promoting Telefunken in the public eye.

The German Foreign Office closely followed developments in Australia, and periodically requested technical information from Telefunken. As much information as possible on other users of the system was needed to be put abroad to facilitate expansion of the German system: the navies of Russia, Denmark, Sweden, Norway, the Netherlands, Spain, Austria-Hungary, and Argentina used Telefunken exclusively on board their warships, while those of the United States and Brazil mixed systems. It was estimated that of some 1700 stations worldwide, more than 50 per cent were Telefunken. The company undertook to supply the Consulate-General in Sydney with supporting material in English for use in promotion.
In June 1910, Telefunken formed a subsidiary in Sydney under the name of Australasian Wireless Limited. For appearances, the major holders and managers were Messrs. Denison, McLeod and Wheeler, and the local firm of Staerker & Fischer moved into the background as the agent for Telefunken, but would conduct all communication with the Commonwealth Government. This ‘Australian company’ succeeded in obtaining a subsidy for the construction of radio transmitter stations in Sydney and Fremantle. Hopes were raised as word was about that the next budget would allocate a larger sum for the construction of stations.

While Australian Wireless now obtained station components from Telefunken, it hoped to be able to fabricate them itself in the future, in order to minimise the anti-German bias which existed. For Telefunken it was obviously desirable that a close cooperation was maintained. The danger was that if Australian Wireless foundered or had to withdraw from the construction of further stations, Marconi again would dominate the field. The company also worked out a proposal for stations at Adelaide, Kangaroo Island, St Mary on the Tasmanian east coast, Brisbane, Mackay, Cooktown, Thursday Island, Port Moresby, Suva, Vila, Tulagi, Ocean Island, Esperance, Darwin (reaching Timor where it also proposed to build a station) and in New Zealand. Simultaneously it was negotiating with the Union of Australian Coastal Shipping Companies for the installation of 30 systems on coastal steamers, to be rented from the Marconi Company, which would retain possession.

During one of his regular port visits reporting to the German Consuls, the commander of the light cruiser Condor advised that the government should remain in close touch with Telefunken, and Staerker & Fischer in Sydney. Given the strategic interests involved in radio, it is interesting that the Company built two stations at its own expense, in Melbourne and on King Island, each with a radius of 600 miles, whose ostensible purpose was to communicate with the steamer traffic in Bass Strait. While there is no concrete evidence that they would be used for any military purpose advantageous to Germany, again one must bear in mind that this area was designated a prime ‘hunting ground’ for the Asian Cruiser Squadron.

By late 1910 the whole situation was examined in Parliament, and Prime Minister Andrew Fisher stated that he did not know if the Telefunken system was better than the Marconi. Indeed, during the previous month several newspaper articles had attempted to thwart the introduction of Telefunken, and naturally did not fail to indicate the German origin of the system. The delay in getting the first Telefunken project underway provided more time for parliamentary action on behalf of Marconi. Acting Consul-General Wilhelm Münzenthaler reported that there were ‘lively discussions and attacks on the government, the Australian Wireless Company and the Telefunken system’. It was a source of concern that the government had not chosen the system used in Britain and in the Royal Navy. The German origin of the Telefunken system was highlighted, it was depicted as incomprehensible how the government could have chosen this system, used in the German Navy, and ‘which should have come last into consideration.’ The contract with Australian Wireless
should be cancelled and the Marconi system universally introduced into Australia. Münzenthaler considered it no coincidence that these attacks should immediately follow the arrival of a Marconi representative from Britain, his establishing contacts with various parliamentarians, and that in the previous weeks the newspapers had reported on new Marconi technical successes. The British origin of Marconi and the Pacific Radio-Telegraph Company was also emphasised. However, Münzenthaler responded by promoting a series of inspired articles in the Sydney and Melbourne press extolling the technical advantages of the Telefunken system.\textsuperscript{34}

By the end of 1910, the Germans could breathe more easily and Münzenthaler reported that the contract for the Pennant Hills and Fremantle stations finally had been signed after long negotiations. It had been a close fight, as Marconi had left nothing untried in order to shut out Telefunken. It now remained to be seen whether Australian Wireless succeeded in its bid for the five New Zealand stations.\textsuperscript{35} The situation in New Zealand was not as promising. Münzenthaler reported that ‘as was to be expected’, now in New Zealand as in Australia the previous year the government was being strongly criticised for its choice of the Telefunken system for the stations to be constructed there. This was primarily on the ground that the choice went against the best interests of national defence. A large part of the agitation in the press again was attributed to the presence of a Marconi representative from London.\textsuperscript{36}

With Australian Wireless about to change itself into a larger share company, Münzenthaler noted optimistically that ‘no more difficulties of this kind are to be expected in the bid for the additional ... stations.’\textsuperscript{37} On 12 April 1911, the Australasian Wireless Company Limited began life with £65,000 share capital. With the agreement of the New Zealand Government, the seven stations to be constructed there soon would begin, to be completed by the end of 1912. In addition, the company had received orders for nine on-ship stations from the Union Steamship Company of New Zealand, and it planned to eventually outfit all of its 60 ships. Contracts for on-board stations were concluded with the Huddart Parker Company, the Australasian United Steam Navigation Company, and Howard Smith. These four companies possessed some 150 steamers and planned to outfit all their ships with on-board radio. ‘It can thus be assumed that the Telefunken system soon will be dominant in the Australasian merchant fleet’, Münzenthaler confidently assured Chancellor von Bethmann Hollweg.\textsuperscript{38} Somewhat prematurely, Cormoran’s commander reported in June that the introduction of the German system in Australia ‘means a complete success for the Telefunken Company’.\textsuperscript{39}

Complications

The middle months of 1911 were preoccupied with patent violation litigation between Marconi and Telefunken, the local press discussing, ‘in detail and not without animosity’, the effects of Marconi’s contesting the decision in London upholding the legal permanence of Telefunken patents.\textsuperscript{40} In July, following Fisher’s visit to London, the government’s attitude towards Telefunken and Australian Wireless appeared to
undergo a change. The government had decided to postpone the allocation of the Port Moresby and Thursday Island stations, and Münzenthaler saw the ominous hand of London at work:

It can be assumed that the changed position of the Government can be traced back to the talks between Fisher ... with the Admiralty, the War Department, and the Marconi Company ... there exists the plan to connect all the British colonies and possessions with each other by radio.41

There now was a completely unexpected factor. In view of the litigation between Marconi and the Telefunken Company, which accused each other of patent infringement, the Australian Government decided to choose neither of these systems, but a third, which had been presented by the Director of Radio Telegraphy in Australia, Dr Balsillie. This was similar to the system of the British Radio Telegraphic and Telephone Company Ltd, where Balsillie formerly was employed.42 It was certainly strange that this system should have been chosen, as following a decision of the High Court in London, it infringed on the Marconi patent.43 However, according to a statement by the Postmaster-General, the Australian Government was aware of this and prepared to pay any possible claims ensuing. Although the adoption of the new system had been stated as the definitive decision of the government, Consul General Richard Kiliani had it on good advice that the possibility of a different decision to the benefit of Telefunken still might be possible. Given the pointlessness of legal action, the Australian Wireless Company had decided to obtain Marconi’s Australian patents ‘at all costs’. The Telefunken station at Pennant Hills had been completed, and Australian Wireless did not appear to doubt that the actual intention of the Commonwealth was to choose ‘the recognised best Telefunken system’.44

However, this was not to be. On 9 February 1912, in the presence of the Governor-General, the Prime Minister, the Postmaster-General and many official guests, the Commonwealth’s first ‘Balsillie system’ radio-telegraphy station was opened. It was hoped to have three more stations, at Hobart, Thursday Island, and Port Moresby functioning by the end of June. At least the Germans had the satisfaction of seeing the first transmission, from the Governor-General to Admiral Sir George King-Hall on board HMS Drake in Hobart, go unreceived and unanswered.45 It now remained for Telefunken to salvage what it could in the new circumstances. In mid-1912 came the good news of successful Marconi-Telefunken negotiations, that the Commonwealth would pay a substantial compensation, and that:

After the dissolution of Australian Wireless a new Australian company will be formed, in order together to continue construction of the radio-telegraphy system ... There appears to be no doubt about the willingness of the Government to work with this company.46
Australian Defence Issues

In 1911, the Postmaster-General stated in Parliament that the government intended to proceed with the construction of the ring of stations around the coast of the continent as quickly as possible. In immediate view were stations at Mt Gambier, Eucla, Eden, Rockhampton, Townsville, Cooktown, Wyndham, Roebuck, Geraldton and Albany. A station of suitable strength would be built in Darwin to connect into the All-British network being constructed by Marconi. While this was not the exclusive participation that Telefunken would have preferred, it at least ensured the German company a share in the construction of Australia’s radio transmitter network.

The significance of radio was increasingly appreciated in Australia. In December 1912, at the sitting of the Parliamentary Select Committee inquiring into the Marconi contract for the erection of the British Imperial network, it was pointed out that its establishment was a matter or urgency, for ‘if war occurred within the next two years, Great Britain would be at a serious disadvantage’. By April 1913, the Naval and Military Record was reporting that the Darwin station, originally a Marconi tender for £120,000, was now being completed by the Commonwealth at a cost of £90,000. The station would have a radius of 2000 miles, touching Singapore at the apex of a triangle which would stretch from Sydney to Perth, and would be ‘capable of communicating with any system which might be established by the British Government’. The Sydney and Perth stations had a daylight range of 1250 miles; the other coastal stations a range of 400 miles, but in good conditions this could extend to 1500 miles.

Australian activity was continually urged from London: the Colonial Secretary advised that:

> H.M. Govt attach great importance to the maintence of communication by wireless telegraphy in time of war. Your Govt will doubtless ... give due considerations of defence when sites for new wireless stations are being chosen.

In March 1913, Winston Churchill stated in the British Parliament that while details of progress were confidential, this was satisfactory and the expense was fully justified given its usefulness. The only current problem was the delay in ratifying the Marconi Agreement and consequent delay in the expansion of the Imperial network.

The German Network in 1914 and its Neutralisation.

At the beginning of 1914, Koloniale Rundschau welcomed the ‘pleasing progress radio telegraphy has made in and with the colonies’. In East Africa there were two stations, on Lake Victoria and Dar-es-Salaam, that could reach ships up to 1500km distant. In Southwest Africa, stations at Swakopmund and Lüderitz Bay could reach ships 1000km distant, with reciprocal contact of 500km. Stations at Duala in
Kamerun and Lome in Togo had a range of 100-1500km. In the Pacific, of the Yap-Rabaul-Nauru-Samoa link, the first two were operating. While trial transmissions between Yap and Tsingtau only had success at night, this was considered satisfactory with the latter’s upgrading planned.\textsuperscript{54} The German Pacific Company for Radio-Telegraphy would begin operating the first two stations of the planned Yap-Rabaul-Nauru-Samoa line by February 1914, as stipulated by its concession. Nauru and Samoa were to come into full operation in the first half of 1915.\textsuperscript{55} A direct connection of the Pacific network with Germany might be made possible over Sumatra-East Africa-Togo-Nauen (Hamburg) if and when the Netherlands granted permission for the Sumatra station. The 8000km distance over Sumatra-East Africa posed certain technical problems which would have to be overcome, but this was considered possible given that good results had been achieved on the 6500km between Nauen and New York. Yet while this was evidence of much local progress, Germany still had not succeeded in constructing its own world network independent of British links.\textsuperscript{56} While not as extensive as originally envisaged, the links sufficed for everyday purposes, with extensions ongoing.

In a 1911 British consideration of what action would be taken against German communications in wartime, a Cabinet sub-committee recommended the neutralisation of the German cables from Emden to Vigo and the Azores, although it was thought that the cutting of the Azores-New York link would be strongly resented in America. It was also feared that the cutting of the joint German-Dutch cable to Yap and the German-owned Monrovia-Pernambuco cable might cause retaliation by the Dutch and Brazilian authorities respectively. It was thought better to simply occupy the Yap Station rather than endanger the Singapore-Australia connection which was linked at Batavia and Banjuwangi. German Southwest Africa, Cameroon and German East Africa were dependent upon British cables. With the Tsingtau-Berlin connection dependent on Russian cooperation, if Yap were occupied and the cables from Emden cut, ‘it would be possible to isolate Germany from practically the whole world outside Europe’.\textsuperscript{57}

With the outbreak of war, Britain needed the speedy destruction of German radio stations, particularly those which could assist ships attacking merchant trade. This was precisely the source of information needed by the Chief of the Cruiser Squadron, Vice Admiral Max Graf von Spee. On the morning after the ultimatum to Berlin had expired, the two ends of the Atlantic cable were cut and were later taken into Falmouth and Halifax harbours. The five German cables from Emden passing through the English Channel to Vigo, Teneriff and the Azores were cut as part of an arrangement between the Admiralty, War Office and Post Office dating from 1912.\textsuperscript{58} The quick occupation of New Guinea and Samoa by Australasian forces, and later of Yap by the Japanese, threw German communications in the Pacific into chaos and disrupted the operational plans of the East Asian Cruiser Squadron.\textsuperscript{59}
On 31 July 1914, the Shanghai Intelligence Zone was taken over by Korvettenkapitän Lüring of *Jaguar*. Shanghai was an important post where a great variety of information was available. The Germans were lucky in being able to maintain contact with Berlin from here, thus securing the supply of intelligence to Tsingtau. This was assisted by the 1.5kw radio transmitter on the steamer *Sikiang*, and was particularly important after the cutting of the Wusung-Tsingtau and Tsingtau-Chifu cables. After the radio stations at Yap and Tsingtau and the German-Dutch cable at the former were neutralised, only the American Manila-San Francisco and Manila-Shanghai cables were available to the Germans. Manila also had an important function until the United States entered the War in 1917. Batavia was ineffective from the beginning due to restrictions imposed by the Dutch, who were determined not to offend Britain, and particularly not the Japanese who had made clear their intention to act decisively if the Dutch assisted Germany. On the other hand, more of a blind eye was initially shown to coal exports needed for the Cruiser Squadron’s operations.60

The defence of Yap with its pivotal highpower transmitter had been cause for concern for several years. An exchange of notes between the German Navy Office, Admiralty, Colonial Office and Post Office in early 1914 emphasised the ‘great importance of the radio station in the pre-hostility declared period of “Tension” and upon outbreak of hostilities for communication of intelligence’ and to its vulnerability to attack. If it were possible to maintain a connection between the station and warships in the Pacific via stations in American or Dutch territory, then ‘it is urgently desired in the military interest to determine such steps to protect this installation against sudden attack’ and use by an enemy. Spee directed Captain Erich Müller of *Emden* to determine protective measures.61

It was clear that Yap, as the seat of the District Officer and possessing both a cable and high frequency radio station, would be quickly occupied. Spee anticipated this, and in 1913 had proposed that since no proper function had been allocated the survey ship *Planet* in the mobilisation preparations, it would be more useful to send it to Yap where the crew of some 100 men could assist in preparing defences and would in themselves offer some security against attack. However, missing Spee’s point the Admiralty rejected his suggestion on the ground that ships were not there to protect such installations if in so doing they could not participate in any offensive action.62 There were also other considerations: the navy was not inclined to divert scarce resources to the defence of land installations, and the Colonial Office was encouraged to provide by other means for its security provisions.63 In any case, the decision was considered a political one resting with the government.

From the middle of 1914, the communications traffic over Yap became quite heavy, and it was possible to inform the government in Rabaul of the deteriorating European political situation with the assistance of *Planet*’s receiver and the supplementary mast at Bitapaka in New Guinea. On 27 July, news came of Austria’s ultimatum to Serbia. On receiving news of the deteriorating political situation, the manager at Yap had the station manned 24 hours a day from 31 July, which placed both the
generator motor and batteries under some strain. On 1 August a state of war was declared on Yap, and three officials manned the night shift alone, particularly after the services of the station at Menado were lost when the station was taken over by the Dutch Indies Government. On 2 August all the operators at Yap were placed under military discipline. Five days later, *Planet* arrived, and the station and surrounds inspected by the commander and officers in view of a possible defence. Subsequently a squad of 30 men and two officers arrived to organise this. On 12 August the British armoured cruiser HMS *Minotaur* and a light cruiser appeared off Yap. The commander radioed that he would open fire on the station at 0900 the next day. This occurring, the station was reduced to rubble within half an hour. However, the cable station remained intact, and no attempt was made to land a party. The British appeared to be in some haste, probably in apprehension of the German Cruiser Squadron as calls for assistance had been transmitted to the last minute. The radio on board *Planet* was demounted and reassembled on the island, in order to re-establish contact with the warships in the Pacific, an undertaking which took ten days.

Following this, the ensuing weeks remained uneventful, with German auxiliary cruisers and transport steamers using the harbour to resupply and receive the latest news thanks to the still-operating cable station. On 27 August came the news that the transmitter was operating again, albeit on a very limited time basis though with a 1000 mile radius, which was as yet unknown to the Allies. However, this idyll was soon to end. On the afternoon on 6 September the station received very clear Japanese signals. On the morning of 7 October the battleship *Satsuma* appeared off Yap. At 11.30 Menado and Guam were informed that Yap would be closing down. Appreciating the seriousness of their situation, the Germans began destroying the cable station, the radio transmitter which had been erected by *Planet*, and confidential papers. Yap was undefended, the German troops having departed eight days previously.

**Effect on the Cruiser Squadron**

In the southeast Pacific, arrangements had been made for Peruvian radio stations to report the movements of British ships. Radio signals from British cruisers were of great assistance to the Germans. As but two examples, when the Cruiser Squadron first approached the South American coast, signals from HM Ships *Monmouth*, *Glasgow* and *Good Hope* were identified from their call signs and probably facilitated luring them into action at Coronel. When *Emden* intended coaling in the Marianas underway to the Indian Ocean, the increasing strength of British signals warned it to clear the region. *Emden* could not expect support in the Indian Ocean as on 8 August the cruiser HMS *Astraea* severely damaged the German station at Dar-es-Salaam, but with means of an earth-laid antenna, it continued to receive from Nauen in Germany, and had the ongoing technical support of the German light cruiser *Königsberg*’s radio officer. As the Squadron approached the Falklands, the German intelligence organisation failed to supply von Spee with any information about the
approach of Admiral Sturdee’s battlecruisers. Although the intelligence reporter at Buenos Aires had already inferred the arrival of HMS *Invincible* at Abrolhos Rock on 24 November, the information was not cabled to Punta Arenas or Valparaiso, from where it easily could have been transmitted by radio. Despite occasional good luck, at the most crucial time when an effective radio network would have been of great advantage the efforts of the preceding decades were almost completely negated, and the divided forces of the Cruiser Squadron headed to their respective fates dependent upon what information they themselves could draw from the airwaves.71

**Australian Action**

Both the Australian Naval Commander, Rear Admiral Creswell, and his intelligence colleague, Commander Walter (Hugh) Thring, were well aware of the importance of radio in naval warfare. With the outbreak of war, the German Consulate-General in Sydney found itself completely cut off from all communication. A Postmaster-General’s Department minute on 3 August stated that cablegrams to German warships, radio messages for steamers and for the Consulate-General were being withheld.72 On 13 August the District Naval Officers in all states, at Newcastle and on Thursday Island received instructions to board all incoming German merchant vessels with an armed guard in plain clothes, at least one of whom could speak German. The captains’ cabins and officers’ quarters were to be isolated, and radios dismantled.73 Searches resulted in a number of useful documents being discovered, including specific code instructions for communication between merchant and naval vessels. As one example, Captain Paulsen of the German merchant vessel *Hobart* had received a sealed packet containing the code that was to be used for communication ‘only on the expectation of war and during its duration’. He was to familiarise himself with the procedures, particularly the composition and deciphering of coded messages. The code was to be kept permanently under lock and key and strictly secret.74 The procedures for call signs were also clearly set out.

The specified code was to be used only in war, and certainly not practised in peacetime.75 Of particular use to the Allies was the finding of a copy of the secret *Handelsschiffs-Verkehrsbuch* (Merchant Vessel Communication Book). The Naval Board in Melbourne managed to decode many intercepted messages, and with some pride cabled the British Admiralty that it was welcome to forward any it had to Melbourne for decoding.76 By 3 September the only other codes which had been seized were a copy of the *Bord-Code* for North German Lloyd from *Prinz Sigismund* in Brisbane, ten mercantile codes from *Berlin* in Sydney, and ‘several small codes’ in Hobart.77 In January 1912 Telefunken had issued instructions for the event of war. It was obviously in the interests of the naval authorities that if a German steamer were captured, the radio installation could neither be used nor quickly repaired. In the event of capture, an extra high voltage charge was to be channelled into the apparatus rendering it useless. This was to be done as late as possible, preferably after the telegraphist had transmitted notification of the impending capture. Captains were in possession of detailed procedures.78
The wrecks wireless mast at Bitapaka after the successful Australian operation to capture the German station in September 1914.

The details of the various Allied campaigns to capture the German colonies are well documented. The fuller occupation of New Guinea and the capture of the station at Bitapaka, still incomplete and working on low power, put out of action the last of the stations (Yap, Nauru, Samoa) forming the German Pacific chain. Since military considerations were the primary object of their establishment, the failure to provide appropriate protection was to cost heavily. The Germans fully expected to lose the Samoan connection in a war involving Britain or America, where prospects of holding the islands were considered small. After Yap and Tsingtau were silenced, and the German-Dutch cable was unable to be used, the Manila Intelligence Zone organisation assumed a crucial role in facilitating communication between the German ships and the other zones, as well as between the zones themselves, particularly intelligence to and from Batavia which had been cut off due to the restrictions imposed by the Indies Government. The importance of the lines Manila-San Francisco and Manila-Shanghai was crucial, and they remained available until the breaking of relations with the United States in 1917.

Later Wartime Developments.

In the early months of the War, the British were decrypting foreign governments’ communications in a very haphazard way. The Director of Naval Intelligence (Admiral HF Oliver) had to rely on assistance from the more developed French and Russian bureaux. The latter provided the Admiralty with the German Naval Signal Book which was quickly put to use. Following the agitation caused by the exploits of Emden, it was assumed that it must have had some radio contact with a land base in order to avoid detection for so long. In March 1915, Vossische Zeitung reported
that *Emden* had been supplied with information on shipping movements in the Gulf of Bengal from a land station in the Dutch Indies. The suspicion that Telefunken stations in the Dutch Indies were being operated by German telegraphists caused considerable British frustration, given the difficulty of interfering with installations on neutral territory.\(^{81}\) Finally, with the entry of the United States into the war in 1917, Germany lost a vital communications connection. Access to coal supplies on the American Pacific coast (in particular San Francisco, which housed a vital intelligence unit) had been crucial for the Cruiser Squadron as it moved across the Pacific to South America.\(^ {82}\) However, Germany remained unrealistically optimistic. In August 1917 the Foreign Office considered the urgency of establishing a German world radio network, whose use for communication with ships and for foreign news had to be ‘promoted with all possible means’. It was a final recognition that ‘especially for Germany radio-telegraphy is of particular importance in the War’.\(^ {83}\)

**Notes**

7. Secretary Department External Affairs-Secretary Department Defence, 22 November 1901, Australian Archives Victoria, B 168/0-1901/4812.
11. BA Berlin, 1009.01, 16 441, p. 33, Irmer-Bülow, 29 June 1908.
12. BA Berlin, 1009.01, 16 441, p. 114, Irmer-Bülow, 1 September 1908.
13. BA Berlin, 1009.01, 16 441, p. 109, Naval Attaché-State Secretary Navy Office, 23 September 1908.
15. BA Potsdam, 09.01, 16 441, p. 200, State Secretary Navy Office-State Secretary Colonial Office, 6 February 1909.

16. Bundesarchiv-Militärarchiv Freiburg, RM5/v 5972, Chief of Cruiser Squadron-Chief of Admiralty Staff, 20 May 1910. Subsequently this code was in possession of the Consuls in capital cities, who acted as coordinators of the Naval Intelligence System.


23. BA-MA, RM5/v 5707, Irmer-Bülow, 18 September 1909; BA Berlin, 1009.01, 16,442, p. 116

24. BA Berlin, 1009.01, 16 442, p. 136, Irmer-Bethmann Hollweg, 18 October 1909.


26. RM5/v 5707, Senior Officer Australian Station-Chief of Admiralty Staff, 18 October 1909.


30. BA Berlin, 1009.01, 16 442, p. 224, Imperial Post Office-Foreign Office, 17 February 1910.

31. BA Berlin, 1009.01, 16 442, p. 226, Telefunken-Foreign Office, 8 March 1910.

32. BA Berlin, 1009.01, 16 442, p. 226, Telefunken-Foreign Office, 8 March 1910.

33. BA Berlin, 1009.01, 16 443, p. 94, Commander Condor-Kaiser, 17 June 1910.


36. BA Berlin, 1009.01 16 443, p. 146, Münzenthaler-Bethmann Hollweg, 2 March 1911.

37. Bundesarchiv-Militärarchiv Freiburg, RM5/v 5703, Imperial Chancellery-Consulate-General, 6 April 1911.

38. Bundesarchiv-Militärarchiv Freiburg, RM 5/v 5707, 8 May 1911.


40. Bundesarchiv-Militärarchiv Freiburg, RM 5/v 5707, Bünz-Bethmann Hollweg, 26 July 1911.


42. RM5/v 5707, Kiliani-Bethmann Hollweg, 8 January 1912. JG Balsillie was a Queenslander who was appointed in 1911 by the Federal Government to the position of Engineer for Radio-Telegraphy within the Postmaster-General’s Department. He had extensive wireless engineering experience and had built stations in Russia and China. From his base in Melbourne he coordinated his main task of establishing a chain of coastal stations around Australia. By the outbreak of the war, 19 government-owned stations were operating. He claimed that he had designed his own separate system, quite different to either the Marconi or Telefunken systems, but it is clear that his was

43. The *Argus* reported that the Balsillie system was claimed to be peculiarly his own, but the complicated question of patents became the subject of litigation instigated by Marconi. *Argus*, 18 October, 27 November 1912. The documents on the Commonwealth vs Marconi case are in Australian Archives Victoria: MP 529/1/0.

44. Bundesarchiv-Militärarchive Freiburg, RM 5/v, 5707, op. cit.

45. BA Berlin, 1009.01, 16 444, p. 61 and Bundesarchiv-Militärarchive Freiburg, RM 5/v 5708, Kiliani-Bethmann Hollweg, 16 February 1912.

46. BA Berlin, 1009.01, 16 444, Kiliani-Bethmann Hollweg, 10 July 1912.

47. *See The Age*, 13 July 1911; and RM 5/v 5708, Kiliani-Bethmann Hollweg, 15 July 1912.

48. Some of the installation work on the German cruisers was carried out in Sydney by the Telefunken subsidiary Staerker & Fischer. RM 5/v 5711, Commander Condor-Kaiser, 30 April 1912.


51. BA Berlin, R85/699, Kiliani-Bethmann Hollweg, 28 November 1913.


55. The Nauru station had been opened for limited public use on 1 December 1913. Translation of ‘Yearly Report of Imperial Station Nauru, 1913’, Australian War Memorial Canberra: 33 12/9.


63. This point is missed by Hermann Hiery in his rejection of the importance of colonial possessions in German war planning. See HJ Hiery (ed), *Die deutsche Südsee 1884-1914. Ein Handbuch*, Paderborn, Schöningh, 2001, p. 806ff.


70. Marine-Rundschau, April-May 1921, p. 180. At Delgoa Bay the steamship Admiral acted as a coastal station until the British Government complained to the Portuguese.


73. ‘Decode of Telegram to D.N.O's’, Australian Archives Victoria: MP 1049/1914/0351.

74. DADG-Paulsen, undated Australian Archives Victoria: MP 1049/1914/0351. The signature appears to be that of Consul Adena in Melbourne, whose firm had the DADG agency.

75. A detailed example of usage in code is in ‘Conveyance of News by Wireless Telegraphy’, Australian Archives Victoria: MP 1049/1914/0351.

76. Telegram 7 September 1914 Australian Archives Victoria: MP 1049/1914/0351.

77. Dept Trade & Customs-Naval Secretary, 3 September 1914, Australian Archives Victoria, MP1049/1914/0351.


83. Bundesarchiv-Militärarchiv Freiburg, R85 762, Post Office-Foreign Secretary, 3 August 1917.
In the early hours of 31 May 1916, the Director of Operations at the Admiralty, Rear Admiral Thomas Jackson, RN, entered Room 40, the anonymously designated location of the covert Admiralty organisation that decrypted German naval communications. The naval war had been in progress for almost 20 months and the esoteric collection of civilian academics who staffed Room 40 under the Director of the Intelligence Division, Captain William Hall, had been formed into an efficient cryptanalytical team, one which had provided the Admiralty with priceless information on German naval movements from the beginning of the war. However, because of the perceived amateurishness of Room 40’s denizens, officers such as Jackson had an unavowed contempt for them and their product. Despite their proven ability to provide warnings of German High Sea Fleet (HSF) major movements, the cryptanalysts were constrained in their ability to disseminate their product. Room 40 was not allowed to send intelligence directly to fleet commanders, and it was denied background information required to fully interpret the decrypted signals. Captain Herbert Hope, appointed by Hall in November 1914 to analyse German intercepts and provide professional naval opinion to the civilian cryptographers commented resignedly that the Admiralty’s failure to properly exploit Room 40’s expertise was absurd:

In a very few months we obtained a very good working knowledge of the organisation, operations and internal economy of the German fleet. Had we been called upon by the naval staff to do so, we could have furnished valuable information as to movements of submarines, minefields, etc.1

Jackson’s rare incursion into Room 40 was part of the dramatic build-up to the Battle of Jutland, the greatest naval battle, not only of World War I (WWI), but since Trafalgar in 1805. Room 40 had decrypted German communications during previous actions in Home Waters, such as the battles of Heligoland and Dogger Bank in August 1914 and January 1915 respectively. However, because Room 40 was not an operational intelligence centre and could not analyse and report intelligence through a war staff to the Fleet, the British lost the initiative and the battles were little more than inconclusive skirmishes.

Jackson’s 31 May visit to Room 40 was spurred by the cryptanalysts’ warning that the HSF commander, Admiral Reinhard von Scheer, had decided to sail early the next day, and the Admiralty so advised Admiral Sir John Jellicoe, RN, Commander in Chief (CinC) of the British Grand Fleet. The German battlecruiser force, intended as a decoy to lure the Grand Fleet towards the German main force battleships, sailed
first. Jackson demanded that the cryptanalysts explain the meaning of the call-sign DK. Upon being told that it was the call-sign of the HSF commander, Jackson left the room without elaborating on the reason for the question. Had he done so he would have been told that when the HSF sailed, DK was transferred ashore to the Wilhelmshaven wireless station in an attempt to conceal the HSF’s movements and a different call-sign used. At midday the Admiralty signalled the Grand Fleet: ‘at 12 noon our directional stations place the German fleet flagship in the Jade. Consider it probable that lack of air reconnaissance may have delayed their start.’

The Grand Fleet at Sea.

The result of this mismanaged intelligence was that pressure on Jellicoe to rendezvous with the British battlecruisers under Vice Admiral David Beatty, RN, was relaxed, to the extent that when Beatty sighted German warships, Jellicoe was 70 miles away. Beatty was still under the impression that the German HSF had not sailed and that he was to engage the German battlecruisers. When it transpired that the entire HSF was out in support of the German battlecruisers, Beatty, feigning retreat, drew the HSF towards the British Grand Fleet. The resultant inconclusive action between the fleets was exacerbated by Jellicoe’s concern at his fleet being drawn over submarines by the retreating German force. Intending to engage the HSF early the next morning, and lying between the German force and its base, Jellicoe covered the wrong route of the two available to Scheer. Exacerbating the situation was a further Admiralty blunder whereby it failed to pass Room 40 decrypts, which identified von Scheer’s intended route. It compounded the confusion in Jellicoe’s mind by signalling a position at 2158, known by Jellicoe to be erroneous, then following it by a 2241 signal mentioning the (correct) Horns Reef passage. By this time Jellicoe
The Communication of Australian Naval Intelligence 1914-1945

had lost confidence in Admiralty-supplied tactical intelligence. The Battle of Jutland was a great disappointment to the Royal Navy – the ultimate opportunity to destroy the HSF was snatched from its grasp.

While the technical means of the communication of tactical intelligence, grounded on an inspired cryptanalytic capability then barely two years old, was highly capable, the management of the intelligence staff process by single-minded traditional officers, and the lack of a properly constituted war staff, led to selective and wrong-headed decisions on how to appropriately collate and disseminate analysed intelligence information. The ensuing interwar years would provide the small emerging cadre of naval intelligence practitioners with an apprenticeship culminating in the intelligence-led war at sea from 1939 to 1945.

The Gestation of Australian Naval Intelligence

In the far-flung corners of the British Empire the collection and dissemination of naval intelligence was in its infancy. This chapter provides an overview of the development of the communication of Australian naval intelligence and the organisations that collected, collated, and analysed it. Until the start of World War II (WWII) this process was largely carried out by informal groupings of civilians, guided by naval officers who had chosen an uncertain and unconventional career in an arcane art. It was the drawing together of the fruits of these efforts which provided the basis for the wartime communication of tactical and operational naval intelligence.

A world-wide Naval Intelligence Organisation (NIO), based on Royal Navy commands, was established in 1911 to observe and report on shipping movements to the Admiralty. In August 1913 the Australian Commonwealth Naval Board (ACNB) enquired of the Admiralty as to the requirement for naval intelligence services in Australia. The ACNB was considering the establishment of a small intelligence staff and sought to include that staff in the NIO. An outline of an Australian participation in the NIO was suggested in a minute to Rear Admiral William Creswell, RAN, the First Naval Member of the ACNB, from Commander WH Thring, RAN, Creswell’s naval assistant with responsibilities (among others) for intelligence matters. Thring proposed that intelligence officers, located at major ports, would report topics of intelligence interest to Navy Office, which would on-forward the information to the Admiralty.

Thring, having retired from the Royal Navy, had arrived in Australia in 1913 and quickly gained Creswell’s confidence. His concept of sharing intelligence with the Admiralty was nevertheless firmly rejected, as the latter considered Australia’s role in the global maritime intelligence effort to be the reporting of German merchant ship positions. Thring circumvented these directives by establishing links directly with the Royal Navy’s Hong Kong-based China Squadron, the Australian customs service and regional business interests.
Early Alarms

On the outbreak of war in 1914, Thring became Director of War Plans with an intelligence staff comprising four officers. These officers were not regarded as an intelligence organisation but rather formed part of the War Staff and intelligence was handled within the ‘Centre Reporting Scheme’. Captain Percy Molloy, Royal Marines Light Infantry, who had been appointed as the Admiralty Intelligence Officer at Fremantle, Western Australia, in 1915 to provide intelligence support to the First Australian Imperial Force (AIF) troop convoys, was transferred to Navy Office to oversee the arrangements.

A wireless interception and direction-finding unit was established at Victoria Barracks, Melbourne, under FW Wheatley, a civilian instructor from the RAN College, Geelong. Wheatley’s German language and analytical skills were foremost in establishing a cryptanalytical capability. The primary intelligence achievement of the nascent RAN was the seizure by a boarding party, disguised as civilians, of the German steamship *Hobart* off Melbourne on 11 August 1914, and the discovery on board of the merchant ship *Handelsverkehrsbuch* (HVB) codebook. Wheatley translated the codebook and, until distribution to the Admiralty could be effected, German signals in HVB were sent to Melbourne from the Admiralty.

At the beginning of the war, the RAN’s prime concern was the location of the German East Asian squadron, which comprised two protected cruisers and three light cruisers, plus auxiliary vessels. On 1 August 1914, the RAN direction-finding station began listening for German transmissions and almost immediately received signals from the protected cruiser *Scharnhorst* communicating with the islands of Yap and Nauru. Communications personnel judged *Scharnhorst* to be 800 to 1000 miles north-east of Port Moresby. Although the RAN staff could not read the cipher, a plain language message from Yap to *Scharnhorst* directed it to proceed to the Mariana Islands. This information was not acted upon by the ACNB and instead a decision was made to order the battlecruiser HMAS *Australia* and the majority of the Australian Fleet to search the Bismarck Archipelago on the presumption that if the squadron was to attack Australia, then it probably would stage through this archipelago, using Simpson Harbour in New Britain as a forward base.

The RAN ships found no German ships to engage, however, because the German squadron had gone east, appearing off Samoa on 14 September and bombarding Tahiti a week later. Meanwhile, the Admiralty advised the British naval attaché in Montevideo, Uruguay, who had been intercepting German signals, to send them to the RAN intelligence section as that station held the HVB code. Although primarily a merchant ship code, HVB was used by warships to arrange replenishment. Wheatley later stated that he was able to exploit this feature, deducing from his decrypts that the squadron would proceed through the Straits of Magellan and thereby influencing the Admiralty decision to deploy two battlecruisers which intercepted the Germans
off the Falkland islands. This claim is not supported by the evidence. Nevertheless, later HVB decrypts did enable HMAS Australia to intercept and destroy the German supply ship Eleonore Woermann off Brazil on 6 January 1915.

Following the defeat of the German squadron, the RAN’s most powerful ships were sent to join the British Grand Fleet. The RAN intelligence division, as part of the Admiralty NIO, thereafter provided advice of merchant ship movements and related maritime information, but with the absence of the majority of the RAN’s warships, little further developmental activity took place.

Post War

In late 1918, the Admiralty sought information on former German Pacific territories from the RAN to compile geographical intelligence publications. The Navy Office, however, was unable to supply up-to-date information. This situation led the Secretary of State for the Colonies to offer the Australian Government the services of an intelligence officer for attachment to the ACNB to assist in the compilation and exchange of intelligence information. Lieutenant-Colonel F H Griffiths, RM, was appointed for three years from January 1921 to take up the position as Intelligence Liaison Officer, later changed to Director of Naval Intelligence (DNI).

Griffiths recruited a civilian navy office accounts clerk and former AIF officer, Walter Brooksbank, as his assistant. The new RAN Naval Intelligence Division (NID) was directed to advise the Admiralty, and regional RAN authorities, of intelligence relating to Australia and territories in the South-West Pacific via Monthly Intelligence Bulletins. Following a suggestion made in 1913 by Thring, an organisation comprising numbers of selected citizens, designated as Special Reporting Officers, covering 60 coastal areas including the Mandated Territory of Papua New Guinea and contiguous islands, was established in the early 1920s. These individuals were requested to provide the RAN with maritime infrastructure information on their areas of responsibility. Brooksbank oversaw the distillation of the information into a publication identifying coastal vulnerabilities in the event of an invasion. This system developed into a naval coastwatching organisation with the issuing of a ‘Naval Coastwatching Guide’, which instructed observers on how to identify suspicious vessels and the procedure for passing information to naval authorities. To assist this communication, special telegraph priorities were arranged with the Postmaster General’s Department.

Ports intelligence collection was carried out by the Squadron Intelligence Officer, who was embarked in the RAN flagship. This officer carried out exhaustive expeditions around ports and their environs during ship visits. A DNI ‘contact list’, which detailed shipping industry entities and personalities, and a ‘Quarterly Plot’, based on merchant ships’ reported noon positions on selected dates were also maintained. The latter was shared with other British intelligence centres, located at the various Royal Navy fleet headquarters throughout the Empire, and provided
a form of traffic analysis of ships’ routings and sailing frequencies. These formed
the basis of planning for wartime exigencies for re-routing, convoy formations and
measures to counter threats from surface raiders and submarines.

Griffiths realised that intelligence on British South-West Pacific territories was
limited. Accordingly, he tasked Brooksbank to join the cruiser HMAS *Adelaide* in
June 1923 for a five-week cruise during which he and a RAAF officer, Flying Officer
EA Mustard, photographed and recorded nine harbours and anchorages. Mustard
was mainly concerned with surveying possible landing areas for seaplanes; however, this information was of equal importance to the compilation of intelligence
data.12 A similar mission was carried out by Flying Officer AE Hempel, in the same
year, when he joined the cruiser HMAS *Brisbane* for a cruise to the Solomon Islands,
Rabaul, New Guinea, and the Queensland coast. Sixteen harbours and bays were
recorded from on-shore and a further ten photographed from the ship.13 Over the
ensuing several years, Brooksbank produced intelligence handbooks on Papua and
New Guinea, the Solomon Islands, the New Hebrides and New Caledonia. These
publications proved useful to the allied navies at the outbreak of the Pacific War.14

On Griffith’s return to the United Kingdom in March 1923, the Assistant Chief
of Naval Staff assumed the DNI’s responsibilities, which were to be shared with
that officer’s other duties of plans and operations. Intelligence therefore lost its
separate status within Navy Office, and this situation continued until the DNI was
re-established in its own right by the appointment of Lieutenant Commander RBM
Long, in August 1939.15

During the long gestation of NID the number of staff did not exceed four persons at
any one time. There was no ‘surge’ capability through reserve augmentation – this
did not occur until the outbreak of the war in September 1939 when NID sought
to increase its staff. Despite qualified shipping industry employees volunteering
for intelligence-related service, the Navy Office was reluctant to admit numbers
of non-seagoing personnel.16 This situation changed as intelligence organisations
mushroomed in the period prior to the beginning of the Pacific War, and for that
campaign’s duration. Three officers stand out as principals of the RAN intelligence
organisation during WWII – Long, Brooksbank, and Commander Eric Feldt, who ran
the Coastwatcher organisation.

**Coastwatchers**

Feldt was a term-mate of Long at the RAN College during WWI. However, he
resigned from the Navy in 1922 to pursue an administrative career in New Guinea.
On the outbreak of war in Europe in September 1939, Long’s pre-war expectation
that Japan would enter the war saw him mobilise Feldt from the Emergency List
of officers. He was appointed Staff Officer (Intelligence), Port Moresby and was
directed to form a coastwatcher organisation – a concept Long had enthusiastically
inherited from his predecessors Thring and Griffiths. Feldt was to oversee the
collection and communication of information to NID Melbourne – the codename he assigned to this new service was FERDINAND, after a cartoon character – a little bull who did no fighting, but sat under trees and smelled the flowers.17

The main tool of the Coastwatcher organisation was the Amalgamated Wireless Australasia (AWA) 3B teleradio. Designed in 1939, the 3B comprised a transmitter, receiver and speaker with four crystal-controlled transmission frequencies. The radio was powered by car batteries, charged by a small petrol engine and its range was 400 to 600 miles. The equipment was bulky and heavy, requiring at least 12 carriers to transport – the charging engine alone weighed 31.8kg. AWA was the principal communication network in New Guinea, with main stations at Port Moresby and Rabaul, which linked the teleradio transmissions and on-forwarded them to its headquarters in Sydney. The AWA network formed the basis of the wartime Coastwatcher communications system. The initial code used was the low-grade ‘Playfair’, which Feldt later strengthened – it was replaced in 1942 by a high grade cipher.18 Teleradios were distributed to designated coastwatchers, with the assistance of the RAAF and the Territory Administration, and were in place by August 1940.

Coastwatcher teleradios were fitted with a special frequency crystal, named ‘X’. Coastwatchers could transmit on that frequency and be assured that relay and main stations would receive the transmissions at any time. The ‘X’ frequency was devised by Lieutenant GJ Brooksbank, RANVR, the brother of DNI’s Civil Assistant.

The coastwatcher story is told in great detail in Feldt’s book, The Coastwatchers, and it is not the writer’s intention to re-examine this history. However, examples of the communications and procedures undertaken by the coastwatchers – despite reporting from enemy territory under the constant threat of discovery and probably execution – demonstrates the flexibility and strategic value of the coastwatcher concept.

Coastwatchers provided early and effective warnings of air attacks on Guadalcanal from positions on Bougainville from December 1941 to August 1942. Among the observers situated on Bougainville were WJ Read, and PE Mason. With the withdrawal of civilians following the beginning of the Pacific War, these coastwatchers operated individually with little military direction – their civilian status offering no protection from Japanese reprisals if captured. Although the ACNB had directed civilian coastwatchers to cease transmissions when their locations were occupied by the Japanese, their signals continued. Feldt had been agitating for the induction of coastwatchers into military service, and it took the execution of a coastwatcher, CW Good, to prompt the Naval Board to commission Read, Mason and CL Page, in early April 1942, as RAN Volunteer Reserve (RANVR) officers.19

Three coastwatchers arrived at Lungga Point, Guadalcanal, following the US Marine landings and established a radio station to relay coastwatcher reports to allied forces. The warning procedure consisted of a Condition Yellow signal from Read and Mason on Bougainville when Japanese aircraft were within 30 minutes of Lungga and Condition Red within 10 minutes. US Navy Wildcat fighters, having arrived
at Henderson Field, Guadalcanal, in mid-August 1942, successfully intercepted incoming Japanese bombers following the warnings from Read and Mason. Coastwatchers were inserted onto Vella Lavella and Choiseul to report Japanese ships coming down the ‘Slot’ with reinforcements, which led to the desperate naval engagements that made up the battles for Guadalcanal.\textsuperscript{20}

The FERDINAND coastwatchers’ reporting of Japanese air and maritime movements contributed directly to the allied victory in the Guadalcanal campaign and proved the intelligence value of island residents with extensive local knowledge using transportable communications equipment. The success at Guadalcanal strengthened and improved the effectiveness of FERDINAND throughout the campaigns to eject the Japanese from the Pacific Islands.\textsuperscript{21}

Codes and Ciphers

The camouflaging of military communications by the use of codes and ciphers is an age-old art. Codes are generally set out in a codebook, in which groups of letters or numbers represent plain-text units of varying lengths, while in ciphers, letters and numbers are represented by plain-text units in accordance with a pre-determined system. Cryptography is the creation of a message and cryptanalysis is the breaking of the code or cipher.\textsuperscript{22}

Coastwatchers initially used the Playfair cipher, which required a codeword, preferably one containing several letters between S and Z. As words became overused with time, coastwatchers’ families were asked to suggest words which could only be identified by the coastwatchers themselves. Playfair was modified by Feldt, in that the message was written out in five groups of five letters across then enciphered vertically. Another cipher was the Bull Code introduced in 1942, based on numbers on cards. When the codebreaker Captain Eric Nave demonstrated the vulnerability of these ciphers he developed the ‘N’ Cipher which used popular books, whereby the plain text was written out and text from a book was written underneath and modified according to a key.\textsuperscript{23}

An essential element of the provision of naval intelligence is the ability to decipher enemy transmission through cryptanalysis. Beginning in the 1920s, the US and Royal navies attacked Japanese ciphers and largely maintained reading currency throughout the war. In December 1923, a research desk was established within the US Navy’s Code and Signal Section of the Office of Naval Communications. As OP-20G, this unit, designed to safeguard US communications, was quietly tasked to penetrate Japanese codes. OP-20G developed the use of machine code-solving and specialised typewriters to type Japanese kana characters, as well as securing US codes. Throughout the 1930s, a small group of naval officers, attracted to the arcane art of code breaking, rotated between OP-20G and sea duty while dedicated civilians laboured to break a new Japanese code. Termed ‘Blue’, it was implemented in 1931 to replace the Red fleet code, a copy of which had been acquired by the US
Navy in 1921. Further changes by the Japanese in 1938 divided their naval codes into Fleet and the more sensitive Admirals’ systems. In 1940, the ultimate Japanese naval code, JN-25, was introduced which, in its several variants, would occupy US cryptanalysts for the remainder of the war.24

A singular Australian contribution to cryptanalysis against Japanese naval communications was Eric Nave. Nave, then a RAN paymaster sub-lieutenant, responded to an opportunity, under a short-lived 1918 scheme for junior accountant officers to study Japanese. He was attracted to the scheme not only by the prospect of learning a foreign language, but also by the five shilling per week allowance it provided. Nave was so successful in his studies that he was co-opted by the Royal Navy to investigate means of breaking into Japanese naval communications. In 1921, the Royal Navy realised that the emerging power of the Imperial Japanese Navy in the Far East had implications for the security of British interests. The Royal Navy’s lack of a Far East wireless interception and direction-finding network, and of Japanese linguists and knowledge of their naval codes, made Nave a valuable asset in the setting up a signals intelligence capability.25 In August 1925, Nave was seconded to the staff of the CinC China Station, ostensibly as an interpreter. However, the admiral directed him to ‘arrange for the interception of Japanese Naval wireless traffic for examination by me and to send this to London with my remarks’.26

Nave set about unpicking the Japanese codes, and by a system of traffic analysis, and his knowledge of Japanese and word association with standard naval operating procedures, he reproduced the Japanese naval signalling system. By the end of 1926, after deciphering naval station callsigns, he was able to decode all Japanese Naval Reporting Code signals. Although this was a minor code, a start had been made and this was in addition to the collection of secret callsigns of all naval bases, major commands and fleet unit squadrons and flotillas.27

Nave was appointed to the British signals intelligence agencies, the Government Code and Cypher School and the Far East Combined Bureau (FECB) from 1937 to 1940. The FECB was made up of British service intelligence agencies with the aim of providing warning of a war with Japan through signals intelligence and other sources. Nave’s anomalous naval career saw him transferred from the RAN to the Royal Navy as a permanent officer in 1930 – the first time this had occurred. Although now a British officer, Nave spent the war in Australia. Recovering from tropical illness in 1940, he was co-opted by DNI Long. Although the RAN had some intercept and direction-finding capability, it had no codebreakers. Long seized on Nave’s presence in Australia to have him appointed to the embryonic RAN Signals Division and he was faced with the same challenge of creating a codebreaking organisation as he had faced in 1925, although by now he was an experienced cryptanalyst.28
In February 1942, the evacuated US Navy signals intelligence personnel from the Philippines-based, Station CAST was amalgamated with Nave's Special Intelligence Bureau and the RAN wireless telegraphy intelligence group in a block of apartments in South Yarra, Melbourne, under the designation of Fleet Radio Unit Melbourne (FRUMEL). Nave was largely engaged in training cryptanalysts and he subsequently transferred to the newly formed Central Bureau under the CinC, General Douglas MacArthur, where he served for the remainder of the war. Nave remained in intelligence circles after the war, initially with the Defence Signals Directorate and later he assisted in the formation of the Australian Security Intelligence Organisation. This unconventional naval officer, by his pioneering codebreaking work, formed the basis of the British, and latterly Australian codebreaking capability against the Japanese navy. All this stemmed from the prospect of earning an additional five shillings per week.

Coding Officers

While codebreakers such as Eric Nave stood out as pioneers in the collection and analysis of signals intelligence, routine allied naval communications had to be protected against Japanese cryptanalysis. Although the codes and methods adopted by the Coastwatcher organisation have been briefly reviewed above, the wider field of allied naval communications in the Pacific was largely protected by coding officers of the RAN Special Branch.

The Navy’s Paymaster (or Accountant) branch was responsible for ‘supply and secretariat’, however, it also became a catch-all for miscellaneous duties such as intelligence. Nave’s Paymaster origins were shared with small numbers of other officers who were attracted to intelligence duties in the Royal Navy. With the beginning of WWII, large numbers of hostilities-only temporary officers were appointed to the branch. As the miscellany of duties expanded, in 1941 the Admiralty decided to create a Special Branch of the Royal Naval Volunteer Reserve to absorb those officers not engaged in traditional supply and secretariat appointments.

The ACNB agreed in principle to follow the Admiralty decision, but it was not until 1 January 1943 that the RANVR Special Branch was promulgated. The delay was due to lengthy consideration of the types of officers to be transferred to the new branch. RANVR Paymaster branch officers engaged in intelligence, coding and ciphering, mercantile movements, railway and sea transport transferred to the Special Branch, as were officers engaged in controlled mining, radio direction finding and degaussing operations. Special Branch officers appointed for intelligence duties served on liaison staffs for combined defence and operational intelligence centres, special intelligence duties, and as assistants to Staff Officers (Intelligence). Officers appointed for ciphering duties became part of the communications departments attached to headquarters.
Most routine coding and decoding/ciphering of naval traffic was done by sailors or civilians (ashore), however, highly classified signals had to be ciphered by officers. This was probably a US Navy security requirement, because that service in general provided the codes, ciphers and ciphering machines. There was also a requirement to security vet Australian personnel to gain access to the system.  

An example of a RANVR Special Branch officer assigned for coding duties in the Pacific was Lieutenant AN Walls. Appointed as a sub-lieutenant for ciphering duties at Navy Office on 27 April 1943, he may also have worked in FRUMEL. Promoted lieutenant in January 1944, his postings took him to HMAS Basilisk, the Naval Headquarters Port Moresby, for ciphering duties, then in September 1944 to HMAS Madang, Milne Bay, ‘additional for cipher duties in the New Guinea area as required’. In November 1944, he joined Allied Naval Headquarters, Hollandia, where he served until September 1945, before returning to his administrative establishment HMAS Lonsdale, Melbourne, for discharge. Apart from the coastwatchers, much of the RAN NID comprised temporary officers such as Walls engaged in the safeguarding and communication of operational intelligence.

### Combined Intelligence Organisations

The ‘RAN Review of Naval War Effort and Activities’ was issued at six-monthly intervals throughout WWII, with one chapter devoted to the NIO. The October 1945 review summarised the composition of the NIO at the conclusion of the war, and identified it as a link in the Admiralty World-Wide Intelligence Scheme responsible for collection and distribution of naval intelligence for the Australia Station and island territories to Australia’s north. Staff Officers (Intelligence) (SO(I)) were located in each of the seven state-based Intelligence Areas, a Brisbane-based Supervising Intelligence Officer was responsible for the islands to the north-east, and liaison officers were posted to seven island locations. This bland overview followed a standard format, and only the numbers and locations of the SO(I)s indicated the expansion of the NIO during the war years. The Review’s definition of the RAN’s NIO is similar to that which it assumed in WWI – that of a link in the Admiralty intelligence organisation. While the 1945 Review listed the locations of RAN Intelligence personnel at 16 South-West Pacific locations, it contained no details of RAN participation in the Allied combined intelligence organisations. These included the Allied Geographical Bureau (AGB), the Allied Intelligence Bureau (AIB), the Combined Operational Intelligence Centre (COIC) and the Allied Translation and Interpreting Section (ATIS) which all formed part of General Headquarters, South-West Pacific Area (GHQ SWPA). The Central Bureau was also a component of MacArthur’s headquarters and was originally established as the Australian Special Wireless Group, with a small naval and diplomatic code-breaking section. Eric Nave and a number of British FECB members initially trained Australian code-breakers...
in Japanese morse-style Kana before the organisation was expanded to become the Central Bureau in mid-1942 with US augmentation. The Bureau established forward listening posts in most South-West Pacific Command island operational locations.36

The AGB, set up in June 1942 as a tri-service organisation, compiled geographical handbooks that contained information ranging from beach intelligence to tropical diseases, poisonous reptiles and plants – anything which might have been of interest to commanders in the field. The AGB was essentially the wartime outgrowth of the geographical intelligence handbooks which Brooksbank had produced in the interwar period. Information was gleaned from geographical, scientific and human intelligence sources.37

The AIB was established July 1942, at the suggestion of DNI Long. The bureau was a coordinating and supervising agency covering a wide range of activities – from intelligence collection to guerrilla warfare. The AIB took over FERDINAND, and the covert and sabotage operations undertaken by Australian, Dutch and Philippine forces. The AIB carried out 264 missions with a peak strength of 3000 allied personnel.38

The COIC was set up in November 1940 to pool the three Australian services’ operational intelligence received through their respective intelligence organisations. Operational intelligence was defined as ‘intelligence directly relating to the enemy or potential enemy which may influence specific operations in the Pacific and Indian oceans as they affect the Australia Station’. The COIC was situated adjacent to the Central War Room, and analysed operational intelligence received from collection units and reported its assessments to the war staff via daily and weekly reports. The first COIC ‘Weekly Summary of Events and Action Taken’ was issued on 1 February 1941, and intelligence reports under the title of ‘Daily Appreciation of Japanese Southward Moves’ began around the same time.39

From early 1941 until July 1943, COIC was situated in a building in the Victoria Barracks complex, isolated from other departments behind a locked door. A hatchway enabled signals to be passed in and out and the DNI had discrete access to the COIC from his office. With the establishment of GHQ SWPA in May 1942, the COIC was absorbed and, except for the remote COICs at Fremantle, Townsville and Darwin, ceased to be an entirely Australian organisation. COIC moved with the GHQ to Brisbane in July 1943.40

COIC Port Moresby was absorbed by GHQ SWPA in March 1943 as an ‘advanced echelon’ to act as an agency for the collection and distribution of operational intelligence in the New Guinea area. As the allies advanced northwards, COIC moved to Hollandia in Dutch New Guinea, thence to Tacloban and Tolosa in the Philippines, and finally to Manila in April 1945. On 23 August 1945, COIC was closed and the Australian personnel repatriated to Australia. By the time of its closure, the COIC was a major centre and included only a handful of NID personnel. However, NID could point out with some pride that their personnel had manned the COIC under its various guises, continuously since 1940.
ATIS was formed in September 1942 by a GHQ directive. In its developed form it consisted of six sections: the translation section, which translated Japanese documents; the examinations section, concerned with the collation and editing of enemy interrogation reports and the handling of prisoners of war; the Philippine Islands Research Section; and supporting information, production, training and records sections. ATIS employed hundreds of personnel in its final form; however, the Australian component largely comprised support elements because of the lack of linguists in the Australian forces. In its final year of operations, ATIS numbered nine Australian naval officers on staff, six of whom were from the Special Branch.

The Communication of Naval Intelligence 21st Century

This chapter has examined the beginnings of naval intelligence in the RAN, concentrating on the manner of its communication. From the written word in geographical intelligence handbooks, through wartime teleradios operated by isolated coastwatchers to cryptanalysis and the ciphering of naval communications, these early activities were largely carried out by naval personnel with non-traditional backgrounds. Very few were permanent naval officers. Nave and Long were the exceptions, and even these two had diverged from the normal naval career stream.

In 1945, the large RAN intelligence organisation was disbanded and the service reverted to a small administrative staff reminiscent of the inter-war years. Intelligence needs were met by the 1947 establishment of the Defence Signals Bureau for signals intelligence and the Joint Intelligence Bureau for all-source analysis. During the 40-year Cold War era, intelligence collection and analysis techniques improved exponentially. Signals intelligence, comprising the sub-disciplines of Communications Intelligence and Electronic Intelligence, ensured that intelligence became an indispensable tool of the naval commander.

With the 1988 establishment of the Maritime Intelligence Centre in the newly constructed Maritime Headquarters building in Sydney, the RAN embarked on a new era of operational intelligence support for fleet operations. New distributive intelligence systems provided naval commanders with practically real-time maritime positional information. This was followed in the late 1990s with deployable systems providing tactical and operational all-source reporting from strategic and operational intelligence agencies. Bandwidth restrictions limited the quantity of intelligence product available to ships at sea; however, recent advances have addressed this to the extent that deployed naval intelligence personnel can now provide analysed intelligence to task force commanders.
These advances have seen the naval intelligence function subsumed into joint organisations. Strategic all-source intelligence agencies such as the Defence Intelligence Organisation employ service members and civilians on political-military and technical analysis, incorporating maritime specialities. The Joint Operations Command Intelligence Branch provides operational and tactical level commanders with intelligence staff and product support for the planning and conduct of ADF campaigns and operations. These organisations provide naval intelligence personnel with opportunities to analyse and report on country-specific political-military topics and technical intelligence on ships, submarines, maritime aircraft and their weapons and sensors. When deployed at sea these personnel, using distributive intelligence systems, are well equipped to advise their commanders on raw and assessed intelligence to which they can ‘value add’ from their own analytical experience. After a century, the communication of naval intelligence has become real-time and global.

What would Admiral Jackson have thought?
Notes

1. C Andrew, *Secret Service: The Making of the British Intelligence Community*, London, William Heinemann, 1985, p. 103. The nascent Royal Navy cryptanalytical capability was revolutionised by the windfall acquisition of three German maritime codebooks in the first months of the War: the first from the merchant ship *Hobart*, off Port Phillip Bay in August 1914; the second by the Russian Navy from the cruiser *Magdeburg*, which had been wrecked in the Baltic in September; and the third from the safe of a sunken German destroyer, dredged-up by a British trawler in November.


4. P Beesley, *Room 40: British Naval Intelligence 1914-18*, London, Hamish Hamilton, 1982, p. 40. Room 40 decrypts were passed to a handful of Admiralty officers including the First Lord, the First Sea Lord, the Commander in Chief Grand Fleet, and the Chief of the War Staff. The War Staff itself, a new innovation, did not have access to decrypts.


9. Beesley, *Room 40*, p. 75. Wheatley’s claim was not borne out in an official report he wrote in 1915. None of the messages that Wheatley quoted in this report gave any indication that the German squadron was about to proceed eastwards via Cape Horn. His later claim that he had tipped off the Admiralty was made in 1926.


13. ‘Report by Flying Officer A. E. Hempel on Solomon Islands, Rabaul and Queensland Coast visited by him whilst attached to H.M.A.S. “BRISBANE”, during the Royal Australian Navy Winter Cruise 29-6-23 to 3-8-23’, National Archives of Australia: A9376, Control Symbol 91.


19. Feldt, *The Coast Watchers*, p. 128. Not all coastwatchers were members of the RANVR – others served as members of the Australian Imperial Force and the RAAF.


21. FERDINAND comprised a total of 396 personnel from the three services and the US forces. There were:

- 76 RAN officers and 87 ratings
- 11 Royal New Zealand Navy ratings
- 5 Honourary CPOs (Amalgamated Wireless Australiasia staff)
- 45 Army officers and 125 other ranks
• 10 RAAF officers
• 8 Solomon Islands Protective Defence Force members
• 28 US Marine Corps
• 21 US Army non-commissioned personnel.

Feldt, *The Coast Watchers*, pp. 387-408.


23. In the N cipher the vertical pairs of letters were replaced by a third single letter according to a key supplied on a card. The VOC code, for small ships was introduced in March 1944. This code comprised seven cards – cards one to four and card six were based on a 10 by 10 grid giving 100 words or phrases scrambled on a daily basis. Cards five and seven were four-block cards giving 400 meanings. Winter, *The Intrigue Master*, pp. 281-282.


31. Email, I Pfennigwerth to Vice Admiral RA Walls, 26 September 2005.

32. Information on Lieutenant AN Walls’ service from RANVR Record of Mobilized Service via Vice Admiral RA Walls. Walls’ appointments in HMA Ships *Basilisk* and *Madang* (Hollandia) were as part of the Communications division of these establishments (Navy List October 1944 and January 1945 respectively).

33. The term Naval Intelligence Organisation (NIO) was the older term applied to the Admiralty system, while Naval Intelligence Division normally applied to Long’s organisation.

34. Details of the NIO from ‘Review of Naval War Effort and Activities to 31 October 1945’, Chapter 16: Naval Intelligence Organisation, p. 25, Navy History Section. The liaison officers were based at Brunei Bay (Borneo), Balikpapan (Dutch Borneo), Morotai, Mios Wendi (Dutch New Guinea), Manus (New Guinea), Point Cruz (Guadalcanal, Solomon Islands). Intelligence officers were also stationed at Merauke, Hollandia (Dutch New Guinea), Aitape, Jacquinot Bay, Lae, Langemak (New Guinea), Milne Bay, Port Moresby, and Torokina (Bougainville).


39. ‘COIC, Research by Mr Norman’, Australian War Memorial: 69/23/81. This early intelligence collection against Japan stemmed from communications intelligence collected via taps of Japanese consulate telephones in London and Australia, and the increased use of radio transmitters by Japanese merchant ships which gave rise to suspicions that they were passing intelligence information. Winter, *The Intrigue Master*, pp. 83-84.


Espionage is as old as human civilisation itself, the need to keep and steal secrets seeming nearly as natural as eating and sleeping, yet intelligence in the awareness sense is an entirely modern creation. The modern intelligence apparatus, the bureaucratised, secrecy-based structure required by all competitive militaries and states, has been with us not even a century. It, like so much else, was a creation of World War I (WWI). In 1914, no military or state possessed an integrated, multi-disciplinary secret service capable of providing timely secret information to top decision-makers; by 1918, no military or government worthy of the name could afford to be without one.

What happened to produce the modern intelligence apparatus was the birth of radio – what was known a century ago as wireless telegraphy (W/T) – the impacts of which were felt suddenly and powerfully, as armies and navies revolutionised their communications with radio in the first decade of the last century. While some armies before 1914 remained dubious about W/T, planning – utterly wrongly – that land-line telephony and telegraphy could be used successfully by 20th century land forces on the move – leading navies from the outset understood the impact of radio on warfighting. The wireless seemingly answered the age-old problem of command and control on the world’s seas, with radio opening up new horizons of strategic possibilities. So long as the navy possessed sufficient bases for W/T stations around the world – which any ocean-going fleet already had for coaling purposes – the potential seemed limitless. Now, at last, a Fleet Headquarters could actually command and control its far-flung units in something like real-time.

The problem, of course, was that high-frequency (HF) transmissions could be heard by anyone with a receiver. Thus began the war in the ether, the secret struggle for information dominance that kicked off in the summer of 1914 and remained intense through to the Armistice of November 1918. During WWI, cryptology, known less formally as signals intelligence (SIGINT) came to comprise about 80 per cent of all intelligence, nearly all of that which could be considered accurate and timely; and so it has remained.

The secret war did not end when the guns went silent on the Western Front, of course, as every major belligerent now possessed large code-breaking organisations whose military and diplomatic purposes – namely stealing the poorly-kept secrets of enemies, rivals, and sometimes friends – offered important dividends. This is a story well told, particularly regarding the Royal Navy’s excellent Room 40, which
in the utmost secrecy performed war-altering work, as any student of Jutland or the Zimmermann Telegram knows; and the impact of SIGINT on the next war would prove perhaps even more momentous than in WWI. Since this remarkable and intricate story has pretty much all been declassified by the US and Allied governments since the 1970s, one need only cite ULTRA and Normandy, PURPLE and Pearl Harbor, or the impact of US Navy information dominance at the epic battle of Midway, which was enabled by Admiral Nimitz’s ‘priceless advantage’ in cryptology, to gain nods of agreement from even amateur historians and military buffs. After 1945, the cryptologic story mysteriously disappears, as few governments have declassified much of significance regarding the secret struggle in the ether between the West and the Communists during the Cold War. But, based on what little is at hand in the public domain, it is evident that the SIGINT saga from the mid-1940s to the present day is as rich and significant as anything that transpired during the 1914 to 1945 period: ample fodder for future historians, and documentaries, then.

Yet the cryptologic story of the World Wars is itself incomplete, though less by government design than by scholarly (and perhaps literary) preference. It is easy to forget that the SIGINT war in the ether is very much a two-sided campaign, a constant, real-time fight between encryption and decryption. And in the movies and books, if less in reality, it is the code-breakers who win. Writing about war-winning feats of cryptology is intrinsically more interesting, and marketable, than penning tomes about encryption, and the complex communications structures that militaries require. This is not helped by the basic fact that, by World War II (WWII), as machine encryption systems became ubiquitous, seemingly taking the human dimension out of the problem, the details of how militaries encoded and enciphered messages is so mathematically and mechanically complex as to be inaccessible to most laypersons and nearly all those trained in the liberal arts; the story apparently requires more mathematics than history to be told.

This is unfortunate, as the code-making story is just as interesting and important as the code-breaking side of cryptology. While Allied SIGINT successes in the World Wars are now much told, their counterparts in code-making – which are every bit as successful, and had much to do with Allied victory in offensive information dominance – remain much less known and understood.

This is particularly the case with the US Navy, which in 1945 would emerge as the most powerful naval force on earth, and perhaps in all history, standing head-and-shoulders above the Royal Navy, its closest ally and shipmate, while the German and Japanese navies were no more, and the weak Soviet fleet seldom left home waters. This triumph had much to do with the exceptional degree of communications security, or communications security (COMSEC), enjoyed by the American fleet from 1941 to 1945. Yet this war-enabling success did not commence after Pearl Harbor, but had its roots a generation earlier, in WWI, a conflict that the US Navy, like the Army, entered without any real SIGINT or COMSEC capability at all. This, then, is the remarkable story of how over the course of a quarter-century, in fits and
starts, led by a very few pioneering – indeed visionary – sailors, the US Navy set the gold standard for securing the airwaves at sea, proving a priceless force-multiplier in the global maritime struggle of 1941 to 1945.

The story can be said to begin in 1915, when Secretary of the Navy (SECNAV) Josephus Daniels - President Woodrow Wilson’s sole SECNAV - who held the office from 1913 to 1921, founded the modern US Navy in bureaucratic terms by establishing the office of the Chief of Naval Operations (CNO), the top uniformed position in the US Naval service. The next year, Secretary Daniels established the Naval Communications Service, charged with regularising messages and radio traffic, under an admiral as Director of Naval Communications (DNC) reporting directly to the CNO.

At the end of July 1916, Secretary Daniels issued a general order directing the DNC to ensure the efficient handling of Naval messages of all kinds – at sea and ashore, via radio, cable, telegraph, and telephone – in as timely and secure a fashion as possible. Thus was rapidly founded the Code and Signal Section to regularise encryption (and soon the decryption of intercepted enemy traffic too) for the navy. Its head was Lieutenant (soon to be Lieutenant Commander) Russell Willson, a hard-charging Naval Academy graduate, class of 1906 – he had failed to gain admission to West Point – with experience with both the fleet and navy headquarters; in every sense, Willson would prove an excellent choice, a classic example of the role played by visionary, motivated individuals in even the largest and most bureaucratised organisations.

The scope of Willson’s, and the DNC’s, job was enormous. Upon American entry into the war in April 1917, President Wilson by executive order charged the US Navy with responsibility for all radio communications in the United States, on grounds of security and efficiency. Until this order was rescinded in February 1920, the Navy took possession of and operated all America’s private radio facilities.

The Code and Signal Section, which was quickly renamed the Code and Cipher Section (C&CS), busied itself with both communications intelligence (COMINT) and COMSEC missions. Offensively, it attempted to break German Navy ciphers, without much success due to personnel shortages, as the Navy possessed no trained code-breakers in 1917; the US Army’s COMINT effort, while small, played a more substantial role in the war. Its national-level mission, under Military Intelligence Section 8 (MI-8), and led by the gifted if erratic Major Herbert O Yardley, worked successfully against German diplomatic and intelligence ciphers, laying the groundwork for decades of American success in SIGINT.

The navy’s cryptologic effort aimed much more at the defensive side of codes and ciphers, thanks to the inspiration of Willson. An amateur code-maker, in January 1917, the C&CS chief began experimenting with machine ciphers, what he soon termed the Naval Cipher Box (NCB). He developed it in his office just west of the White House. The Navy’s existing codes and ciphers dated to the Spanish-American War (1898) – some were even older – and were woefully inadequate for the needs
of an ocean-going modern fleet whose communications were based on HF radio. Feeling the NCB Mark I, his first output, was inadequate cryptographically, based on his understanding of the state of the art in codes, Willson spent 1917 perfecting his device; he also re-wrote the Navy’s two-part codebook. By the year’s end the NCB Mark II, the Navy’s first mechanical encryption system, was ready for service with the fleet; when it reached Navy ships in early 1918, it was the most advanced cipher system in the world.

The NCB Mark II, classified secret (as it would remain for several decades), employed a polyalphabetic system to encipher code groups, with the help of the new Navy codebook. Code groups were encrypted by finding other letters in a pre-arranged manner on paper strips containing printed mixed alphabets covered by celluloid. Each numbered mixed alphabet strip was inserted into a rack or slide that was then slid onto a steel rail – the NCB Mark II had 25 racks, which would slide horizontally to encrypt the message. Decryption worked exactly backwards, based on the Navy codebook and eight classes of ciphers that were employed to enhance crypto-security. DNC regularly changed the cipher classes to make the system even more secure. Willson’s machine was very secure, reliable and, just as important, fast. It required only modest training to allow any signalman to use it with a high degree of accuracy. It was hugely popular with the Navy from its first appearance. German Navy code-breakers were unable to successfully attack the NCB Mark II’s output, and it would remain in US Navy service for two decades.

Neither was the Navy its only impressed user. The machine was used by the State Department for sensitive messages, though it remained in Navy hands, operated by sailors specially detailed to support diplomacy. Such a Navy team accompanied President Wilson to Paris in 1919 for the Versailles Peace Conference, and an NCB Mark II was successfully used to communicate the President’s daily messages to Washington, DC, and back again. The tinkering President Wilson was so impressed by the Navy’s device that he received his own special cipher and used to operate the machine himself.

Russell Willson’s machine won the inventor substantial accolades. He was promoted to commander in November 1918 and received the Navy Cross, the sea service’s penultimate decoration, second only to the Medal of Honor, for his pioneering work. In 1935, the House of Representatives voted Willson, now captain, a $15,000 prize for his work, whose patent was owned by the US Government (under the tax rates of the day, Willson actually received approximately $14,000). At the time, he was beginning his command tour of the battleship USS *Pennsylvania*, nearing the end of a long and successful career that culminated in promotion to vice-admiral, yet whose highlight to history was the invention and widespread use of the NCB Mark II.
USS Pennsylvania in Melbourne, 1925.
In an odd coincidence, Vice Admiral Willson’s daughter, Eunice, worked for the Office of Naval Intelligence as a civilian from 1935 through WWII, spending most of that time as a code-breaker; during her training in the mid-1930s, she received instruction on the encryption machine her father invented and which she had last seen as a five-year-old, when her father brought an early version of the NCB home to work on after hours – the little girl had been fascinated by the strange device that her father allowed her to play with.

Cryptology in the US Navy in the first decade after WWI is a brief story. In terms of COMSEC, the C&CS was content to keep the NCB Mark II at work, as its encryption standard remained more than adequate for the time. The Navy’s small COMINT effort, the Navy Staff desk that was named OP-20-G in the mid-1920s, was a small outfit consisting of barely more than a handful of code-breakers; already, their primary mission was studying the communications, codes, and ciphers of the Imperial Japanese Navy, though they did very little operational (as opposed to theoretical) work before the early 1930s.

What active COMINT effort the US Government possessed in the 1920s resided in the Cipher Bureau, which was the peacetime successor to MI-8, the Army’s successful cryptologic office headed by Yardley. After 1919, it continued work, about two dozen strong, under the brilliant and bumptious Yardley; this was the first real peacetime intelligence operation in American history. Interestingly, it was a ‘black’ organisation, as it did not officially exist, and was headquartered in New York, masquerading under cover as a telegraphy firm. Despite some excellent work such as sterling service to US diplomats during the 1922 Washington Naval Treaty negotiations, when the Cipher Bureau provided translations of secret Japanese messages, Yardley’s outfit was a troubled creation. It had to serve two masters, the War and State departments, and Yardley’s difficult personality hardly helped matters; when the Cipher Bureau was disbanded in 1929 on the orders of Secretary of State Henry Stimson – who killed the office with the most famous line in the history of US intelligence: ‘Gentlemen do not read other gentlemen’s mail’ – its day had already passed.

The Cipher Bureau was among the last of the great, old fashioned Black Chambers, which broke enemy messages with pencil and paper. The age of the machine had arrived in codes and ciphers, as everywhere else, and new methods were required to both encrypt and decrypt messages. This reality the US Navy began to appreciate. Its need for modern encryption was clear, as since 1919 it had been the second most powerful fleet in the world, with global presence missions and responsibilities. The Navy’s interests in maritime commence and security, both of which depended heavily on maintaining secure communications, were appreciated at the highest levels of the Naval service. Here, again, a small number of talented officers would make the difference and bring navy encryption up to world standard, indeed beyond it, just in time.
That the radio age required machine encryption was no revelation to anyone current with communication technology in the 1920s; the military need for machines to encipher messages faster and more reliably than the human hand could, following a codebook carefully, was broadly understood. The main question was how to proceed. The German solution, the famous ENIGMA machine, requires little explanation. This device, which employed three (later four) rotors and a complex plug-board, both of which were reset every 24 hours, was the gold standard for encryption in the interwar period, and was exceptionally difficult to defeat. The battle for ULTRA was a much nearer-run thing than most latter-day historians credit, and even today it would take a machine, that is a computer, to defeat an ENIGMA machine. In 1926, the German Navy began issuing ENIGMA machines to its tiny fleet, and within a few years all German naval traffic was unreadable to every country save Poland.

In 1918, the same year that the German engineer Arthur Scherbius patented the first ENIGMA, the American horse thief Edward Hebern patented his own rotor-based electro-mechanical encryption device, hoping to sell it to the US Army and Navy. They were unquestionably interested, as the Hebern machine - which the inventor claimed to have conceived in his jail cell - on its face was everything the military needed: secure, relatively easy to use, fast in operation, and cheap enough to allow the Army and Navy to buy enough of them to put it in general use. However, the US military failed to bite, and did not buy Hebern machines in large numbers. William Friedman, the founder of machine-age cryptology in the US Army, the prodigy who stepped into the breach when Yardley was fired in 1929, found cryptographic vulnerabilities in the Hebern device, an opinion seconded by Willson, who was serving part-time as a code and cipher expert for the Navy, and both men recommended against a large-scale buy of the machine.

Navy code experts kept studying Hebern’s machine, however, and hoped to improve on it, which they did beginning in 1935. Lieutenant Joseph Wenger, the Navy’s next generation Russell Willson - like his predecessor, Wenger would also finish his career as an admiral - learned from his Army code-breaking counterparts William Friedman and Frank Rowlett of an emerging technology that would make a rotor-based encryption device even more secure by rendering the movement of rotors significantly more random. With the support of Commander Laurence Safford, the Navy’s top cryptologic officer, Wenger spent months, part-time, evaluating potential solutions, and in early 1937 he applied for a secret patent for what he termed ‘Stepping Maze’. This allowed for more random rotor movement by forcing at least one rotor, and up to four, moving with each letter typed into the machine. Safford gave Wenger more funds to pursue ‘Stepping Maze’, including small-scale support from leading mathematicians from the Teletype Corporation, and within a year a prototype was ready for testing.

Wenger called his ground-breaking device the Electronic Cipher Machine, or ECM. When it was ready to enter production in late 1939, it was a full generation ahead of any encryption system on earth. Where the ENIGMA had three (by mid-war
four) rotors, the ECM Mark II had 15, divided into three banks of five rotors for enciphering, controlling, and indexing the messages. Between the number of rotors, the device’s electrical inner workings, and its pseudo-random rotor moves, the ECM Mark II offered the US Navy an inestimable advantage in communications security. More than a year before Pearl Harbor, the new machine was entering fleet service in the utmost secrecy.

In February 1940, Safford and Wenger informed their Army counterparts of their new machine, which they were wholly unaware of. Friedman and Rowlett were enormously impressed by what the Navy had developed and they requested immediate joint production of the ECM Mark II for both services – the Army would term it the SIGABA. By the late summer of 1941, as the United States readied for war, the Army and the Navy possessed an identical, comprehensive, fully compatible COMSEC system, complete with uniform communications procedures behind it, an advantage possessed by no other major belligerent at the beginning of WWII.

While the Army shared the Navy’s enthusiasm for the ECM II/SIGABA, the sea service was a more logical user, as the new device’s only real drawback was its size and weight, as well as its relative fragility – if it was a much better machine than the portable ENIGMA, it was also much bigger and heavier – which rendered it less than ideal for front-line action on the ground. As a result, the SIGABA was seldom used by US Army formations smaller than a division. Yet it was carried on every US warship from submarines through battleships, where the machine’s added dimensions and weight posed few problems.

From the beginning, the US military took security precautions for its new wonder-device exceptionally seriously, and communications personnel were rigorously trained in how to use the machine securely, without error, and how to prevent the ECM II or any of its cipher material from falling into enemy hands. As a result, of the 10,000 ECM IIs and SIGABAs produced during WWII, none ever fell into enemy hands. The Germans, who like the Japanese gave up mid-war their futile efforts to break the intercepted traffic from the impressive machine it did not even know the name of, simply termed it ‘the big machine’. It needs to be stated that this security success was helped by prevailing attitudes in the Navy and the nation regarding the imperative need to keep secrets. In a typical case in November 1943, Captain John Cromwell, commander of a submarine squadron hunting Japanese shipping in the central Pacific, voluntarily went down with the USS *Sculpin*, rather than possibly fall into Japanese hands, as he was indoctrinated into the ULTRA secret; Crowell was posthumously awarded the Medal of Honor, the most senior US submariner to ever be so honoured.

The importance of the ECM II to the American and Allied war effort has been broadly overlooked by even intelligence history, yet can be stated with clarity. Although both the German and Japanese navies possessed impressive code-breaking organisations – the former in particular, the *B-Dienst*, was very good overall, possessing solid
skills yet placing third in the war behind, unfortunately for them, the US and Royal navies’ cryptologic outfits – they got nowhere in their long efforts to break ECM II traffic, which they intercepted in abundance. Believing (wrongly) their ENIGMA to be unbreakable, the Germans considered that the enormous effort in top-notch manpower and computing – things the German Navy lacked anyway – that a sustained attack on the ECM II would require constituted a waste of time and effort. As a result, despite many code-breaking successes, neither the Germans nor the Japanese would have an ULTRA secret of their own against the US Navy, an outcome with enormous consequences for the war’s schedule and course of events.

Almost as important was how the ECM II enabled the US Navy to communicate its own cryptologic successes to the fleet. It was via ECM IIs that the Navy passed vital actionable ULTRA information – for instance, timely information to a submarine at sea, telling the commander where and when to encounter a Japanese merchant convoy – to the war-fighters who operationalised such information on a daily basis during the wars for control and dominance of the Atlantic and Pacific oceans.

It is a tribute to the success of Joseph Wenger’s remarkable ECM II that during its service life no country is known to have ever been able to read its traffic, and it remains a formidable device even today; the Navy kept it in front-line service until 1959, by which point the need for a faster and more secure (and also smaller) code machine was clear, and the National Security Agency did not declassify the inner workings of the ECM II until the year 2000.

Several lessons appear with clarity upon examining how the US Navy developed the most secure communications at sea in both World Wars. The enormous role of the right people – in this case, forward-thinking and forceful mid-grade officers – in the right jobs, some aspect of which must be happy chance, cannot be overlooked. Neither can the backing of their superiors, who bureaucratically and financially supported and encouraged ideas that might have appeared as whimsy to lesser minds. The ability to produce advanced machines in large numbers mattered, as unquestionably did the Navy’s ability to develop and implement secure communications systems around good encryption machines. Perhaps above all, the US Navy understood that its newfound worldwide presence mission would require impeccably secure communications. If the American fleet has maintained this edge, historians cannot yet say, but the experience of 1917 to 1945 illustrates how such a lead can be gained and maintained, and its intrinsic value to maritime operations.
At the time of World War II Australia was mainly a primary producer, with an economy heavily dependent on overseas trade, with Britain as our main trading partner. High levels of traffic sailed from Sydney southbound through Bass Strait, around Cape Leeuwin and across the Indian Ocean. Also important was Australia’s coastal interstate and intrastate sea trade. Long haul road transport was in its infancy, but although railways at the time were well developed, they tended to radiate out from the main ports, with interstate connections being bedevilled by differences of rail gauge between the states. Small volume, but nevertheless vital, shipping routes also covered Australia’s north and north-west, where rail and road transport were virtually non-existent.

September 1939 to December 1941

During the period up to Japan’s entry into the war in December 1941, the threat to Australia’s seaborne trade came from German surface raiders, primarily disguised armed merchant ships. In all, five German armed merchant raiders operated from time to time in Australia’s general vicinity. The only incidents related to these raiders that occurred close in around the coast, however, were the sinking of a merchant ship in Bass Strait by mines laid by *Pinguin* in November 1940, and the fateful encounter between HMAS *Sydney* (II) and *Kormoran* off the coast of Western Australia in November 1941.

Notwithstanding the low level of the German threat, the RAN and RAAF expended considerable effort in providing protection for the regular troopship convoys that sailed from Australia to the Middle East. These were regarded as high value targets, both because of the number of troops carried, and the individual importance of the troop ships. These included the pride of Britain’s ocean liner fleet, *Queen Mary* and *Queen Elizabeth*.

The command and control arrangements for this period had been planned pre-war and were put in place step by step as the war progressed. They were based on the organisation set up by the Royal Navy and the Royal Air Force’s Coastal Command for trade protection around the British Isles. At the heart of these arrangements was the Central War Room in Melbourne, from where the three Service Chiefs of Staff were supposed to coordinate joint operations for the defence of Australia. In practice, the only cooperative effort was that between the naval and air staffs for the coordination of trade protection operations.
For the execution of the trade protection task, Australia was divided into four areas: North-West, North-East, South-West, and South-East. In each area an Area Combined Headquarters (ACH) was established as a joint RAN/RAAF coordinating centre. From this centre the local naval and air force commanders exercised operational control over assigned forces. There was, however, no one in overall command; each service retained operational control of its own units. ACHs were established, progressively, in Melbourne, Fremantle, Darwin and Port Moresby. When an RAAF Area Headquarters was established in Townsville in May 1941 the ACH for the North-East Area moved from Port Moresby to Townsville. The major difficulty with this system lay with the basic organisation of the RAN and the RAAF, which did not match the area boundaries of the trade protection organisation.

The RAN had a centralised system, with no subordinate area commands. The RAN’s headquarters (Navy Office) was in Melbourne, while command of the Australian Squadron, which included all major warships, was exercised from a headquarters in Sydney, or afloat. Naval support activities, including control of local defence vessels, were the responsibility of the Naval Officers-in-Charge at each of the major ports. Because the operational commander in Sydney exercised his command afloat, operational control of the diverse trade protection operations had to be exercised directly by the Chief of the Naval Staff (CNS) in Melbourne.
While the RAAF, with its headquarters also in Melbourne, also started out with a centralised system, area operational commands were progressively introduced; initially with two areas in southeast Australia (Southern Area with headquarters in Melbourne and Central Area with headquarters in Sydney), then one in Western Australia (Western Area with headquarters in Perth) and one in Northern Australia (Northern Area with headquarters in Townsville).

For the period to August 1941, ACH Melbourne, jointly staffed by the naval and air staff from the two service headquarters, operated as the main centre for the coordination of trade protection operations. The prime focus of these operations was the safe passage of the troop ship convoys from Australia to the Middle East, which in turn involved only the South-East and South-West trade protection areas.

In August 1941 the RAAF combined its Central and Southern Areas into one. This new area (Southern Area with headquarters in Melbourne), which corresponded closely in coverage to the South-East trade protection area, was then delegated operational control of the air side of trade protection operations within its area, control that had hitherto been exercised directly by Air Force Headquarters. At the same time, the naval side of trade protection operations remained with Navy Office. On the formation of Southern Area, ACH Melbourne, moved from Victoria Barracks to the new Area headquarters, thus starting a trend that eventually saw all ACHs transformed from joint Naval/Air Force coordination centres to RAAF Air Operations Rooms.

**December 1941 to May 1942**

The period from December 1941 to May 1942 was one of considerable confusion and uncertainty. As the Japanese forces advanced rapidly south, old defence arrangements crumbled and the Americans arrived on the scene. This period also saw the virtual cessation of troop convoys from Australia to the Middle East, and the withdrawal of German armed merchant raiders from the Indian and Pacific Oceans.

**May 1942 to September 1945**

On 31 May 1942, the Imperial Japanese Navy carried out an unsuccessful midget submarine attack in Sydney Harbour. This attack was followed by a brief two month campaign against shipping off the east coast of Australia by the five long range submarines that supported the midget submarine attack. This in turn forced the RAN to institute a system of coastal convoys between Melbourne and Brisbane, a system that later extended northwards as the Allied campaign in New Guinea got under way. Although the initial submarine campaign ended in early August 1942, the convoy system continued. Then in January 1943, a second campaign was launched, which lasted until June 1943.
A total of 12 Japanese submarines were involved in these two campaigns. Between them they sank 18 merchant ships totalling some 80,000 tons, and attacked another 15, some of which were badly damaged. Some 500 fatalities were suffered, including 268 lost when the hospital ship *Centaur* was sunk off Brisbane in May 1943. None of the Japanese submarines were sunk, or even badly damaged, even though a number of attacks were made on them by ships and aircraft.³

The only other threat to sea communications around Australia came in late 1944 when the German submarine *U-862* made a single, largely unproductive, sortie across southern Australia from its base at Batavia.⁴

**Command and Control**

On 18 April 1942, command arrangements in Australia underwent a major change, when the South-West Pacific Area was established under the command of General Douglas MacArthur. At that time the operational control of all Australian fighting units in the area passed from the Australian Service Chiefs to General MacArthur. MacArthur in turn appointed three component commanders to take control of all naval, land and air forces, United States, Australian and others, assigned to his command. Vice Admiral Leary, USN, was appointed Allied Naval Commander, Australia’s General Blamey was appointed Allied Land Commander and Lieutenant General Brett, US Army Air Corps, was appointed Allied Air Commander.

Each of the Australian services took a different approach to the new arrangements. On the naval side, Leary allowed the Australian CNS, Admiral Sir Guy Royle, RN, to retain operational control of trade protection operations, while he concentrated on operations in direct support of the forces engaged in the forward area in New Guinea. On the army side the situation was made simple by the appointment of General Blamey as Commander in Chief of the Australian Army, as well as being Allied Land Commander. On the air side, General Brett, who had as his Chief of Staff Air Vice Marshal Bostock, RAAF, established an integrated US Army Air Forces (USAAF)/RAAF operational control organisation which operated through the existing RAAF Area command system. Under this arrangement the Chief of Air Staff, Air Vice Marshal Jones, unlike his naval counterpart, had no involvement in operational matters.

In May 1942, the RAAF split its Southern Area into two, by establishing Eastern Area with headquarters in Sydney, and a smaller Southern Area with headquarters still in Melbourne. Each Area had its own ACH, which exercised direct control of air operations for trade protection within its area of responsibility. Thus, ACH Sydney became responsible for the bulk of the east coast convoy protection work. Later, the title ‘Area Combined Headquarters’ was changed to ‘Air Operations Room’.

In July 1942, General MacArthur moved his General Headquarters, and the headquarters of his three Component Commanders, from Melbourne to Brisbane, thus separating Admiral Royle and the Naval Staff in Melbourne, from both the Allied Naval Commander and the Allied Air Commander. Then in August 1942,
General Brett was replaced by Lieutenant General Kenney. Kenny separated the United States and RAAF forces within the Allied Air Command into the US 5th Air Force and an Australian formation called ‘RAAF Command’. He appointed Major General Whitehead as Deputy Commander of the 5th Air Force and sent him to New Guinea to conduct air operations in the forward area. He also appointed Air Vice Marshal Bostock as Air Officer Commanding, RAAF Command. Kenney then further allocated operational control of all air units, USAAF and RAAF in New Guinea to General Whitehead; and all air units, USAAF and RAAF, on the Australian mainland to Air Vice Marshal Bostock. Thus Bostock became, or rather remained, responsible for the air side of trade protection, a task that he in turn delegated to each of the RAAF area commanders.

As an aside, it is of interest to note that Bostock had been closely associated with the RAAF side of trade protection since before the war when he had been Director of Operations and Intelligence at Air Force Headquarters. Then in 1940 he became Deputy Chief of the Air Staff, with oversight of operational matters. In May 1942 he became Chief of Staff to the Allied Air Commander, until his appointment, against the wishes of Air Vice Marshal Jones, as Air Officer Commanding in September 1942.

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**Figure 10.1 Control of Air Operations**
In September 1942, Vice Admiral Carpender, USN, replaced Leary as Allied Naval Commander, but without change in the naval command arrangements put in place by his predecessor. The final major change in the organisation came in March 1943 when Carpender appointed Royle as Commander South-West Pacific Sea Frontiers, with responsibility for the naval side of convoy protection operations in the Area, thus formalising, and extending in area, a role that Royle had carried out since the establishment of the South-West Pacific Area 11 months previously.

Communications

I will now turn to the third element in the command, control and communications trilogy. And here the first point to make is that the speed and effectiveness of communications in the era was vastly inferior to that which we have today. Point-to-point communications were in the main by landline, with wireless telegraphy as a backup, and for use in areas where there were no landlines. Earlier in the war communications by landline used hand speed Morse telegraphy with transmission speeds limited to around 25 words per minute. As the war progressed teleprinter machines and high speed Morse with speeds around 100 words per minute, were introduced. Although greatly increasing the speed and efficiency of communications, teleprinters could only be used on landlines, while high speed Morse was only available on major point-to-point circuits.

Communications between ship and shore, and between general reconnaissance aircraft and their bases were limited to hand speed wireless telegraphy using frequencies in the medium-frequency (MF) and high-frequency (HF) bands. Transmissions in these bands were variable and unpredictable in range performance, particularly between day and night; could be read by friend and foe alike; and, the direction of the transmission could be readily determined. This in turn led to the widespread use of direction finding stations, of codes to protect the message text and of code breaking.

Code breaking was, as is well known, a very important source of intelligence. However, due to the inevitable delays in decoding, the level of secrecy applied to decoded information and the delays in its dissemination, such information was of far greater value at the strategic than at the tactical level. Thus it appeared to play little part in day to day trade protection operations.

In order to limit the flow of intelligence from wireless intercepts, radio silence was imposed right from the outbreak of war for ships and aircraft on operational missions, and for merchant ships. The only time that ships and aircraft were permitted to break radio silence was when in contact with the enemy, or in dire emergency. Such was the stress placed on the need for radio silence that, as folklore would have it, naval captains feared court martial if they broke it without very good reason. Thus, maintaining radio silence at all cost became a matter of professional
pride. Yet, while radio silence greatly improved security, it also impeded the flow of essential operational information from ships and aircraft to their controlling headquarters ashore.

One aspect of operations that suffered from the imposition of strict radio silence was the shipping plot. The only way that shore authorities could determine the position of ships at sea was by dead reckoning, modified by occasional lighthouse and air reconnaissance reports. Due to such things as weather, mechanical breakdown and disregard for sailing orders, the estimated position of convoys, individually routed merchant ships and warships, was often widely in error. Not infrequently, aircraft sent out to provide air cover for convoys or individual ships failed to locate their objective, even after extensive searching.

Two examples illustrate some of the adverse implications of the imposition of strict radio silence:

- On 24 November 1941, the troop ship *Aquitania, en route* from Singapore to Sydney, picked up a group of survivors from the German raider *Kormoran* following its encounter with *Sydney* four and a half days earlier. Assuming that the cruiser concerned would have already reported the action, the captain of *Aquitania* elected not to break radio silence, and did not report the rescue until off Wilson’s Promontory lighthouse on 27 November, where he reported, by light signal, that he had picked up *Kormoran* survivors. By way of contrast, the tanker *Trocas*, which picked up the second group of *Kormoran* survivors late on 24 November, did break radio silence, thus giving authorities ashore the first affirmation of *Sydney*’s fate.5

- On 11 April 1943, a RAAF Avro Anson was on patrol over a convoy off Gabo Island when one of the ships in the convoy was torpedoed and sank within a minute and a half. The Anson assisted one of the naval escorts in searching for the submarine, without success. Because the aircraft had not itself been ‘in contact with the enemy’ it did not report the sinking until it returned to base some three hours later. Thus valuable time was lost in sending out additional search aircraft.6

Another disadvantage of radio silence was that there was normally no acknowledgement by ships or aircraft of instructions from shore authorities. This, given the variable performance of MF and HF wireless, meant that from time to time important instructions were not received. Also, shore authorities could never be sure that instructions they had sent had been received, unless they elected to order the ship or aircraft to break radio silence, which they rarely did.
Yet another disadvantage of radio silence was that communications at sea, ship to ship and ship to aircraft, had to rely on visual signalling, by signal lamps using Morse code and signal flags. Visual signalling was particularly limiting for ship to aircraft communications, due in the main to the aircraft’s speed of movement relative to the ship. Also, visual signalling between ships and aircraft was not available at night, because of the ship’s fear of exposing their position to enemy submarines. Very high frequency radio, which could have overcome many of these difficulties, was not in widespread use in RAN ships until 1944.

Another less well understood disadvantage of radio silence was that, because ships and aircraft rarely used their transmitters, faults in equipment and procedures tended to remain hidden.

Radio silence, coupled with the vagaries of MF and HF wireless, engendered in all concerned an air of complacency about having to operate in an environment of incomplete information. Radio silence was one of the facts of life that no one questioned.

The System in Action

The control of naval trade protection operations off the New South Wales coast rested with the Naval Officer-in-Charge, Sydney, who had his headquarters at Potts Point. The control of air operations rested with the Air Officer Commanding, Eastern Area, who had his headquarters, and Air Operations Room, also in Sydney, in the adjoining suburb of Edgecliff.

Naval communications for the whole of the South-West Pacific Area were based on a major wireless telegraphy communication station at HMAS Harman in Canberra, and several subsidiary stations spread around the country. As well as its point to point duties, Harman’s role was to broadcast routine messages to ships at sea (in what was known as ‘Bells’) and to receive messages from ships at sea. Air Force communications, on the other hand, were based on the concept of each operational base communicating directly with aircraft operating from that base. Each base was also linked by a point to point circuit to its Area Air Operations Room, which also maintained a listening watch on the various aircraft operating frequencies.

During convoy protection operations the aircraft, their operating base, one of the escorts in the convoy and the Area Air Operations Room all stood watch on a common frequency, known as the Convoy Reconnaissance frequency.

During combined anti-submarine search operations the aircraft, their operating base, ships involved in the search and the Area Air Operations Room all stood watch on another common frequency, known as the Hunting Reconnaissance frequency. In these circumstances, because of the limited wireless fit in most anti-submarine vessels, they were not able to also stand watch on the routine broadcast (Bells). Here procedures were in place for the Naval Officer-in-Charge to ensure that relevant routine broadcast messages were relayed to the ships by the Area Air Operations Room on the Hunting Reconnaissance frequency.
At dusk on 16 June 1943 a north-bound coastal convoy was attacked by the Japanese submarine *I-174* some 55 miles south-east of Coff’s Harbour. During the attack, SS *Portmar* was sunk and *LST 469* badly damaged. Following the sinking, the corvette HMAS *Warrnambool* gained a sonar contact on the submarine and attacked with depth charges, assessing that the submarine had been damaged.

On receiving a report on the incident, Royle decided to lay on a major anti-submarine hunt on the following evening. Three vessels, HMA Ships *Kalgoorlie*, *Vendetta* and *Deloraine* were detailed to search an area to the east of the sinking in an effort to find and destroy the damaged Japanese submarine. At the same time, Air-to-Surface-Vessel radar equipped Beaufort aircraft from Coff’s Harbour were ordered to carry out an all night search of the same area. In accordance with established procedure, all concerned were ordered to stand watch on the Hunting Reconnaissance frequency.

The first communication problem arose with the corvette *Deloraine*. She had been in Coff’s Harbour during the day delivering casualties from the *Portmar* sinking and had received telephone instructions from Naval Base Headquarters in Sydney on the evening’s operation. Unfortunately, she did not receive a follow-up signal on the operation because her wireless receiver was slightly off tune. 

*HMAS Harman W/T Station. View of Receiving Room.*
The second problem arose with the Beaufort aircraft from Coff’s Harbour. Because the base at Coff’s Harbour was also working aircraft on convoy protection duties and had only one wireless telegraphy circuit available, the base ordered the aircraft to set watch on the Convoy Reconnaissance frequency, not the Hunting Reconnaissance frequency as ordered. The base then failed to inform the Air Operations Room in Sydney of the change.\(^8\)

The operation got underway as ordered and just after midnight the first of the Beaufort aircraft on task sighted a submarine on the surface and immediately attacked with depth charges. Unfortunately the attack was unsuccessful, although the aircraft believed that it had damaged the submarine. After the attack, contrary to normal practice, the submarine remained on the surface.

The aircraft sent out its enemy contact report which was received, with a corrupt position group, by the Air Operations Room in Sydney, but not by the surface ships, which were on a different frequency. Subsequent analysis showed that at the time _Deloraine_ was probably within 10 miles or so of the attack position.

In Sydney, the duty officer at Naval Base Headquarters asked that, when the attack position was known, the Air Operations Room send a signal about the air attack to the searching ships. This message was subsequently drafted and sent to the Naval Signals Centre for coding. At the Signals Centre the Yeoman-in-Charge forwarded the message to _Harman_ for broadcast on Bells, rather than returning it to the Air Operations Room for transmission on the Hunting Reconnaissance frequency.\(^9\)

Meanwhile at sea, a second Beaufort had relieved the first. It too carried out an unsuccessful attack on the still surfaced submarine. Subsequently, in between carrying out machine gun attacks on the submarine, the aircraft flew over to a nearby surface ship and attempted to make contact by visual signalling. This it did on two occasions, but got no response. The ship concerned was _Deloraine_ who by that time had come within a few miles of the submarine. On board _Deloraine_, the aircraft’s visual signalling was unreadable, and, because the aircraft did not persist for long, and because _Deloraine_ was not fully in the picture, her captain assumed that the aircraft was merely trying to challenge him as to his identity, a challenge that he chose to ignore. The end of the incident came when, after the departure of the second Beaufort to Coff’s Harbour, the third aircraft arrived and was unable to regain contact with the submarine.

Following this unfortunate saga of missed opportunity, Admiral Royle ordered a Naval Board of Inquiry. One of the most important recommendations from the Board was ‘that in the area south of Brisbane speed and reliability of communication should take precedence over security until efficiency has been obtained’.\(^10\) This recommendation was immediately put into effect, with radio silence being lifted for convoy operations south of 25 degrees south latitude, along with the promulgation...
of a raft of simplified procedures. This was followed by an intensive period of training and exercising of the revised procedures. Unfortunately, there were no further opportunities to put all of this training into effect.

Conclusion

During the period September 1939 to December 1941, the command, control and communications arrangements were simple and adequate to the threat posed by the German raiders, and the troop convoy protection task. With the advent of the Pacific War, the shipping of men and military supplies across the Pacific Ocean from the United States, and their subsequent onward movement from Sydney, Brisbane and Townsville north to New Guinea added greatly to sea trade off Australia’s east coast and between there and New Guinea.

In the period from May 1942 to the end of the war, however, the command, control and communication arrangements were somewhat more complex and not well suited to the protection of coastal trade against the Japanese submarine threat. Communications in particular were limited in their effectiveness by the imposition of strict radio silence. Unfortunately, by the time this limitation was lifted in mid-1943, the Japanese submarine campaign was over.

Notes

3. GH Gill, Royal Australian Navy, 1942-1945, Canberra, Australian War Memorial, 1968, p. 262
5. Gill, Royal Australian Navy, 1939-1942, pp. 452-453.
6. Operational Record Book (A50), Headquarters, Southern Area, p. 182.
7. ‘Narrative of the Board of Inquiry into the Sinking of SS Portmar and Torpedoing of LST 469 on 16 June, 1943 and Subsequent Events, circa 1 July 1943’, para. 16, Sea Power Centre - Australia.
9. Letter, Naval Officer in Charge Sydney to the Air Officer Commanding, Eastern Area, 18 June 1943, National Archives Australia: A11066, 8/2/36.
10. ‘Narrative of the Board of Inquiry into the Sinking of SS Portmar and Torpedoing of LST 469 on 16 June, 1943 and Subsequent Events, circa 1 July 1943’, Recommendations, para. 11.
Strategically, the fighting in Korea between 1950 and 1953 has been described as the wrong war in the wrong place. It was fought against unprovoked communist aggression by a coalition of United Nations’ (UN) member states that elected to defend a country that had only recently come into existence and with which they had no defensive alliance or cultural ties. Weapons and tactics were employed that strategists, especially in the United States, believed had been rendered obsolete in 1945 by the development of the atomic bomb and its subsequent deployment by the recently formed Strategic Air Command. It proved, inevitably, to be a maritime war in which the UN forces demonstrated the advantages of sea power over a one-dimensional enemy. The success of allied communications, in all the various meanings of the word, and the failure by the coalition allies to comprehend aspects of the enemy’s communications were critical factors in the war.

The Origins of War in Korea

Korea gained complete independence from Chinese domination in 1895 following the Sino-Japanese War (1894-95), but was annexed by Japan in 1910 and ruthlessly exploited. At the Cairo Conference in December 1943, the United Kingdom (UK), United States and China had stated that ‘in due course Korea shall become free and independent’. This policy was reaffirmed at the Potsdam Conference in 1945 but Russia declared war on Japan in the final days before its surrender and in September 1945, Korea was occupied by Russian forces in the north and United States forces in the south. An ad hoc agreement between the two powers fixed the 38th Parallel as the line of demarcation between them.

In December 1945, the Moscow Agreement, signed by the USSR, UK and United States and subsequently adhered to by the Chinese communist regime, proposed the re-establishment of Korea as a separate state and proposed a ‘trusteeship’, under the auspices of the four powers, which would assist the Korean population in setting up a democratically elected government. Agreement was never reached on the method to be adopted, and the UK and United States resorted to the UN in an attempt to resolve the question. In September 1947, two resolutions were passed calling for elections, to be overseen by a UN Commission. The Soviet authorities flouted them, however, and all the commission could do was monitor elections held in the south where a National Assembly was voted in and the Republic of Korea (South Korea) created in 1948. Shortly afterwards, the Democratic People’s Republic of Korea was proclaimed in the north. Since the Commission had not been allowed to monitor any
northern elections, it recommended against recognition of the People’s Republic and identified South Korea as the only legal Korean government. This view was endorsed by the UN General Assembly.

The UN Commission continued to strive for unification, but stated in a Report dated 8 September 1949 that it was hopeless to try to gain access to, or even communicate with, North Korea. It described the northern regime as ‘the creature of a military occupant’ that denied its subjects any chance to express their opinion upon its claim to rule. Communication failure between the ‘two Koreas’ was, thus, a significant factor in developments that led to war. American occupation troops left Korea in June 1948, leaving a small military advisory group. There could be no verification of when Soviet forces actually left, but by 1949 they had created a North Korean People’s Army (NKPA) of over 130,000 combat troops equipped with 500 Russian-made tanks and 132 aircraft. Neither North nor South had a significant navy.

The Outbreak of War and UN Reaction

At 0400 on 25 June 1950, the NKPA attacked across the 38th parallel with eight combat divisions, one of them armoured. It came as a complete surprise, unpredicted by any western agency and must stand as one of the greatest intelligence failures of the modern era. It was not, however, to be the worst in that eventful year. The South Korean Army lacked tanks, artillery and air support and retreated south, impeded by large numbers of fugitives who choked every road. News of the unprovoked aggression reached Mr Trygve Lie, the Secretary-General of the UN, in New York at 0300 local time on 25 June, some 14 hours after the attack. An emergency meeting of the UN Security Council was held within hours and, by a unanimous vote of nine member nations, the blame for aggression was placed completely on the North Koreans, who were called on to cease hostilities immediately and withdraw north of the 38th parallel. They took no notice.

On 27 June the Security Council passed a Resolution branding the NKPA attack ‘a breach of world peace’ and authorising member nations to assist South Korea in repelling the invasion and to ‘restore international peace and security’. Within three days, 32 of the 59 member states endorsed these proposals and many had offered military or economic assistance.

The United States’ Reaction

The reaction of US President Harry S Truman was swift and unambiguous. He was aware of the attack before the UN but waited until 26 June, hours after the first meeting by the Security Council, to order US air and sea forces to give cover and support to South Korean military forces in order to gain time to gather international support for action against the communists. The US 7th Fleet was also ordered to prevent any attack on Formosa by Chinese Communists, the first manifestation of fears that Korea might be the initial phase of a general communist offensive. The
Commander in Chief of the US Pacific Fleet was ordered to organise further task
groups to reinforce the one already deployed in the western Pacific. General Douglas
MacArthur, who commanded the US occupation in Japan from his headquarters in
Tokyo, was placed in command of all US forces in the area. These comprised four US
Army divisions at reduced strength, a number of US Air Force combat squadrons,
with a total of about 400 aircraft, responsible for the defence of Japan, Okinawa,
the Philippines and Guam and US Naval Forces Far East under the Commander US
Naval Forces Far East (COMNAVFE) Vice Admiral C Turner Joy, USN. The latter
comprised a light cruiser, four destroyers and six minesweepers. Further away but
available for operations was a task force of the 7th Fleet under Vice Admiral Arthur
D Struble, USN, which included the carrier USS Valley Forge, a heavy cruiser and
eight destroyers. Most US forces ashore were equipped for their constabulary role
as an occupying power and not for combat on a large scale.

There was also a British Commonwealth Occupation Force under Lieutenant
General Sir Horace Robertson of the Australian Army, but by 1950, this had been
reduced in size to one Australian battalion, a RAAF fighter squadron and a small
naval contingent under a commander RAN at Kure dockyard. On 30 June, President
Truman ordered a naval blockade of the whole Korean coast and authorised General
MacArthur to send troops to Korea and to carry out air strikes on North Korean
forces both north and south of the 38th parallel. MacArthur had, in fact, already
ordered the first attack on the north a day earlier.

Having completely failed to anticipate the conflict, the UN had at least condemned
the aggression and, within a week, taken extensive steps to defend South Korea.
General MacArthur was appointed the supreme commander of all UN as well as US
forces in the Far East on 7 July 1950. His line of responsibility, however, remained
to the US Joint Chiefs of Staff rather than to the UN General Assembly.

The British and Commonwealth Reaction

The British Prime Minister, Clement Attlee, announced British support for the UN
Resolution in the House of Commons on 27 June. A day later he announced that
British naval units of the Far East Fleet were to be placed at the disposal of the
US authorities to operate on behalf of the UN. The Canadian Government offered
naval support on the same day, followed by the governments of Australia and
New Zealand, the other side of the International Date Line, a day later on 29 June.
Admiral Sir Patrick Brind, Commander in Chief of the Far East Station (CinCFES)
had, fortuitously, elected some months earlier to station units of the Far East Fleet
in Japanese waters under the tactical command of Rear Admiral William Andrewes,
Flag Officer Second in Command Far East Station (F02FES) in order to maintain
close contact with their US Navy counterparts and to carry out joint exercises. While
in Japanese waters, they formed part of the occupation forces and came under the
command of Vice Admiral C Turner Joy. The ships included the aircraft carrier HMS
Triumph, the cruisers, HM Ships Belfast and Jamaica, two destroyers, three frigates
and auxiliaries. When fighting started at dawn on 25 June, *Belfast*, the flagship, was visiting Hakodate in northern Japan. Andrewes heard news of the invasion on the evening of 25 June and sailed, on his own initiative, to position himself further south where he would be available for any eventuality. Another cruiser, HMS *Kenya*, and further destroyers, frigates and auxiliaries were in Singapore and Hong Kong and available for tasking. Andrewes subsequently reported:

> Hakodate is a long way from Yokosuka and Tokyo, the centre of naval activities in Japan, and further from Kure. Moreover, the other ships in my command were either at sea, or in southern Japanese ports, and I wished to be able to concentrate the Fleet if necessary without delay. It also seemed probable that any action required would be off South Korea and finally I thought that, should Russia intervene, my best place would be further south.

On the next day, 26 June, Brind signalled COMNAVFE offering the use of British warships for ‘any humanitarian mission’ he might require. Later in the same day he warned Admiral Andrewes that his ships might be called upon for action under the UN Charter.

After a rough passage, *Belfast* arrived at Yokosuka at noon on 27 June and Admiral Andrewes drove immediately to meet Admiral Joy in Tokyo. The latter had just come from a meeting with General MacArthur and was deeply concerned at the deteriorating situation on land in Korea. He advised that, since all US, British and Commonwealth citizens had already been evacuated from Korea; there was no need for any humanitarian operation. However, since Russian reaction to a UN mobilisation was uncertain, he thought it best for the British force to concentrate south of Japan having fuelled and, as far as possible, taken on provisions. On 28 June, a message was received from the Admiralty directing the CinCFES to:

> Place the Royal Navy at present in Japanese waters at the disposal of the United States Naval Commander for Korean Operations (Admiral Joy) in support of the Security Council Resolutions.

The early meeting between the two tactical commanders meant that they understood each other and could move quickly. In consequence, during the afternoon on 28 June COMNAVFE ordered Andrewes to deploy his ships to join US Navy task groups. *Jamaica*, and HM Ships *Black Swan* and *Alacrity* joined Rear Admiral Higgins, USN, flying his flag in the USS *Juneau* off the east coast of South Korea. FO2FES himself, once more in *Belfast*, in company with *Triumph*, HM Ships *Consort* and *Cossack*, and the newly joined HMAS *Bataan* was to join Vice Admiral Arthur D Struble, Combined Task Force (CTF) 77, off Okinawa. From this position they could strike at Korea or move to defend Formosa or Okinawa if required. The group also included *Valley Forge*. 
The close liaison between British and US naval forces in Japanese waters in the months before June 1950 paid handsome dividends in the initial stages of the war. To ensure that the relationship continued, Commander JMD Gray, RN, who had been serving with the British Mission in Japan, put himself at the disposal of COMNAVFE. Admiral Turner Joy at once invited him to become a member of his staff as RN Liaison Officer with accommodation in his operations room and full authority to see all classified signals. Admiral Brind subsequently wrote of his appointment noting that he carried out a difficult task:

> With initiative, tact and skill at a time of stress when faulty handling might have impaired the close relationship and trust which had been built up between the two navies.\(^9\)

### First Strikes by Aircraft Carriers

The British and US carriers joined forces on 2 July and headed for an area in the Yellow Sea from which to launch strikes against North Korean targets. Between them the carriers flew continuous anti-submarine and combat air patrols in daylight. No difficulty was experienced working together. In fact Andrewes wrote:

> It all seemed so familiar as it was just what we had done so often during the exercises in March with similar forces. We were already getting back into the easy use of American signal books.\(^10\)

On 3 July the first strikes were flown off at 0545. Aircraft from *Valley Forge*, including Panther jet fighters, Corsairs and Skyraiders attacked airfields around Pyongyang, the North Korean capital, destroying 15 to 20 aircraft on the ground and two in the air. Seafires and Fireflies from *Triumph* attacked the airfield at Haeju, damaging hangars and buildings but finding no aircraft to destroy.\(^11\) All the carrier aircraft landed on safely but some had been damaged by small-arms fire. The separate targets had been chosen both to maximise impact and as a reflection of the smaller radius of action of the older British aircraft. The geographical separation of strikes by aircraft of differing performance or command structure was to be a major feature of air operations over Korea in the years to come.

Admiral Struble congratulated ‘all hands’ in the British ships on the manner in which they had ‘taken their responsibilities, and at the successes they had achieved’.\(^12\) Andrewes wrote that ‘things did work well, thanks very largely to our previous practice and knowledge of American ways, signals and, frequently, language’.\(^13\) After this first strike, FO2FES detached from CTF 77 with *Belfast, Cossack* and *Consort* and returned to Sasebo. *Triumph* remained with the 7th Fleet for several more weeks but when more US carriers arrived in the western Pacific, the British light fleet carrier on station was re-allocated to the west coast blockading group together with the majority of the other British and Commonwealth warships; an arrangement that was to last for the remainder of the war. *Triumph* was relieved in turn by HM Ships *Theseus, Glory and Ocean*, and HMAS *Sydney (III)*.
Blockade Forces

On arrival in Sasebo, Admiral Andrewes was able to discuss further plans with Admiral Joy in person, gaining valuable insight into US thinking as the conflict developed. Both MacArthur and Joy had been surprised by the scale of UN intervention although each was convinced of the correctness of the decision. No contingency plans existed, however, and the available land and air forces would need considerable reinforcement. Nevertheless, UN command of the sea allowed an immediate blockade of the Korean peninsula to be implemented. COMNAVFE ordered Andrewes to operate off the western coast using Commonwealth and other UN warships as they became available. Higgins was ordered to use American warships for a similar blockade off the east coast. This arrangement also worked well, allowed ships to move between coasts when necessary, and was to continue for the remainder of the conflict. COMNAVFE gave instructions for the conduct of the blockade which included notes on international law and directions for the treatment of ships attempting to evade interception. There were concerns about the possibility of Soviet submarines from Vladivostok being used to support the communist offensive and, after signalled discussion between Admiral Brind and the US Navy Chief of Naval Operations, Admiral Forrest Sherman, attacks on unidentified, submerged submarines within the war zone were authorised, should they become necessary. On 2 July, Jamaica was operating off the east coast with Higgins’ forces when she took part in the first open water naval action of the war after four fast patrol boats attacked them. Three of these
boats were sunk by gunfire and one made off to seaward, zigzagging at high speed. The first action off the west coast occurred on 12 July when Cossack was engaged by enemy field guns while passing inside the Techong Islands. She returned their fire from a range of 5000 to 8000 yards and destroyed two guns for the expenditure of 140 rounds of 4.5-inch ammunition, suffering no damage.

FO2FES issued his first instructions for the implementation of the blockade on 8 July. The object was to dominate the coastline occupied by the North Koreans; prevent any infiltration by sea into coastal areas held by South Koreans; and, to provide naval gunfire support against any North Korean target at sea or on land. The earliest disposition included three task units, each based on a cruiser and including destroyers and frigates. The latter had the advantage that they could move close inshore to engage specific targets, but during the conflict a number of different warship types were used to bombard the enemy coast including, once, the maintenance aircraft carrier HMS Unicorn which gained the unlikely distinction of having carried out the only shore bombardment to have been conducted by an aircraft carrier.

The objects of the British and American patrols were obviously similar, but their conduct differed because of the geographical differences between the east and west coasts. The east comprises steep cliffs with a narrow coastal strip along which both road and rail communications run. The mountainous terrain meant that in 1140 miles of coastal railway track there were 956 bridges and 231 tunnels, making enemy communications on this route particularly vulnerable to interdiction by naval gunfire and commando raids in addition to air attack. There are few islands off this coast. The west coast, on the other hand, has shallow seas and a number of islands surrounded by extensive mud flats and silting in numerous river estuaries. This made blockade by large vessels close inshore impractical. There was also a danger of the enemy moving supplies in small junks close inshore until carrier-borne aircraft from the light fleet carriers allocated to the west coast task force became available to deal with them.

UN control of the sea around the Korean peninsula was only contested by the laying of mines by junks, which delayed the amphibious landing at Wonsan but only briefly looked like interrupting allied operations. Anger at the Wonsan mines led Rear Admiral Allan E ‘Hoke’ Smith, USN, to state:

We have lost control of the sea to a nation without a navy, using pre-World War I weapons, laid by vessels that were utilised at the time of the birth of Christ.

Lack of prior knowledge of the communist mine capability was another intelligence failure but Admiral Smith subsequently modified his out-spoken view as the Allies dealt with the mine threat. In addition to its blockade, escort and fire support duties the US 7th Fleet was responsible strategically for preventing the Red and Nationalist Chinese from spreading the conflict to Formosa and for the protection of Japan.
Logistical Communications

The US Military Sea Transportation Service carried more than 95 per cent of all US troops and combat cargoes into Korea without interference by the enemy. In the three years of war, the Service delivered 5 million servicemen, 52 million tons of cargo including ammunition and 22 million tons of petrol and oil. Every US soldier landed in Korea was accompanied by 5 tons of equipment and needed 64lb a day to keep him there. For every ton of air freight, there were 270 tons of sea freight and 4 tons of fuel for each aircraft’s return trip had to be brought into Korea by sea.  

The operational command of warships in Korean waters was exercised by COMNAVFE but logistical support for US Navy warships came through four agencies. These comprised a service squadron of the 7th Fleet that gave that force afloat support and maintenance; a service squadron in Sasebo that supported ships that were not part of the 7th Fleet; and, fleet activities commands in Sasebo and Yokohama that administered the bases and their facilities. Administration of personnel, training and drafting was the responsibility of Pacific Fleet Headquarters in Hawaii.

The British warships were able to rely on the logistic organisation of the Far East Fleet for support and the Commonwealth ships fitted easily into its structure since, at the time, all were of British design or construction. When the British Government agreed to deploy troops to Korea in early August 1950, the 27th Infantry Brigade, comprising two battalions were ferried from Hong Kong to Pusan in the cruiser HMS *Ceylon* and the maintenance carrier *Unicorn* escorted by the destroyer HMAS *Warramunga*. The carrier was also able to carry most of the Brigade’s vehicles, heavy weapons and ammunition. *Unicorn* had arrived in Singapore in late 1949 with replacement aircraft for *Triumph* and had been due to return to the UK but, on the outbreak of war, the very real contribution she could make was recognised and she was retained in the Far East. During her four year deployment she steamed over 130,000 miles, spent 500 days at sea, handled some 600 replacement aircraft, and carried more than 6000 troops and passengers. The latter included Gloster Meteor fighters ferried from the UK for 77 Squadron RAAF deployed in Korea as well as aircraft for the RN and RAN carriers. Passengers, aircraft and freight from the UK were carried in a number of ships, among which the aircraft carrier HMS *Warrior* operated in the ferrying role. Commonwealth warships were under the operational control of COMNAVFE, usually through FO2FES on the west coast, logistically supported by the British Fleet Train. They remained under the administrative control of their navy boards for personnel, training, drafting and appointing issues. The British authorities were flexible and, for instance, when *Sydney* lost aircraft in action, replacements were provided from Far East Fleet reserve stocks, some of which remained with the RAN Fleet Air Arm after 1953.

The Royal Fleet Auxiliary (RFA) played a prominent role in keeping the Commonwealth navies at sea and deployed 13 tankers and 5 stores issuing ships. Andrewes had returned to Sasebo after the initial carrier strikes where he met...
Brind’s Chief of Staff, Commodore GF Burghard, RN, who had been sent there to await him and to discuss ‘the whole gamut of needs and troubles, refit programmes, personnel and logistics’. COMNAVFE generously urged the Commonwealth warships to make use of US Navy facilities in Sasebo but their principal requirements for oil, food, stores and ammunition were well catered for because the necessary RFA vessels had been deployed to Japan with the fleet and were still inside their planned endurance. Ammunition was likely to run down first, but the arrival from Hong Kong of the SS Choyssang as a temporary armament stores issuing ship, taken up from trade, assured the Commonwealth ships an adequate reserve. Later, after fighting intensified and pre-positioned stock in the Far East was used up, there were delays shipping stores from the UK and shortages arose, for example in radio and radar valves, the absence of which reduced the fighting efficiency of the fleet in some instances. A shortage of aircraft bombs was overcome by acquiring and modifying American weapons.

Admiral Andrewes wrote to the CinCFES on 5 August and remarked:

I must say again how noticeable has been the way in which your administrative staff seems so frequently to have anticipated our requirements. Once or twice it has almost seemed as though someone among them has possessed the power of thought reading.

They were naval professionals, many of whom had extensive experience in the Pacific War five years earlier in which logistics had proved so important. There is no substitute for experience.

**Inchon – Triumph of Amphibious Warfare**

From the earliest days of the conflict, MacArthur intended to mount an amphibious assault against Inchon, Seoul’s seaport on the western coast, to outflank the NKPA and exploit UN maritime strength. For this daring operation, the UN assembled 230 ships from the United States, UK, Australia, New Zealand, Canada, Japan, Korea and France and re-constituted the run-down 1st Marine Division. The US Army had opposed the plan and the US Navy had been hesitant because of the poor hydrographical conditions at Inchon, among them a tidal range of 33 feet and other factors that limited a landing to one of only three days in the autumn of 1950. MacArthur over-rode all opposition and chose 15 September 1950, stating ‘amphibious landing is the most powerful tool we have. To employ it properly we must strike hard and deep into enemy territory’. The landings and their support by naval gunfire and marine tactical aircraft were outstanding examples of amphibious warfare and allied cooperation. Once they commenced, the result was never in doubt. The communists had not believed it possible that the US could mount such an assault so soon after war began, nor that US commanders would risk landing on the treacherous beaches of Inchon. Once the decision to land was taken, the navy and marines led the way and MacArthur said of them ‘the star of the Navy and Marine Corps never shone brighter’. The NKPA was soon in full retreat.
Command and Control

The existence of a US command structure in Japan was an early advantage and, since the US would clearly bear the brunt of the fighting, it was logical for the British and Commonwealth forces to be placed immediately under its orders. General MacArthur acted as a focal point during the critical early stages when plans for the amphibious landing at Inchon were devised. The deployments to Japanese waters in the spring of 1950 and joint exercises proved to be of enormous advantage and British warships were able to adopt US Navy signal procedures immediately on the outbreak of war. Later additions to the UN forces naturally came under this command system as they arrived.

The principal weakness of the US command structure was that it had no joint headquarters, each Service maintaining its own concept of how best to implement the instructions of the Joint Chiefs of Staff in Washington. The lack of any real liaison gave rise to misunderstandings and complications at the level of strategic direction throughout the war. Since the Commonwealth naval forces obtained logistical support through the British Far East Fleet and administrative support through their own naval systems, it was in the exercise of tactical operational command that they interfaced with the Americans. The chief difference between the US and British systems of command and control lay in the rigidity of the former and the expectation of initiative and flexibility in the latter. The early movements of British
warships during the first days of the war are examples of what British commanders expected of their subordinates, but their US contemporaries were expected to stick rigidly to detailed sets of instructions.

Contact between US and British senior officers was sometimes difficult to arrange because the Americans tended to exercise command afloat whereas the three successive British flag officers tended to spend most of their time ashore where they had access to key staff officers, intelligence and the ‘bigger picture’. While the task force, group, and element system was flexible and ideally suited to operations, US Navy operational orders were extremely detailed, contained numerous pages of duplicated information and made it difficult for the recipients to ‘detect the wood amongst the trees’. Communication at junior level with other services or even task elements was not welcomed and senior US officers often had no conception of the real implications that rigid interpretation of their directives produced, or even what value was actually being obtained from them. The British system encouraged ‘feed-back’ and was able to evaluate difficult and dangerous tasks, such as the stationing of frigates in the Han Estuary between July and November 1951 against a more realistic background. Despite the differences in style, relations between British and American officers remained close and cordial and US commanders were often envious of the close relations that existed between the operational, maintenance and technical branches of the staff of the British Flag Officer.²⁸

Another difference in the exercise of command was the rule in the US Navy that the officer in tactical command of a carrier or carrier task force must, himself, be a pilot. The fact that none of the British flag officers were aviators made it difficult for the Commander 7th Fleet to understand how they could command a group that contained two light fleet carriers. At one time it was suggested they should be taken out of Task Force (TF) 95 and, though continuing to operate in the same area of the Yellow Sea, put under the operational control of TF 77, the US Navy fleet carriers, which usually operated in the Sea of Japan. This proposal was not accepted by the British and the status quo remained. A special command structure, TF 91, was established for the Inchon landings, after which west and east coast blockade forces were re-formed as groups within TF 95 with Andrewes in charge of the west and Rear Admiral Hartman in the east. Captain Unwin, RN, commanded a small escort group. For a brief period between November 1950 and February 1951, the British flag officer commanded the whole of TF 95 after his promotion to vice admiral, a combined force of some 85 ships. Captains of US warships attached to groups under British command very much appreciated being allowed to exercise their own initiative, without being subjected to signals, instructions and demands for reports.²⁹
Interdiction of Enemy Communications

Complete interdiction of a battlefield has always proved difficult, but circumstances in Korea seemed to offer unusual opportunities. The complete blockade enforced by the overwhelming UN naval forces entirely ruled out supply by sea as an option for the communist forces and the meagre rail and primitive road communications of North Korea seemed vulnerable to UN air attack. Once the Chinese offensive had been halted and the land war became static in 1951, the main allied air effort was directed at interdiction of enemy communications. This was the primary responsibility of the US 5th Air Force, supported by allied contingents and all available naval and US Marine Corps aircraft. It gradually came to be accepted that the navy would deal with the east coast rail and highway systems and the Air Force would deal with targets in the western region where it interacted with the Commonwealth carrier operations. With only minor exceptions, this policy continued for 20 months. Immense damage was unquestionably inflicted on the enemy communications systems and all movement by rail or road was confined to the hours of darkness, since the allies had few aircraft capable of night operations, but full interdiction of the battlefield was never achieved. The communists continued to be able to launch an offensive whenever they wished and in this they were helped by the UN’s acceptance of a static front line where minimal supplies, often moved on foot or small cart by peasants, would suffice for the NKPA’s needs. The failure of aircraft to defeat ‘low technology’ opposition first became apparent in Korea.

The causes of this failure, in British eyes, were primarily due to inhibitions accepted by the UN for political reasons, but tactical and operational considerations were also to blame. Politically, the ban on bombing sources of supply in Manchuria robbed aircraft of targets that might have proved decisive. The static war, accepted during the protracted armistice negotiations after 1951, enabled the communist forces to keep their strongly fortified front lines supplied to a degree they could never have achieved if a war of movement had been forced on them. The enemy was allowed to fight on his own terms and many of the advantages possessed by the allies if a maritime strategy had been pursued were negated.

When it was initiated in January 1951, the object of the interdiction campaign was to impede the advance by Chinese forces. Though this line of reasoning was justifiable, Struble opposed it because he believed his aircraft would be better used to provide close air support for troops on the ground. The continuation of the interdiction campaign savoured dangerously of trying to win the war by air power alone while the army and navy were relegated to comparatively static and defensive roles. It is difficult to resist the conclusion that this strategy, which certainly suited the communists, was continued for too long and that better results would have been obtained if a more aggressive amphibious policy had been implemented using the capabilities of all the forces available. Had the UN exerted the mobility given to its forces by the command of the sea, albeit with the need to defeat the threat from
mines, the enemy could have been forced into a war of movement that he could not sustain. This might well have compelled the communists to accept more satisfactory armistice conditions at an appreciably earlier date.30

Joint Control of Air Operations

Difficulty in controlling strikes by navy and air force aircraft appeared as early as 4 July 1950, when TF 77 struck at Pyongyang for a second day causing US Air Force (USAF) Lieutenant General George E Stratemeyer, Commander Air Force Far East, to cancel a B-29 attack planned for the same time. A joint operations centre (JOC) was established, but the US Navy took the view that this was only suited to pre-planned attacks over a wide area and would be incapable of ‘funnelling’ a large number of aircraft into a small area without over-loading communication channels. Admiral Joy did accept that, in an emergency, naval aircraft in flight could be re-tasked and that closer control of tactical aviation was needed. Consequently, on 15 July 1950 he agreed to place carrier-borne aircraft under the ‘co-ordination control’ of Far East Air Force, an ill-defined arrangement that did little more than provide 5th Air Force with plans for strikes by TF 77 rather than precise details. Naval aircraft approaching the battlefield were expected to report to the JOC for allocation to an airborne controller known as a ‘Mosquito’. A similar arrangement applied to Commonwealth carrier aircraft although, in general, they enjoyed a more cordial relationship with 5th Air Force.

At first US Navy fears proved justified, and the volume of communications at times inundated the system and important messages for TF 77 failed to arrive in time. The task of handling close air support missions by naval aircraft often fell to overburdened controllers who might be trying to meld F-80 jet fighters based in Japan and already short of fuel with navy propeller-driven attack planes that, despite their greater endurance, had to return to their carriers at a set time. The system gradually got better and naval airborne controllers joined their USAF colleagues in 1951 with responsibility for areas in which carrier-borne aircraft operated. Better communications between the JOC and TF 77 were eventually established and, in the last months of the war, US Navy representatives were appointed to the JOC to make binding commitments on targets and sorties.31 The command of joint air assets in Korea proved a sound basis on which plans for Vietnam and the Gulf wars were laid, although both old and new mistakes continued to be made.

Signal Communications – Comment and Reflection

Many references to the importance of communications in every aspect of operations were made in post action reports. Signal communications benefited from the fact that both the Commonwealth and US navies nominally spoke the same language, but different word meanings sometimes raised difficulties. For example, the world ‘presently’ means ‘now’ to an American but ‘later on’ to the British; ‘available’ meant to an American that a ship was non-operational and available for maintenance whereas, to the British it meant available for operations.
US operation orders were lengthy and, from a British perspective, overly detailed. For instance, the same orders concerning air spotting for naval gunfire support would appear in air, gunnery and communication sections. Time was wasted by passing orders down the long chain of command rather than directly to ships concerned, and the almost total absence of paragraphing facilitated neither reading nor reference. The use of abbreviations, such as RFS - ready for sea, caused confusion at first but was soon comprehended. British and Commonwealth ships were equipped with slightly less communications circuits and operators than their American counterparts but proved able to cope. Other UN ships usually had even less and had difficulty in operating in the same tactical formation as US and British ships unless they embarked a nucleus of English-speaking personnel or a liaison team. It is a problem that persists to the present day. The requirement for Commonwealth ships to cope with the extra volume of signal traffic during the war was met by using the extra communications staff deployed to support the Flag Officer re-distributed among individual ships. This was detrimental to the flag communications, of course, and the only real solution was to form a deployable pool of extra communications staff to support the fleet in any future conflict. This was strongly recommended in a number of reports. The strain on communications was amplified by the requirement for situation reports, reports of actions taken and intentions required by US commanders. Great importance was placed also on ‘Opsums’, often dispatched with ‘priority’ or ‘immediate’ classifications for the benefit of the press. This was something new to the British at the time, although it was to become familiar to a later generation during the 1982 Falklands War.

Voice communications had to be effective, and there were numerous examples of allied inter-operability. Spotting corrections for naval gunfire support involving a British Royal Artillery officer giving corrections to a Royal New Zealand Navy frigate, supported by a Canadian destroyer whilst shooting in support of South Korean Marines on a remote island, whilst being flown as a passenger in a light aircraft with a USAF pilot were a not uncommon combination. Communications had to work without fail during combat Search and Rescue missions behind enemy lines. For instance, Sub Lieutenant MacMilland, RAN, and Chief Petty Officer Hancox from Sydney were rescued by the ship’s US Navy helicopter, supported by RAN Sea Furies and Meteor fighters of 77 Squadron RAAF. The helicopter finally landed after sunset at a UN air strip having crossed the front line.

With regard to enemy signal communications, their complete lack was often of more significance to the allies than their presence. Allied intelligence experts relied extensively on signals intelligence, but failed to note the gathering Chinese forces in the autumn of 1950 because of their electro-magnetic silence. This was the second and greatest intelligence failure of the war. On a tactical level, the North Koreans used Russian techniques for aircraft interception, keeping their own fighters under tight radio control. Low technology tactics sometimes caught the allies off guard. Ocean instituted pre-dawn missions in 1952 that proved most productive at first and
found enemy transport that was still on the move. The enemy was quick to evolve an effective counter, however, and when *Glory* relieved her and tried the same tactic, the enemy introduced a simple air-raid warning system; fires were lit on the ground from two to three miles ahead of the strike aircraft. On looking back, pilots could see a long line of fires stretching away behind them, betraying their presence both to vehicles and enemy aircraft.

**In Summary**

Any study of the Korean War reveals object lessons in the need for faultless communications. It was the first to be fought from the outset by coalition allies in the name of the UN and required greater detailed inter-service cooperation throughout the conflict than had been the case in the recent world war on which practical knowledge was based. Operations took place at a considerable distance from the main bases of the western powers, which had not expected to fight that sort of war in that sort of location. Overall, the Allies achieved considerable success, but failure to understand the enemy’s ‘low technology’ approach to both signal and logistical communications led to reverses after the Chinese intervention. In one of his reports Admiral Andrewes wrote:

> The Korean War produced some astonishing spectacles The heavily armed and mechanized forces of world powers, with undisputed command of the sea and air, retreated before a mass of lightly-equipped oriental foot soldiers, with our air forces unable to prevent the movement of vast numbers of enemy troops, their concentration, supply and subsequent attack.  

Without allied communications skills, the war might not have ended as successfully as it did.

The signing of an armistice on 27 July 1953 ended hostilities that had lasted 1128 days and involved naval forces from Australia, Canada, Colombia, France, the Netherlands, New Zealand, South Korea, Thailand, the UK and the United States. Two days later the following communication was signalled by Her Majesty Queen Elizabeth II to her fleets:

> Please express to all serving in the Commonwealth Fleet my deep appreciation of the splendid service they have given throughout the fighting in Korea.
Notes

3. The USSR was not represented as its ambassador, Mr Malik, had boycotted the UN Council since January 1950 over the question of Chinese representation. He could not, therefore, employ his right to veto. Yugoslavia abstained from voting.
4. F02FEF, Report of Proceedings in Korea, no. 1. This was the first in series of 62 detailed and informative Reports of Proceedings written by three successive flag officers second in command in Korean operations, quoted in the Naval Staff History, *BR 1736(54)* and preserved in The National Archive at Kew.
5. CinC Far East Station 260431Z; and Naval Staff History, *BR 1736(54)*.
6. CinC Far East Station 261350Z; and Naval Staff History, *BR 1736(54)*.
7. A total of about 2000, half of which were evacuated by sea from Inchon and half by air.
8. Admiralty Message 281702A; and Naval Staff History, *BR 1736(54)*.
9. Naval Staff History, *BR 1736(54)*.
11. Number 13 Carrier Air Group in HMS *Triumph* comprised 800 Naval Air Squadron (NAS) with 12 Seafire FR 47 single-seat fighters and 827 NAS with 12 Firefly FR 1 two-seat fighters.
15. HMS *Kenya* had arrived from Singapore in early July to reinforce HM Ships *Belfast* and *Jamaica*.
18. The threat did concern a number of Western navies and led, in the UK, to the large construction programme of coastal and inshore mine-sweepers during the 1950s.
21. 1st Battalion Argyle & Sutherland Highlanders and 1st Battalion Middlesex Regiment (Duke of Cornwall’s Own). Such a lasting friendship grew between the latter and HMS *Unicorn* that the carrier was subsequently bestowed the rare distinction of being given the right to play the regimental march on all suitable occasions. Only two other Royal Navy warships had ever received such an honour.
22. She paid off and re-commissioned at Singapore in October 1951; the relief crew being sent out in HMS *Warrior*. She eventually returned to Devonport in November 1953.
24. Naval Staff History, *BR 1736(54)*.
25. *Choysang* had a northern Chinese crew and it was known by her British officers that they had received indoctrination by communists during a recent visit to Tientsin. In consequence an armed guard of sailors from Hong Kong was maintained on board.
26. Naval Staff History, *BR 1736(54)*.
27. Polmar, *Aircraft Carriers*.
34. Naval Staff History, *BR 1736(54)*.
35. Naval Staff History, *BR 1736(54)*.
The strategic significance of sea lines of communication (SLOC) was understood too well by the Russian school of naval thought. The security and economic development of the so-called ancient Russia (9th-10th centuries) was largely dependent on uninterrupted maritime links with the Byzantium Empire and Scandinavia. Later, the power of Novgorod (9th-15th centuries) as one of Russia’s leading trade centre of that time, was linked directly to uninterrupted maritime communications with Europe. Indeed, the maritime communications factor was one of the key strategic motives, which led to the formation of a regular Russian naval force in 1696, under the reign of Peter I (The Great). Since its formation, securing access to the open sea, protecting vital points of entry (seaports and naval bases), protecting the nation’s maritime flanks, and maritime communications – not just in support of maritime trade but also in the context of ensuring uninterrupted communications with Russia’s separate maritime theatres and denying hostile enablers the advantages of maritime trade – have been the main strategic missions of the Russian Navy.

Contrary to the global strategic standoff between the Soviet Union and the United States, which was characterised by periods of heightened tensions (late 1940s, early 1960s, and early 1980s) and relative calm (the 1970s), the Cold War at sea was a permanent conflict in development. Effectively, the confrontation at sea had three major phases:

- 1962-86 – a period of rapid growth of Soviet naval power, globalisation of the military-political rivalry, and the establishment of a strategic naval parity.

Throughout the naval Cold War, maritime communications played a considerable and, at times, decisive role in Soviet naval strategy. It was also a point of continuous concern for Western strategists, who often referred to it as the ‘Sea Line Interdiction’ factor. This chapter will critically analyse the significance of maritime communications from 1962, in the aftermath of the Cuban Missile Crisis, through to 1992 when Russia temporarily withdrew from the high seas.
Achieving Strategic Naval Parity

The 1980s, the last decade of the Cold War confrontation, marked a milestone in the development of Russian naval power. For the first time since the formation of a regular naval force in 1696, the Russian (then Soviet) Navy positioned itself as a global blue-water force, capable of challenging the ruler of the sea (the US Navy) and its principal maritime allies in Europe and the Pacific. Achieving this strategic status was the result of an unprecedented long and painful effort by the Soviet state to build up its naval might in response to the growing maritime threats posed by Western maritime coalitions (See Table 12.1).

<table>
<thead>
<tr>
<th>Phases</th>
<th>Principal Tasks</th>
<th>Main Arm(s)</th>
<th>Force Development</th>
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</thead>
<tbody>
<tr>
<td>1945 - mid-1950s</td>
<td>Littoral combat activities in support of land operations</td>
<td>Surface arm</td>
<td>Development of the navy’s traditional components (surface fleet, submarine force, naval aviation)</td>
</tr>
<tr>
<td>Mid-1950s - early 1960s</td>
<td>SLOC interdiction</td>
<td>Subsurface arm</td>
<td>Large-scale introduction of nuclear weapons &amp; relevant combat systems</td>
</tr>
<tr>
<td>Early 1960s - early 1970s</td>
<td>Destruction of enemy major naval strike forces; strategic strikes against land-based targets</td>
<td>Subsurface &amp; air arms</td>
<td>Large-scale introduction of missile technology &amp; mass construction of relevant platforms; large-scale introduction of modern electronics; the initiation of combat service</td>
</tr>
<tr>
<td>Early 1970s - mid 1980s</td>
<td>Strategic strikes against land-based targets; destruction of enemy major naval strike forces</td>
<td>Subsurface &amp; air arms</td>
<td>Initiation of carrier construction programs; introduction of automated control systems; achieving strategic naval parity</td>
</tr>
<tr>
<td>Mid-1980s - 1992</td>
<td>Counter-value strategic nuclear strike; destruction of enemy major naval strike forces &amp; strategic ASW; SLOC protection &amp; defence of the littoral</td>
<td>Subsurface, surface &amp; air arms</td>
<td>Perestroika: reconfiguration of Soviet military planning; the adoption of the defensive doctrine; partial nuclear disarmament</td>
</tr>
</tbody>
</table>

*Table 12.1 The Evolution of Soviet Naval Strategy & Force Development, 1945–92*
After the end of World War II (WWII) in 1945, a significant shift occurred in the global balance of naval forces. With the defeat of Germany and Italy in Europe and Japan in the Pacific, the two former Soviet allies, the United Kingdom and the United States, achieved effective strategic control of the sea. Soviet naval power at that time, brown-water in its orientation with limited blue-water capabilities, was unable to compete with these navies for supremacy on the high seas. Its principal operations were limited to the immediate maritime defensive perimeter of some 150–200km. With the beginning of the Cold War in the late 1940s, the United States and its allies turned the sea into a global launch-pad for possible conventional and nuclear strikes against the Soviet mainland. This growing maritime threat forced the Soviet military-political leadership to respond, especially when its Cold War adversaries deployed new military technologies at sea, affecting the strategic and conventional military balances. The need to expand the strength of the Soviet Navy and to extend its operational activity into the high seas (eventually establishing an outer maritime defence perimeter of 1500–3000km) was understood as a matter of national importance.

Four major phases can be identified in the creation of the Soviet global blue-water force:

- **1946–55** - the elaboration of a conceptual base for the development of a modern ocean-going navy; introduction of missile and nuclear technology at sea; large-scale construction of conventional submarines and the brown-water surface arm.
- **1956–75** - the creation of a blue-water force and the formulation of operational methodology for its employment in strategic operations; establishment of a forward presence.
- **1975–85** - achieving and maintaining strategic naval parity.
- **1986–92** - qualitative modernisation of Soviet naval power and the adjustment of a new geo-political course initiated by Mikhail Gorbachev.

In 1946, the Soviet naval staff proposed a ten-year development program, planning to build 4 battleships, 12 aircraft carriers, 10 heavy cruisers, 84 light cruisers, 358 destroyers and 495 submarines. The plan showed the desire of the Soviet naval command to build an ocean-going navy roughly comparable with the US Navy, and superior to the Royal Navy. Andrei Kokoshin in his major analytical work on the evolution of Soviet strategic thinking wrote:

> Stalin was considering building an ocean-going surface and submarine fleet that would have strategic offensive missions. One of the fundamental aims of this plan was to create a threat to the United States on the seas that was analogous to the US naval threat to the Soviet Union.\(^2\)
On 16 October 1946, Joseph Stalin approved an amended shipbuilding program for the period 1946–55 that aimed to strengthen all Soviet fleets substantially. The need was also driven by the lessons learned during the Korean War (1950–53), when the Soviet Union was unable to pressure the United States primarily due to the limited capabilities of the Soviet Pacific Fleet. As David Winkler wrote in the *Cold War at Sea*:

American naval actions off Korea at the start of the Korean War only reinforced Stalin’s conviction that the USSR needed a large ocean-going navy. The Soviet leader pushed forward a large construction program that began producing cruisers and fast destroyers at about the time of his death in 1953.

The major result of Stalin’s post-war shipbuilding program was the significant enhancement of Soviet naval power in all maritime theatres, especially the Pacific. Although the development of a capability for forward naval presence was underway by the 1950s, Stalin’s death appeared to mark the cancellation of the construction of large surface warships. Nikita Khrushchev came to power and brought with him new views on the use of naval power and the composition of the navy. The concept of developing a balanced fleet capable of contesting command of the sea was replaced with a strategy for the expansion of sea-based assets in the littoral and sea-denial capabilities. After the dismissal of the then Commander in Chief (CinC), Admiral Nikolai Kuznetsov, in December 1955, this new concept of naval development was further elaborated. Preference was given to the construction of conventional and nuclear-powered submarines, light surface warships, including missile craft, and the introduction of missile-carrying naval aviation. In other words, the idea was to create a navy suitable for a global nuclear war, where nuclear-powered submarines and light surface forces would probably have greatest combat stability *(boyevaya ustoichivost)* and the highest survivability potential. Under Khrushchev, the submarine force became the most important and most developed combat arm of the Soviet Navy, followed by missile-carrying naval aviation. At the same time, the Navy’s surface arm was disadvantaged and suffered some serious losses.

The situation began to change after Admiral Sergei Gorshkov was appointed CinC on 5 January 1956. A strong supporter of the concept of a balanced ‘blue-water navy’, Gorshkov had to implement Khrushchev’s policies, but was able to moderate the more excessive demands regarding large surface combatants (See Table 12.2). By 1966, the Navy had commissioned 4 cruisers, 49 destroyers, 105 frigates, 56 nuclear-powered and 102 diesel-electric submarines. Altogether, between 1957 and 1975, the Soviet Navy received nearly 900 new surface platforms (including 7 cruisers) and 371 submarines (including 151 nuclear-powered). While the US Navy’s surface fleet was still superior to its Soviet counterpart, the USSR had more nuclear-powered and more conventional submarines, providing it with a powerful sea-denial capability, which was particularly important in communications warfare.
<table>
<thead>
<tr>
<th>Tasks</th>
<th>Navy’s Combat Arms</th>
<th>Surface Force</th>
<th>Submarine Force</th>
<th>Naval Aviation</th>
<th>Coastal Defence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Principal Tasks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Destroying Carrier Battle Groups</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Destroying Submarines</td>
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<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Destroying ASW Forces</td>
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<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SLOC Interdiction</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Attacking Targets on Land</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Secondary Tasks</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amphibious operations</td>
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<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SLOC protection</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Anti-Amphibious Warfare</td>
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<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Minelaying</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Supporting Tasks</strong></td>
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<tr>
<td>Recon</td>
<td>-</td>
<td>+</td>
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<td>-</td>
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</tr>
<tr>
<td>Supporting submarine Ops</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Patrols</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>MCM*</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>8</td>
<td>12</td>
<td>10</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

*Table 12.2 The Distribution of Combat Tasks within the Soviet Navy, 1960s–70s (Mine Countermeasures)*
Perhaps, the period between 1975 and 1985 could be called the golden decade of Russian naval might. After the late 1970s, growing Soviet naval strength and its expanding power-projection ability represented the most serious challenge to the American fleet. By 1985, the Soviet Navy approached the point where it could credibly threaten US Navy global supremacy, closing the capability gap but still failing to achieve strategic parity at sea. In that year the Navy comprised over 1800 major surface combatants and submarines, including 76 nuclear-powered ballistic missile submarines (SSBNs), and about 1100 minor warships and auxiliaries. Compared to the 1960s, the Soviet sea-based strategic nuclear arm had increased by 200 per cent, with more strategic submarines and longer-range and more accurate submarine-launched ballistic missiles (SLBMs). The overall number of long-range combat deployments undertaken by submarines had increased 20-fold, and deployments by surface combatants, ten-fold. For example, in late 1978 and early 1979, more than 120 warships and support vessels (including up to 30 submarines) were patrolling the sea. Meanwhile, Soviet Naval Aviation (SNA) staged nearly 3500 sorties. By 1985, nearly 160 warships and support vessels (including approximately 40 submarines) were on combat patrols every day, and SNA conducted more than 4500 sorties.

According to Soviet war plans in the 1970s and 1980s, the Navy was to have the combat capability to destroy or at least neutralise the combined naval power of the United States and its allies in the initial period of a military conflict between the two antagonistic military-political blocs. The creation of favourable conditions for the USSR and its allies in the key maritime areas was essential for the successful conduct of such a war. To achieve this condition the Soviet Navy was tasked with a wide range of missions:

- Missile-nuclear strikes against the enemy’s critical land infrastructure.
- Disrupting or weakening the enemy’s sea-based first missile nuclear-strike capability.
- Disrupting maritime communications (anti-SLOC operations), especially in the Northern Atlantic.
- Engaging the enemy’s anti-submarine warfare (ASW) forces.
- Protecting friendly shipping.
- Defending naval bases and operational areas of allied navies.
- Protecting national interests at sea; supporting allies and friends.

The tasks the navy was supposed to undertake were:

- positioning sea-based strategic nuclear forces in preparation for an all-out war
deploying conventional (primarily ASW) forces capable of disrupting the enemy’s first sea-borne strategic nuclear-strike capability

preparing for anti-SLOC operations in the Atlantic and the Pacific oceans

monitoring foreign naval activity, and preparing for sea-based strikes against enemy forces

maintaining presence in strategically important areas (forward presence)

Supporting Soviet national interests through continuous naval presence.

The navy was also supposed to play a significant role in strategic operations. Soviet war plans specified such operations as: strategic nuclear strikes; strategic operations in continental and maritime theatres; strategic air-defence operations against aerospace enemy attacks; and strategic air operations together with the air elements of other Soviet fighting services. The Navy also envisaged joint non-strategic operations with the other fighting services on the maritime flanks of the Soviet strategic theatres of war. In particular, it was planned to stage joint sea-assault landing operations as well as anti-amphibious warfare together with elements of the Soviet ground forces and air force. SNA also prepared to wage operations against an enemy’s carrier battle groups together with the Long Range Aviation (LRA) units.

This Soviet naval expansion caused serious concern among US defence analysts and planners. Bruce Watson, in the Red Navy at Sea, described the improvements in Soviet naval power between 1956 and 1980 and predicted that Soviet naval construction had ‘narrowed the gap between Soviet and US naval power, and the USSR could have naval superiority over the US in future decades’. Two years later, Rear Admiral John L Butts, USN, Director of US Naval Intelligence in the early 1980s, addressed the Senate Armed Services Committee on the growing threat of Soviet naval power. In his concluding remarks, Butts emphasised the USSR’s ever-growing combat potential: ‘The Soviet Navy, which today poses a clear and present challenge to our national interests, will be even more capable tomorrow ... This is the growing danger we confront.’ The 1988 edition of Soviet Military Power highlighted that:

Since 1981, Soviet maritime forces have become increasingly capable of conducting wartime operations at greater distances from home waters, in either a conventional or nuclear environment, and better able to support state interests abroad during peacetime.

Moreover, in August 1989, Vice Admiral Jerome J Johnson, USN, then Commander of the US 2nd Fleet, described the Soviet navy as an offensive force:
At the present time, I think, we look at the Soviet Navy as a very large navy. It is very capable. We understand that there have been comments made that they are a defensive navy, but they certainly have a capability that far exceeds that, from our perspective.\textsuperscript{20}

The US defence planners believed that the Soviet navy posed a true challenge to the ‘West’s traditional dominance of the open ocean’.\textsuperscript{21} The Pentagon anticipated further improvements in Soviet naval capabilities, even to a stage where the US Navy would become an inferior force. According to these assessments, such a situation could arise sometime in the 1990s.

**Reasons for Provoking the Soviet Naval Leap**

The rapid growth of Soviet naval capabilities during the second stage of post-WWII development was caused by a combination of geo-political and geo-strategic considerations that confronted Soviet political and military leadership in the 1960s.

As discussed earlier, the Khrushchev era marked an initial slow down in the post-1945 organic growth of Soviet naval strength. Soviet experiences in the war against Nazi Germany and Japan resulted in the domination of the continentalist army culture and the growing influence of a new but ambitious combat element of the Soviet Armed Forces – the Strategic Missile Force.\textsuperscript{22} The war at sea was considered a matter of secondary significance. For example, Marshal Sokolovskiy in his monograph *The Military Strategy*, while acknowledging the prospects of large-scale operations in maritime theatres, expressed doubts that the outcome of the armed struggle at sea could have any significant impact on the overall outcome of a future war. He argued that ‘the main aim of combat activities for the navy in the maritime theatres is the destruction of enemy naval forces and the disruption of its oceanic and sea communications.’\textsuperscript{23}

However, very soon these views were proven outdated. In the same year that the first edition of Sokolovskiy’s monograph was published in Moscow, the Soviet Union found itself engaged in a major geo-strategic standoff with the United States. In the most dangerous encounter between the two superpowers since the Berlin crisis of 1948, the Cuban crisis of 1962 showed the USSR’s weaknesses in power projection and the lack of development in its surface naval arm.

In response to American plans to execute a military invasion of Cuba with a strategic end of achieving a regime change (Operation MONGOOSE), the Soviet leadership ordered a covert deployment of a combined-arms Operational-Strategic Group with a total strength of 50,000 personnel, reinforced with air defence units, tactical bombers, fast attack craft and surface-to-surface anti-ship missiles (Operation ANADYR). The main deterrent force was several divisions (diviziony) of R-12 intermediate range ballistic missiles (IRBMs) armed with nuclear warheads. By late October 1962, the Soviet Union was able to covertly deploy 42,000 troops, 36 IRBMs plus 164 nuclear warheads and free-fall bombs.\textsuperscript{24}
Although the covert deployment was a success (US intelligence failed to uncover the actual size of the Soviet Cuban group), the USSR found it highly challenging sustaining the operation, particularly after US President John F Kennedy signed Decree N 3504 (complete naval blockade of the island) on 23 October 1962. The deployed 69th Submarine Brigade of the Northern Fleet (four Foxtrot class conventional submarines) could only tease the US Navy’s standing force of 183 warships, and had no success in breaking the blockade.

These weaknesses were a major factor in the eventual withdrawal of Soviet missiles from Cuba, and thus Soviet political defeat in its power struggle with the United States. Admiral Chernavin wrote in *Atomny Podvodny* that the Cuban crisis demonstrated the ‘obvious loosening of the USSR from the possible enemy [the United States] in the sphere of sea-based armaments’. The naval imbalance was particularly evident in the Soviet surface fleet’s inferiority:

> Soviet leaders, considering the part played by US sea power in the Cuban crisis...and in the Korean War, became convinced that they could not attain national objectives while relying solely on submarines for naval power. To them recent events provided persuasive arguments for building a surface fleet.

As in the 1930s, during the Spanish Civil War, as well as during the war in Korea in the 1950s, Soviet weaknesses on the high seas, where foreign policy initiatives could not be supported by military means, made the Soviet military-political elite reconsider its opposition to the construction of a balanced ocean-going navy. Another contributing factor was the US Navy’s deployment of offensive nuclear power at sea. The introduction of Lafayette class SSBNs carrying Polaris-Poseidon SLBMs, a primary weapon system to be used in a nuclear strategic strike against targets in the Soviet Union (later replaced by the more potent Ohio-Trident strategic system), called for a naval force capable of engaging these strategic platforms in their own patrol zones, such as open-ocean strategic ASW operations. Adding to this was the growing threat from a US carrier strike force, which was undergoing a qualitative transformation in the 1960s with the introduction of large nuclear-powered aircraft carriers, particularly with the commissioning of USS Enterprise.

After 1945, US Navy carriers became combat-delivery platforms for tactical nuclear weapons and, over the years, more and more powerful for this task. A standard US Navy strike carrier battle group (CVBG) comprised eight to ten escorts plus a carrier and could launch air and missile strikes at a distance of 1000–1500km from its targets. An ability to deliver either high-precision or nuclear strikes against continental targets makes CVBGs a potent reserve for US strategic deterrent forces. The Soviet military command clearly understood the dangers posed. While discussing the development of Soviet naval power during the Gorshkov era, Rear Admiral Zakharov noted in an article in *Morskoi*
Sbornik that the development of anti-carrier warfare capabilities was the Soviet navy’s second-most important strategic task after the introduction of sea-based strategic nuclear forces.32

The deployment of new American military technologies at sea were clear illustrations of the implementation of the principles of a new US maritime strategy, which envisioned a ‘forward defence’ of European and Pacific allies while at the same time putting strategic pressure on Soviet flanks. The Soviet naval command and political leadership were convinced of the need to bring their naval forces onto the high seas. As David Winkler in Cold War at Sea wrote:

The imminent threat posed by Polaris missiles on board American nuclear-powered submarines was one the Soviets were unprepared to handle. The new mobile undersea strategic missile bases were simply beyond the reach of the Soviet submarines, warships, and land-based aviation that had been amassed to counter the nuclear threat from the new big-deck carriers being commissioned by the US Navy.33

Kokoshin also highlighted these factors:

The necessity to develop a Soviet oceanic fleet was substantiated by the military, because of the growing strategic threat to the Soviet Union and its allies that was posed by US nuclear-armed aircraft carriers and Polaris submarines. Thus, the key mission of the Soviet Navy was to destroy the enemy’s naval strike force and ground installations. The more traditional mission of breaking up US sea lines of communication, particularly those that connected the United States with its European allies, remained on the navy’s agenda.34

It was important for the Soviet naval command to extend the traditional maritime defensive barrier well into the open ocean, away from home shores. To achieve this strategic objective, the Soviet Navy had to establish its permanent naval presence in the key maritime areas used as zones of combat patrol by the US Navy’s SSBNs and CVBGs. Admiral Kostev argued that the US open-ocean maritime strategy provoked a Soviet symmetric response:

Therefore it is quite natural that beginning the second half of the 1960s, the priority in the development of the Soviet Armed Forces to some extent turned in the navy’s favour.35

The move towards prolonged blue-water operations was reflected in the re-evaluation and expansion of the Navy’s tasks and missions during the Cold War years. At the same time, Soviet naval command continued to value operations aimed at achieving control over critical maritime links, a factor that grew in its strategic significance particularly during the second phase of the Cold War confrontation at sea, between 1962 and 1986.
Appreciating the Maritime Communications Factor

During the Cold War, Western defence and intelligence analysts were divided in their assumptions about the significance of warfare on communications (anti-SLOC and pro-SLOC) in Soviet naval thinking and war planning. For example, a US naval intelligence report on Soviet naval capabilities, later published as a book, presented the following view:

The interdiction of Western sea lanes of communication has been a mission of the Soviet Navy since the beginning of the ‘Cold War’. The relative importance of SLOC interdiction within the hierarchy of Soviet naval missions has fluctuated, depending on the current perceptions of the likely nature and length of NATO-Warsaw pact conflict.\(^3^6\)

In reality, securing critical maritime links was considered to be a matter of continuing strategic significance for the Navy and the Soviet Armed Forces in general. Admiral Novoselov insisted that the maritime communications factor was critical in shaping Soviet naval power during the Cold War.\(^3^7\) A review of the evolution of Soviet naval planning between 1946 and 1987 illustrates this hypothesis.

In the decade after 1945, Soviet naval developments were marked by the reorientation of the principals of application of national naval power; away from a limited role in support of the armed struggle on land, and towards a more independent combat role at sea, where the Navy assumed more ambitious, strategic-level tasks. The first major conceptual document concerning the application of Soviet naval power was elaborated between 1945 and 1946. Entitled \textit{Nastavleniya po Vedeniyiu Morskikh Operatsiy Voenno-Morskim Flotom} (Guidelines on the Conduct of Sea Operations by the Navy), and also known as \textit{NAMO–46}, the document emphasised the effective conduct of amphibious operations in the interests of the army.\(^3^8\)

After 1947, SLOC interdiction activities began occupying a progressively more significant role in Soviet naval thinking and planning. The Naval Staff planned systematic (continuous) combat activities combined with specific operations aimed at achieving a particular end (for example, the destruction of a large convoy) within a given time and a designated area. As Admiral Kasatonov argued, ‘In the first years of the Cold War the Soviet Union was trying to create a constant threat to the US communications in the Atlantic and the Pacific Ocean.’\(^3^9\)

From the mid-1950s, Soviet SLOC interdiction activities were extended into the high seas. Several factors called for the need to review the principles of application of national naval power. Among them were the growing conventional capabilities of the Soviet Navy and the numerical expansion of its standing force, the introduction of nuclear weapons and thus the increased offensive capabilities of Soviet fighting services, including the naval arm and, finally the increased possibility of an all-out combined conventional and nuclear war with the United States and its allies in Europe and the Asia-Pacific region and the subsequent need to respond to this strategic threat.
Even the traditional opponents of a strong navy understood this strategic need. In particular, Marshal Georgiy Zhukov, a fierce supporter of the land-based strategic orientation of Soviet military power, agreed in 1955 that ‘in a future war the struggle on maritime communications is assuming a more significant role than it was in the past war’. This appreciation of the Navy’s strategic significance by some ‘heavyweights’ of the Soviet continental school of military thought was driven by the pragmatic evaluation of the sustainability of Western maritime coalitions in both World Wars and the realisation of their ‘Achilles heel’ – the trans-oceanic connection. It was projected that the success of US operational army groups in Europe and possibly Asia would depend on uninterrupted supplies of reinforcements and military hardware, the same went for assisting America’s European allies - NATO members. These geo-strategic considerations eventually convinced the Soviet military-political leadership that the outcome of the struggle for principal maritime links (warfare on communications) may, under certain circumstances, affect the outcome of a future war. The navy was tasked to develop the relevant strategy.

On 3 March 1956, Admiral Vladimir Alafuzov presented a report titled ‘The Navy’s Actions during the Strategic Offensive Operation’. Bearing a top secret classification, the report detailed the Soviet’s military vision of future war and the navy’s new roles and missions. In particular, the value of major surface combatants offering traditional gunfire support to ground forces was questioned due to potential high losses and limited combat value, while attack submarines and long-range strike aviation were favoured as primary offensive platforms, especially against an enemy’s maritime communications. In fact, the main theme of Alafuzov’s presentation was the need to prioritise SLOC interdiction warfare. This is how Dotsenko described the key points:

By taking into consideration the nature of a future war Alafuzov concluded that the enemy’s most vulnerable element was its sea and oceanic communications: by sinking a single cruise ship one can eliminate an entire division. He noted that it is much simpler to sink a transport carrying 50-60 tanks than destroying these tanks by offering gun support to the army’s flanks. To sink these ships one needs only several torpedoes launched from a single submarine.

As a consequence, the report recommended that the navy’s special operations against enemy strategic maritime communications within a range of combined operations, which formed part of a strategic continental operation of the Soviet Armed Forces, primarily against the United States and NATO, were given the highest priority.

These recommendations were reflected in the new operational guidelines released by the Soviet Naval Staff in 1957. Known as NMO–57, or Nastavleniya po Vedeniiu Morskikh Operatsii (Guidelines on the Conduct of Sea Operations), they emphasised the need to extend naval activity well into the open ocean, primarily to increase the
effectiveness of offensive operations against an enemy’s strategic maritime links.\textsuperscript{44} NMO–57 also discussed the massive employment of nuclear weapons in naval defensive and offensive operations, especially in support of the navy’s strategic tasks. As Dotsenko noted:

They included the undermining of the enemy’s military-economic might by the way of disrupting its sea (oceanic) communications and the destruction of naval bases, ports, industrial and administrative centres located on the sea and ocean coasts; … defence of national economic and military shipments; support of ground forces operations in coastal zones; the destruction of enemy’s naval grouping.\textsuperscript{45}

To conclude, in the 1940s and throughout the 1950s, Soviet military leadership considered SLOC interdiction as one of the two primary strategic tasks of the Soviet Navy (See Table 12.3).

<table>
<thead>
<tr>
<th>Main Tasks</th>
<th>Forces Involved</th>
<th>Targets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disrupting main maritime communications</td>
<td>Naval aviation, attack submarines, surface forces (to protect friendly submarines)</td>
<td>Ports &amp; naval bases, convoys, carrier battle groups</td>
</tr>
<tr>
<td>Combined-arms counter-amphibious defensive operations</td>
<td>Naval aviation, attack submarines, surface forces, coastal defence, Air Defence</td>
<td>Carrier battle groups, convoys &amp; amphibious forces, combat aviation</td>
</tr>
<tr>
<td>Combined-arms offensive operations in coastal areas</td>
<td>Naval aviation, attack submarines, surface forces, coastal defence, Air Defence</td>
<td>Strike naval groups, SLOC, combat aviation</td>
</tr>
<tr>
<td>Protecting friendly maritime communications</td>
<td>Naval aviation, attack submarines, surface forces, coastal defence, Air Defence</td>
<td>Carrier battle groups &amp; other strike forces, combat aviation</td>
</tr>
</tbody>
</table>

\textit{Table 12.3: War Tasks of the Soviet Navy, 1956}

As already noted, the 1960s marked a significant shift in Soviet naval war planning as well as in the theory of the wartime use of naval power. This shift was possibly due to the considerable changes in the appreciation of the strategic value of modern sea power within the Soviet political and military establishment together with the continuous quantitative and qualitative improvements of national naval power.
The complex geography of the Soviet Union as a maritime power, in particular the wide spread of maritime theatres and the subsequent need to divide the standing force, left the Soviet naval command with little choice but to adopt new practices for the employment of naval power in peacetime, resulting in the initiation of the so-called combat service (*boyevaya sluzhba*). This envisaged the build up of the most potent surface combatants and submarines in the areas destined for wartime operations.

A turning point came in 1963–64, when Soviet naval forces began patrolling distant maritime areas (combat service in forward areas) on a regular basis. Kasatonov noted that combat service was crucial in peacetime and also demonstrated the high level of readiness of the navy for war. Although a routine operational activity during the Cold War, the combat service also served as an effective deterrent against unexpected sea-borne attacks. Forces involved in combat services activities in forward areas effectively became the first strategic echelon of the Soviet naval standing force from 1964 until 1992.

Soviet naval forces pursued multiple tasks as part of their combat service, including:

- combat operations of SSBNs and associated supplementary forces
- strategic ASW (anti-SSBN/nuclear-powered submarine operations)
- surveillance of the US Navy’s CVBGs
- special counter-operations against foreign submarines and surface ships engaged in reconnaissance activities near or inside Soviet territorial waters
- maintaining a naval presence in the high seas.

Forces involved in combat service operations were also tasked to control strategically important arteries, especially the maritime oil routes, and critical ‘choke points’, and be prepared to paralyse them in the initial stages of war.

The overall intensification of Soviet naval operations and the establishment of a permanent forward presence called for the creation of special naval groupings (the first strategic echelon). These special operational squadrons (*operativnye eskadry*) included the 5th Operational (Mediterranean) and the 8th Operational (Indian Ocean) Squadrons. Formed in 1967 and 1968 respectively they were directly subordinated to the CinC of the Soviet navy. Additionally, operational squadrons were formed within two Soviet ocean fleets for area operations: the 7th in the north and the 10th in the Pacific. Both these squadrons (plus the 17th Southeast Asian) were responsible, among other tasks, for SLOC interdiction operations in the North Atlantic, western Pacific and around the Philippines and the Indonesian archipelago.
The introduction of the first strategic echelon required the state of technical readiness of operational platforms and units to be upgraded. As a result, the Soviet Navy introduced a concept of a constant combat readiness (постоянная боевая готовность) – the ability to commence military operations at any time and achieve success. According to new guidelines, the Navy had to keep over half of its sea-borne platforms, 90 per cent of its aircraft and 100 per cent of its coastal defence, communications and electronic warfare units in a state of constant combat readiness. The tempo of Soviet naval activities consequently intensified.

Owing to its geographic situation and widely separated maritime theatres, the Soviet Union had no choice but to split the navy in order to be able to respond to maritime threats coming from all directions. This division created several geo-strategic disadvantages. The dispersion of the force between different maritime theatres makes it hard to achieve superiority in all theatres simultaneously. In a wartime environment, the physical separation of the fleets and the USSR’s difficult geographic configuration complicates the manoeuvre of forces between theatres. The development of an inland maritime network to ease the exchange between European fleets through a system of canals and rivers did not resolve the problem, nor did the exploration and development of the Northern Sea Route between the Northern and Pacific theatres. Maintaining secured connectivity was a matter of principal importance for the Soviet navy, while other considerations included:

- securing access to the open ocean and closed principal sea theatres (for example, the Mediterranean)
- pressuring or paralysing enemy SLOC
- supporting the first strategic echelon and forward combat operations
- ensuring uninterrupted connectivity between points of basing within a theatre
- supporting SSBN deployments (particularly in the Pacific during the transit to the SSBN patrol area in the Sea of Okhotsk).

To resolve the choke point dilemma the Soviet Navy faced a multi-tiered challenge. First, Soviet forces had to secure what could be called the 1st Tier Group of choke points – critical natural and made-made passages (ASW barriers such as Greenland-Iceland-United Kingdom (GIUK) Gap) to enter the high seas (See Table 12.4). The 2nd Tier Group included a range of straits and narrows that were critical to control either to enter particular theatres of operations (for example, the Gibraltar or the Malacca Strait) or to block maritime (especially oil) traffic (Suez Canal, Hormuz Strait and other).
The Soviet Naval Staff well understood that its Cold War opponents would try to exploit the USSR’s strategic weakness and limit the effectiveness of its naval operations. Gorshkov in the *Sea Power of the State* noted:

> Even in peacetime, in establishing control over straits and narrows, they [United States and allied navies] are seeking to create all the pre-requisites for achieving dominance in these areas immediately after the start of a war.\(^{57}\)

In response to these concerns in the early 1950s the Soviet Naval Staff developed a comprehensive concept of naval operations aimed at securing critical choke points either through establishing control (through amphibious assaults) or denying free passage to hostile forces (primarily through blockade).\(^{58}\) Seizing control over selected choke points was regarded as a form of offensive naval operation, while denying their use as a form of defensive naval engagement.\(^{59}\)

The 1960s were also marked by debate about the continuing relevance of strategic communications warfare. Soviet military planners grew increasingly concerned with how to neutralise US Navy SSBNs and CVBGs (forward combat operations), overshadowing the importance of putting pressure on enemy trans-oceanic links. The fact that in a future nuclear conflict the need to target enemy SLOC would be unnecessary, or might only be used as the last ‘pressure point’ after nuclear options had been exhausted, strengthened the arguments of those critical of maritime interdiction operations.\(^{60}\) However, at the end of the 1960s, naval operations against enemy communications grew back in their significance. Gorshkov clarified the matter:

<table>
<thead>
<tr>
<th>Fleet</th>
<th>Key Choke Point/s – Straits</th>
<th>Strategic End/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>GIUK Gap</td>
<td>Trans-Atlantic links, the Mediterranean</td>
</tr>
<tr>
<td>Pacific</td>
<td>Bering, Tartar, La Perouse, Ekateriny, Tsushima</td>
<td>The Northern Sea Route, western Pacific, Southeast Asian links, the Indian Ocean</td>
</tr>
<tr>
<td>Baltic</td>
<td>Danish (the Belts)</td>
<td>Trans-Atlantic links, the Mediterranean</td>
</tr>
<tr>
<td>Black Sea</td>
<td>Turkish (Bosphorus, Dardanelles)</td>
<td>The Mediterranean</td>
</tr>
</tbody>
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*Table 12.4: Principal 1st Tier Choke Points*
These operations [SLOC interdiction and protection] are now the most important constituent part of the efforts of a fleet, aimed at undermining the military-economic potential of the enemy, that is, at solving one of the special tasks arising from the main tasks of a modern fleet in war.61

The expansion of Soviet naval activity into the high seas, the establishment of a permanent forward presence, and the continuous introduction of new weapons systems made the provisions of existing naval strategy obsolete. Throughout the 1970s Soviet naval planners continued improving their conceptual methodology to include special strategic-level operations such as the forward combat operations (anti-SSBNs and anti-CVBGs), strategic strikes against land, warfare on communications (anti/pro-SLOC) and amphibious operations.

The Soviet Naval Staff’s most comprehensive SLOC interdiction operation aimed to paralyse the supply of enemy land forces in Europe and Asia. Using a ‘strike-in-depth’ approach, continuous attacks were to be conducted against enemy communications from embarkation until destination. The strategic outcome expected was the disruption of transoceanic supplies, which could be achieved either by reaching a level of reduction (terminating 50 to 70 per cent of the initial volume of maritime traffic), interruption (30 to 50 per cent), or difficulty (10 to 15 per cent), with the first two being the most desirable ends.62

The capability to implement these plans was tested during numerous exercises carried out by all four Soviet naval fleets and demonstrated during the worldwide Soviet naval manoeuvres Okean (also known as Ocean-70) and Okean-2 (Ocean-75). Okean, the Soviet navy’s largest ever global exercise, involved 80 submarines (including 15 nuclear-powered), 84 surface combatants, and 45 auxiliaries supported by 20 SNA regiments and 2 regiments of naval infantry.63 Shore-based units of the SNA, Air Defence and LRA also participated.

Okean involved 31 separate exercises, with the majority of naval activity taking place in the North Atlantic and Norwegian Sea, the primary maritime highway between Europe and North America. Although Okean-2 was not so grand in terms of numbers it was in some ways more substantial than the 1970 manoeuvres, with Soviet ships operating well beyond the 2000-2500km ‘defence perimeter’ around the USSR.64

The growing threat posed to Western maritime communications was taken very seriously by senior US Navy commanders. Watson in Red Navy at Sea, remarked:

The Soviet Navy … has helped to reduce NATO’s warfighting capability. For example, Admiral Moorer has stated that although all contingency plans for the defense of NATO countries are predicated on an allied control of the North Atlantic sea lanes, the Soviets could deny the use of those lanes in wartime, thus reducing or preventing the
reinforcement of Europe. Admiral Zumwalt believes that regardless of the relocation of US naval power, the allies would probably lose a war in Europe in six weeks.65

In the early 1980s, Soviet military planning placed most emphasis on maintaining strategic nuclear retaliatory capabilities, thus inducing a reassessment of the role and place of SSBNs, the sea-based strategic component of the nuclear triad. Consequently, a considerable share of the Soviet Cold War naval operational activity was designed to ensure the survival of SSBNs in their combat patrol areas.66 The Soviet Navy’s tasking required it to achieve six strategic missions in order of priority:

1. Attacking strategic targets on land.
2. Forward combat operations (seeking and destroying enemy SSBNs, CVBGs and other strike battle groups).
3. Achieving sea control.
4. Warfare on communications (anti-/pro-SLOC).
5. Defending points of basing and critical coastal areas.
6. Supporting ground forces in the littoral.

The clear shift towards SSBN protection was taken by Western defence analysts as a sign that warfare on communications was losing its significance for the Soviets. Thomas Burnes, for example, argued in 1978 that the Soviet Union was not planning to fight a conventional war of attrition at sea, while David Winkler notes that ‘…there were indicators that the Soviet naval strategy was shifting away from the sea-denial mission that the Nazis had pursued three decades earlier’.67 Similarly, in 1986 Paul Dibb speculated that anti-SLOC operations were not the top priority for the Soviet Naval Staff.68 These assumptions were not accurate,. Although ensuring the combat stability of the SSBNs remained the highest priority, the strategic significance of maritime communications was still appreciated. Writing in The Navy: The Role, Perspectives of Development, the Use, one Soviet author noted:

In the modern war, the struggle for maritime communications will retain its significance, it will continue to be an important component of the combined efforts to suppress the enemy’s military-economic potential, and will occupy an important place in the system of the armed struggle of confronting coalitions ... The outcome of this struggle and the sustainability of transoceanic links will largely determine the success of military operations in the continental theaters and, under certain circumstances, the continued capacity of states to resist.69
Indeed, having established a true global presence by 1980, the Soviet Naval Staff intended to engage in protracted warfare on Western communications, even in the event of a nuclear conflict.\textsuperscript{70}

The adoption of the so-called ‘defensive doctrine’, announced on 29 May 1987, marked a gradual change in the strategic application of Soviet military power. Yet, even with the adoption of Gorbachev’s ‘new thinking’, warfare on communications remained one of the priorities shaping the naval operational agenda. This remained the case until the collapse of the Soviet Union in December 1991 and the subsequent temporary withdrawal of the Russian Navy from the high seas.

\textbf{Lessons Drawn}

The history of the Soviet naval Cold War is full of complexity and controversy. The debates about the USSR’s strategic intentions at sea continue and many questions have yet to be answered. Nevertheless, some conclusions may be drawn. As part of its Cold War strategic rivalry with the United States, the Soviet Union was forced to challenge its opponent not only on land but also at sea. To achieve global naval parity, the Soviet navy was given a wide range of missions and tasks. Gorshkov spent 30 years building up Soviet naval might, and the rapid expansion from the 1960s to the 1980s in the navy’s ‘blue-water’ capabilities provided the nation with an ability to project its power into vast areas of ocean. Despite this effort, the Soviet Union was unable to reach the same level of combat effectiveness as its rival. Although the extension of Soviet naval operations into forward areas posed a serious threat to US forces and Soviet battle groups could probably have inflicted sufficient damage to at times deny the US Navy the use of the sea, the USSR had little chance of achieving complete control of the high seas.

Notwithstanding Gorshkov’s attempts to build a balanced fleet, Soviet Cold War naval forces were largely defensive in nature. Their capabilities were largely oriented toward denying the use of the sea to the enemy, rather than securing it for its own use. One of the principal reasons for this orientation was the pressing need to mount an effective campaign against the West’s maritime communications. Novoselov effectively summarised Soviet Cold War thinking as follows:

\begin{quote}
  The country’s military-political leadership have always emphasised that in a case of war one of the most important tasks of the Soviet Navy was the disruption of communications in the Pacific and Atlantic oceans, to prevent the supply of troops, weapons and military equipment and material hardware from the American to Eurasian continents.\textsuperscript{71}
\end{quote}

The Soviet Union nevertheless had reasonable expectations of success in a future world war. By planning to interdict strategic transoceanic SLOC the USSR aimed to critically damage the economic potential of any Western maritime coalition and
its ability to support operations overseas. Perhaps in this context the defensive nature of Soviet naval power gave way to a clear display of strategic offensive intent and capabilities.

There were other reasons that justified the continuous Soviet interest in maritime communications. These include securing access to the high seas through establishing control over critical choke points (a factor that grew in its significance with the globalisation of Soviet naval activities and the establishment of a permanent forward presence); maintaining links between maritime theatres; strategic naval warfare (responding to the deployment of nuclear weapons and delivery platforms and supporting their own sea-based strategic forces); and, by assisting major foreign policy actions worldwide (the importance of this was understood by the Soviet Government after the Cuban Crisis).

Soviet appreciation of the maritime communications factor in world events was based on a multi-vectorial approach. Its struggle to control global maritime links enabled the USSR to achieve a relative status quo at sea, demonstrate a potent deterrent, and possess limited offensive capabilities in operations against hostile naval and land forces. Above all, the contest for mastery of maritime communications enabled the Soviet Union to become a global superpower, even if only for a limited time.

Notes

1. Russian historians and military analysts consider Winston Churchill’s speech in Fulton, Missouri, on 5 March 1946, as signalling the beginning of the Cold War. See G Kornienko, ‘Kholodnaya Voyna kak Osnovnoi Generator Gonki Vooruzheniy’ (The Cold War as the Main Generator of the Arms Race), in AV Minayev (ed), Sovetskaya Voennaya Moshch (Soviet Military Might), Moskva, Voenny Parad, 1999, p. 43; I Kasatonov, Flot Vyshel v Okean (The Navy was put out to the Ocean), Moskva, Andreevskiy Flag, 1996, p. 352.


3. The plan, which can be regarded as the first stage of Soviet post-war naval development, called for the construction of 4 heavy gun cruisers, 30 light gun cruisers, 188 destroyers and 367 submarines. AD Muraviev, The Russian Pacific Fleet: From the Crimean War to Perestroika, Papers in Australian Maritime Affairs No. 20, Canberra, Sea Power Centre - Australia, 2007, p. 21.


5. In Khrushchev’s view, the introduction of nuclear weapons and the large-scale development of combat missiles diminished the role of large surface combatants in modern naval warfare.


8. In particular, further construction of the *Sverdlov* class gunships was cancelled (ships 90–95 per cent completed were scrapped), surface ships were restricted to no more than 5000 tonnes in displacement and any design work on aircraft carriers was stopped. See Kasatonov, *Flot Vyshel v Okean*, p. 55.


16. Long Range Aviation (*Dal’nyaya Aviatsiya*) is the strategic bomber force responsible for retaliatory strategic nuclear strikes and operations against high value naval targets (primarily strike carrier battle groups).


30. For information on the role of the Soviet navy in the Spanish Civil War see Muraviev, *The Russian Pacific Fleet*, p. 18.


33. Winkler, *Cold War at Sea*, pp. 27.

34. Kokoshin, *Soviet Strategic Thought*, p. 120.
44. Kostev, *Voenno-Morskoi Flot Strany*, p. 139.
49. These operations included searching enemy submarine patrol areas, and establishing and maintaining acoustic contact with boats, the so-called ‘seek-and-shadow’ operations.
51. The hypothesis that the Soviet navy planned to paralyse Western oil traffic can be supported by an analysis of Soviet naval writings. See for example, N. Vyunenko B Makeev, V Skugarev, *Voenno-Morskoi Flot: Rol’, Perspektivy Razvitiya, Ispol’zovanie* (The Navy: The Role, Perspectives of Development, the Use), Moskva, Voenno Izdatel’stvo, 1988, pp. 198, 200. This acclaimed publication identified the Mediterranean and the Persian Gulf as major transit areas of oil shipments to the United States and other NATO member-states.
56. The geography of each theatre and its strategic importance for Soviet security affected the development of the composition of each regional naval force, resulting in the establishment of two ocean-going fleets (Northern and Pacific); two fleets for operations in the enclosed theatres (Baltic and Black Sea); and one separate flotilla (Caspian). This organisation of the Russian navy continues today.
58. Priority was given to establishing control over the 1st Tier Group.
64. Watson, *Red Navy at Sea*, p. 32.


In the summer of 2005, US Chief of Naval Operations Admiral Mike Mullen, outlined at the International Sea Symposium a proposal for a ‘1000-Ship Navy’. Unlike the 600 ship navy of the 1980s Reagan administration, this navy would fit very much into the ‘coalition of the willing’ preferences of current American defence policy. Mullen challenged the collective leadership of most of the globe’s naval services to:

Imagine (a) fleet operating with the navies and naval infantries of a host of other nations, again, fully netted and interoperable. They could be anywhere the national and international political leadership wanted them to be … ready to go at a moment’s notice – and they could contribute in all manner of ways. Not just a force to wage war, but a force to wage peace as well. A force for good.¹

In May 2006, Mullen’s proposal was translated into the Navy Strategic Plan as a US Navy objective, and formalised by a new ‘Maritime Strategy’ that appeared in 2007. The former document argues that ‘no single nation has the sovereignty, capacity, or control over the assets and resources’ to meet the challenge of the ‘transnational threats in the maritime domain.’ The development of already existing naval relations between states can be taken advantage of to ‘export maritime security by sailing beyond territorial waters or exclusive economic zones to bolster maritime security in other parts of the world.’²

The US Coast Guard has also proposed a similar program under the rubric ‘Maritime Domain Awareness’ (MDA). MDA proposes strategic information sharing at the same level as tactical situation awareness. In an age of networked adversaries taking advantage of the relative security provided by anarchical conditions in weak states and legal ‘grey areas’, a higher level of strategic awareness is necessary to prevent these groups from exploiting their natural advantages. MDA proposes an architecture to fuse information in order to generate actionable intelligence so that ‘the most threatening vessels … receive priority cuing in order to focus our assets in the right areas.’ In this regard, the MDA is as much about policy coordination between governments, ports, and shipping companies as it is in generating maritime coalitions of the willing to share information at sea:
Domain awareness requires integrating all-source intelligence, law enforcement information, and open-source data from the public and private sectors. It is heavily dependent on information sharing and requires unprecedented cooperation among the various elements of the public and private sectors, both nationally and internationally.\(^3\)

While networks have faced significant operational development challenges in terrestrial applications, it is not yet apparent if their application has reached a high water mark both at sea and in the air. The remarkably successful naval coalition operations in the Persian Gulf region that functioned in support of operations ENDURING FREEDOM and IRAQI FREEDOM may have provided significant stimulus for Mullen’s noteworthy proposal. Between the autumn of 2001 and 2003, two distinct naval coalitions developed a high degree of maritime security through their operations in the Red Sea, Gulf of Oman, and Northern Persian Gulf. A collection of European vessels operating off the Horn of Africa conducted limited boarding operations and developed a regional picture of maritime activity in support of counter terrorist operations. Canada effectively integrated into American naval operations, supporting first an amphibious group operating off the coast of Pakistan, and later led a diverse collection of coalition nations conducting a ‘leadership interdiction operation’ aimed at terrorists fleeing Afghanistan. Finally, Australian, British, and Polish vessels supported American operations in the Persian Gulf in the conduct of IRAQI FREEDOM.

The successes of those operations mask some pressing challenges that may not directly translate into similar successes for 1000-Ship Navy operations, or the realisation of the Coast Guard’s MDA. To a large degree, the successes in the Gulf region were due to the leadership of America’s closest allies and the high levels of professional trust that are enjoyed by the navies of those countries. In broader coalition efforts such as those that are envisioned by the 1000-Ship Navy concept, or the even broader collection of maritime security and law enforcement agencies, port authorities, and shipping companies that would participate in MDA, similar levels of cooperation may be extraordinarily difficult to coordinate.

What will determine the success or failure of such ventures are hardly the technical issues that the networking literature likes to concentrate on. Indeed, the technical issues may be the easiest to solve. The United States in general has already developed releasable network terminals to facilitate its partners’ connection to coalition networks like the Combined Enterprise Regional Information Exchange System (CENTRIXS).\(^4\) Certain levels of capital investment must be made by partner nations in satellite communications, which is a real barrier for small and under-funded militaries operating in highly localised areas. However, if the will is there and the money invested, the technical means can be provided.
The most problematic aspect of these ventures, however, is found precisely in the area of political will. Policy issues remain the biggest barriers to enhanced naval cooperation, either in terms of warfighting operations or the simple provision of maritime security.

The Nature of Network Centric Warfare

Network Centric Warfare (NCW) is a relatively new concept, first appearing in the open literature in 1998 in a United States Naval Institute Proceedings article authored by Vice Admiral Arthur Cebrowski and John Gartska. However, the idea of networking information amongst naval platforms began to emerge during World War II (WWII). The challenge presented to surface ships by aircraft, ubiquitous at sea for the first time with the appearance of modern aircraft carriers, required considerably more coordination amongst fighting platforms than had traditional naval gunnery. The coordination of diverse vessels and missions resulted in the development of modern Combat Information Centres, or Operations Rooms. Contemporary tactical data exchange systems such as Link and the Global Command and Control System (GCCS) can also trace their origins to WWII.

In 1996, Admiral William A Owens published his article ‘The Emerging System of Systems’ in the National Defense University’s Strategic Forum describing a concatenation of sensors, command and control systems, and precision weaponry that would, he argued, result in ‘dominant battlespace knowledge’. In the same year, Joint Vision 2010 appeared, describing the ‘conceptual template ... for achieving dominance across the range of military operations through the application of new operational concepts’. It introduced the concepts of dominant manoeuvre, precision engagement, focused logistics, and full spectrum protection to achieve ‘massed effects’. Joint Vision 2010 represented the distillation of 20 years of technological advance and operationally focused thinking in the US armed forces. Yet it was clear that ‘information superiority’ was the basis for these novel operational concepts.

In 1998, the NCW concept emerged, first in Cebrowski and Gartska’s seminal article and later in a book written jointly by Gartska, Director of Research and Strategic Planning for the Office of the Undersecretary of Defense (C3I), David S Alberts, and Colonel Frederick P Stein. NCW was elaborated in three semi-official publications: Network Centric Warfare, published in 1999; Understanding Information Age Warfare by Alberts, Gartska, Richard E Hayes, and David A Signori in 2001; and Power to the Edge: Command and Control in the Information Age, by Alberts and Hayes in 2003. Together, these three works form the canon from which most thinking on NCW has developed. Through a series of business case studies, Network Centric Warfare introduces the idea that networks generate power through the distribution of information. Understanding Information Age Warfare takes the idea of NCW and develops a theory about how information, knowledge, and awareness interact in a
military environment. *Power to the Edge* is a more conceptual piece ruminating about the implications that information and networks will have for military organisations and their operations.

In exploring how computer networks are altering the economic and business activities of US corporations, *Network Centric Warfare* shows its lineage from earlier works by Alvin and Heidi Toffler, who suggested in their influential *War and Anti-War* that ‘the way we make wealth is ... the way we make war’. Corporations, having linked together ‘knowledgeable entities’ (sub-units within the organisation) through computer networks, can take advantage of the shared awareness thus generated to make decisions faster, and more efficient, and to improve the accuracy of business predictions. Networked businesses may also improve collaboration between sub-units and ultimately create efficiencies in their supply chains and customer relations. Alberts and his co-authors suggested that the compression of time and space caused by this shift would also impact on warfare. In essence, the same processes so important to creating better business decisions would also enable military commanders to create a condition of ‘information superiority’, analogous to earlier concepts of air superiority or sea control.

Such capabilities would be increasingly important because of the growing complexity of the modern battlefield. This new approach would produce a series of remarkable outcomes changing the very nature of warfare. Networks would permit the generation of combat power from highly dispersed yet agile military units because of their enhanced situational awareness. Alberts et al. argued that both the ‘fog of war’ and friction in military operations, while not eliminated completely, would be dramatically reduced. As enhanced awareness would reduce risk, the cost of operations would decline, just as networks permitted businesses to reduce cost. The combination of these assets would permit networked militaries to ‘mass effects’ instead of massing forces.

In *Understanding Information Age Warfare*, these ideas are fleshed out into a full theory of operations. The authors begin with a series of assumptions about how experience ultimately translates into awareness, and derive a theory of warfare in networked environments. They suggest that we consider the manner in which we obtain information about the external environment through the interaction of a set of logical assumptions. Sensory impressions of the environment can be directly inferred (seeing an event occur, for example) or indirectly (through the interpretation of data from a sensor such as a radar). These impressions are then translated into ‘information’ by putting the impressions into a ‘meaningful social context’ through the identification of patterns interpolated between the sensed data and the purported social context. These patterns represent ‘knowledge’, and comparisons between what is ‘known’ about the world (prior knowledge) and what is currently being sensed generates ‘awareness’. Finally, with sufficient levels of knowledge, by identifying developing patterns the observer can draw inferences
about what is likely to happen. In this way, awareness permits the observer to identify what is known about the past and present, while ‘understanding’ allows identification of ‘what the situation is becoming’. At the end of this sensing process, the observer is capable of deciding what to do and then acting on that decision. The whole process is similar to the famous OODA (Observe, Orient, Decide, Act) Loop developed by Lieutenant Colonel John Boyd.17

Alberts and his co-authors describe the world in which this process of sensing and interpretation of data takes place as a series of interconnected ‘domains’. Three principal domains are posited (with a fourth added to the theory in Power to the Edge). The ‘physical domain’ is described as the scene where all action takes place. It is the location where military forces manoeuvre, strike, and defend themselves, and action, being directly observable here, can be measured through direct and indirect sensing. The ‘information domain’ is where information is created, manipulated, and shared. It is a virtual environment in which data is transferred and shared amongst actors through technology, and software; at its heart, it is a medium for communication. The ‘cognitive domain’ resides in the minds of actors participating on the network. In this domain, understanding is created through the interpretation of the data being communicated from the physical domain through the information domain. It is in the cognitive domain that information is evaluated and judged, and decisions made from the conclusions arrived at.18 Finally, the ‘social domain’ mediates the evaluations, judgements and decisions that are developed in the cognitive domain (this recent addition to the theory has yet to be as firmly described as the previous three). As Alberts points out, NCW is principally about sharing information and awareness.19 It thus enables the development of superior awareness that ultimately translates into information superiority. Essentially, then, as the ‘Tenets of Network Centric Warfare’ assert:

A robustly networked force improves information sharing and collaboration, which enhances the quality of information and shared situational awareness. This enables further collaboration and self-synchronisation and improves sustainability and speed of command, which ultimately result in dramatically increased mission effectiveness.20

Shared knowledge is critical for forces participating in a networked operation.21 The end result of this sharing of information and awareness is the creation of additional combat power through enhancing the utility of information provided to decision makers. Information can be characterised by its richness (or the quality of the information), and its reach (or its ability to permeate every area on the network). Typically, the richer the information, the less reach it has. This is most obviously the case with classified information, which is generally closely held by those with a ‘need to know’. However, those in the field with proper clearances may be unable to
access this information because of their distance from those who control it. Lower level information will spread much further through a network than the most highly classified material.

In a functioning network-centric environment, however, richness no longer faces barriers to its reach. Those with the proper credentials in the field will be able to access even highly classified information in real time. As a result, the ‘traditional business space’ is transformed into a ‘new competitive space’ which in turn, generates additional combat power. A ‘common operating picture’ permits greater unity of command and purpose, de-conflicted missions, avoidance of any duplication of effort, enhanced early warning (and thus greater force protection), and the ability to use scarce resources more economically.

The requirements for this outcome are high. In the physical domain, all elements of a military force must be connected together, ‘achieving secure and seamless connectivity and interoperability’. In the information domain, people and platforms must be able to share access and most importantly, protect ‘information to a degree that it can establish and maintain an information advantage over an adversary’. Finally, in the cognitive domain, forces must be able to use the shared information to develop awareness of their environment as well as sharing that awareness with other network participants. Unless these objectives are accomplished, military forces will be unable to ‘self–synchronise’ and thereby take advantage of the benefits conferred by the network.

While it is the combined effect of the four domains that allows shared awareness and self-synchronisation, the lynchpin of the whole enterprise is the security of the information domain. Establishment of a combat advantage depends on information superiority, but this superiority must be protected. In the words of Alberts et al, ‘in the all-important battle for information superiority, the information domain is ground zero’.

With a theory in place describing the relationships between information, knowledge and awareness, further thinking concerned the implications for military operations in this new environment. The conclusions of this research emerged in 2003 in *Power to the Edge*, where Alberts and Hayes argued that in order to take advantage of the opportunities offered by NCW, militaries would have to ‘focus on C2 [command and control], where information is translated into actionable knowledge’. In the modern battlespace, traditional procedures and organisations for command and control of military forces would be unable to cope with the complexity that they will face. Alberts and Hayes argued that militaries had so far been able to adapt by using ‘work around’ procedures that were typically unique to the time and place of specific operations. Relying on these inefficient information sharing practices in the face of the growing complexity of the modern battlespace will eventually frustrate the application of military power. Decision makers in these challenging global arenas cannot
possibly anticipate every outcome, nor possess complete knowledge about the environment in which they will operate. In order to maximise the potential offered by information, modern organisations must be capable of sharing their specific situational awareness with others. Furthermore, since they cannot know who they will work with, nor which systems may be relevant to the solution of problems, a high degree of agility would be necessary ‘in terms of who participates as well as who plays what roles’.

Given these observations on the demands of the modern military environment, the centralisation of command and control is increasingly impractical. Instead, power needs to be devolved to ‘edge entities’:

Power to the Edge involves the empowerment of individuals at the edge of an organisation (where an organisation interacts with its operating environment to have an impact or effect in that environment) or, in the case of systems, edge devices. Empowerment involves expanding access to information and the elimination of unnecessary constraints.

This vision is potentially revolutionary: in terms of its organisational and procedural implications, it strikes directly at the hierarchical structures that militaries have always relied on for command and control. It remains to be seen whether militaries will be capable of adapting to such a wide-ranging vision. Nevertheless, to illustrate, at least, the Pentagon’s commitment to it, Albert and Hayes point to the development of the ‘Global Information Grid’ that will integrate communication and computer systems into a secure, seamless infostructure providing access to a variety of information sources and information management resources.

Coalitions and Networks

Nevertheless, the realisation of this vision in terms of current operations has to date been less than perfect, especially in coalition environments. As Stuart notes:

NCW was not a panacea for warfighting connectivity in the NATO alliance setting, as realized upon examination of some unintended consequences in the Kosovo conflict. A major stumbling block was realized in the lack of US and European information interoperability, where communications were hamstrung by both equipment incompatibility and classification or releaseability mismatches.

While Stuart refers to releaseability concerns, the majority of analysts focusing on interoperability issues have characterised the problem as technical in nature and resolvable through upgrades and capital investment.

In many ways, the United States has been successful in finding workaround solutions to the issues of connectivity raised in the first section. While there were significant interoperability problems in the Balkans, many of these issues were resolved
through the installation of technology in allied formations. Similarly, the United States often devises procedural workarounds in order to facilitate greater allied cooperation. This has been most evident in the Canadian participation in American carrier battle group operations and to a limited extent, the naval operations of the War on Terrorism. There would seem to be an upper limit on just how far the United States is able or willing to solve some of these connectivity issues, however. This limit is defined first by the demands for information security, and second, by the nature of trust between partners.

Efficiency is the principle that animates the quest for information centralisation under the NCW concept. Universal access to common databases will lead to shared awareness and thus the harmonisation of operational goals and the elimination of inefficiencies in achieving them. Alliances and coalitions, however, have a natural animus that underlies them; their modus operandi is not that of efficiency but rather that of national interest. As such, alliance and coalition operations are frequently marked by infighting and competition. NCW might be one tool for alleviating these problems in the hopes of generating a ‘common operating picture’ or the development of a ‘shared awareness’ between alliance partners, the hope being that shared awareness will generate shared interests.

However, the barrier to this is the basic difficulty in sharing information between partners. Information release policies are purposefully inefficient tools in order to protect the information, the sources used to gain it, and the organisations using the information from the harm that would result from disclosure to hostile or politically uncertain forces. Information release and control must be conducted in a manner that prevents damaging foreign disclosure[,] this capability must be demonstrated to information owners’ before any transfer can be effected. Information, and what it may imply about the systems that collected it, or the operational goals and capabilities of the organisation that is collecting it, may be too sensitive to be entrusted to others. Further, because the long-term effect of individual disclosures can be difficult to ascertain, and because the career impact of improper disclosure is so serious, ‘commanders often choose stringent release rules to avoid problems’. In this way, releaseability concerns have dictated separated networks operating at different tempos. As Brigadier General Gary Salisbury, Director of Command, Control, and Communications Systems for US European Command, characterised the situation in September 2001:

How do [combined planners] get these national communication and information needs and fit these into a coalition environment? The bottom line is we are generally operating two different networks at two different security levels. We run our networks at a coalition releaseability level that’s basically unclassified.
President Dwight D Eisenhower famously remarked, ‘Allied Commands depend on mutual confidence’. Like relinquishing command and control, releasing sensitive information is an act of trust between states surpassed only, perhaps, by placing troops under even the limited control of an ally; releasing closely held knowledge places technology, operations, and even personnel at risk. ‘Trust involves a willingness to be vulnerable and to assume risk. Trust involves some form of dependency.’ However, the international environment through the medium of anarchy makes trust exceedingly difficult to generate, even in close alliance contexts. Furthermore, alliance partners generally exploit dependencies in order to enhance their control over alliance policies. Thus, we can expect that just as nations have always been unwilling to place complete control of their troops under the control of foreign nations, they will be unwilling to share completely all information they have: ‘As close as ... Canadian and British allies are in common interests and objectives, there will always be limits to sharing the most highly classified information with these nations.’ In the past, this reluctance did not typically jeopardise operations. However, in NCW information is the cornerstone of all action; the existence of separate networks operating at different speeds will have an undeniable impact on battle rhythms.

NCW, then, will have an enormous bearing on how alliances and particularly coalitions will conduct their operations in the future. The United States is certainly willing to share most of its information with certain partners. For national forces not in this privileged club, integration into American networks will be increasingly difficult, depending on how often they operate with the US forces and the degree of trust extended to them. Forces not permitted to take part in planning will ultimately be restricted simply to taking orders; for these forces, militarily meaningless tasks are the best they may hope to be assigned. The added risk is that multinational operations will become more and more circumscribed, and that allied participation will be accepted only under the most restrictive circumstances. The United States is unlikely to hamstring its own military forces or to slow its implementation of NCW given its perceptible benefits. It may decide simply to ‘pass’ entirely on alliance participation. Information releaseability policy, would ultimately decide, then, not only the shape and nature of coalitions but also possibly even their very existence. Finally, the unipolar nature of the current international environment will likely place additional barriers to information sharing between states, particularly between the United States and its allies. Armed as it is with the full panoply of information garnered by its worldwide intelligence services, the United State will provide more than the lion’s share of information to its partners and only seek highly specialised intelligence from them. Furthermore, the unipolar environment itself will generate increasing distrust amongst alliance partners as the role of independent national interests in shaping policy becomes stronger.
Operational Use of Networks in Coalitions: Australia and Canada in the Gulf

These networking technologies were used operationally for the first time in 2001 with the formation of the coalition to fight the ‘war on terror’. Both Australia and Canada have participated extensively in this ongoing campaign. Although each has adopted different roles in the ‘war on terror’, and each took very different paths in terms of operations in Iraq (Canada abstained, while Australia committed forces), each nation fielded relatively similar capabilities in operations throughout the Middle East. In the naval sphere, both provided task groups composed of frigates for sea control operations. Australia supplemented its frigate deployments with periodic deployment of its amphibious ships, HMA Ships *Manoora* (II) and *Kanimbla* (II), and Canada supplemented its frigates with both of its resupply vessels, and the destroyers HMC Ships *Iroquois* (II) and *Athabaskan* (III). Each navy has a long tradition of interoperability with the US Navy, dating back to WWII. Both navies have operated alongside the US Navy in the Persian Gulf region since the early 1990s.

Between 2001 and 2003, both the Australian and Canadian navies conducted extensive operations in the Gulf region. All Canadian naval operations fell under Operation APOLLO; RAN operations for ENDURING FREEDOM were code named Operation SLIPPER, and those supporting IRAQI FREEDOM were named Operation FALCONER. Each navy conducted similar missions in separate regions, although Canadian ships occasionally supported Australian operations in the Northern Persian Gulf. Ultimately, the Canadians took control of the ‘Leadership Interdiction Operation’ (LIO) in the Southern Persian Gulf, the Strait of Hormuz, and the Gulf of Oman. The RAN operated in the Northern Persian Gulf, where it had patrolled in three separate deployments since 1996. There, it continued to conduct maritime interdiction operations and general sea control tasks.

Despite the similarity between their missions, each navy’s operational area was significantly different. The Northern Persian Gulf is a shallow body of water, hemmed in on three sides by the Al Faw Peninsula, the Arabian Peninsula, and Iran. Besides the local knowledge of the area they had built up over ten years of operations, the shallow drafts of both the Australian amphibious ships and the *Anzac* class frigates made the RAN an ideal force to operate in the area. The Royal Canadian Navy (RCN) worked in a much larger area, first in the Arabian Sea, and later in the Gulf of Oman and Southern Persian Gulf. This is one of the busiest shipping lanes in the world, moving 30 per cent of the world’s annual oil shipments. More than 450 vessels transited the area daily. These ranged from small wooden dhows to super tankers, generating nearly 6000 radar contacts on a regular day. Given their different operational environments, the RAN effectively conducted a traditional ‘close blockade’ of the Iraqi coastline, whereas the RCN’s operations were oriented towards sea control and distant blockade.
Ensuring naval task group technical interoperability during the Cold War was often a process of ensuring that the proper cryptographic keys and the right frequencies were coordinated so that secure radios could communicate with each other. The emerging digital environment has complicated this process considerably because it requires the installation of the requisite hardware and software (including the proper version and latest updates), firewalls, accreditation, IP addresses, connectivity paths and processes, and sufficient communications bandwidth to carry the burgeoning traffic exchanged between forces.\(^45\) Further, ensuring that all of this is present has expanded beyond the technical and procedural realm of tactical interoperability and into the realm of strategic policy that specifically governs the relations between states.

**SIPRNET’s Role**

The prime example of the strategic impact networks play has been the growing importance of the US military’s Secret Internet Protocol Router Network (SIPRNET) for managing information and running its global operations. In 2003, former US 5th Fleet commander, Admiral Thomas Zelibor elaborated on his experience with using the SIPRNET in his carrier battle group during the 2003 Gulf War, describing it as the evolution of a ‘knowledge web’ that contained the ‘ground truth’.\(^46\) Coalition Operational Wide Area Network (COWAN) and later CENTRIXS performed analogous functions for the coalition, but one Canadian ship’s commanding officer, reflecting on Zelibor’s observations, noted that COWAN was ‘not where the real battle is being fought, at least not yet, and perhaps never’, as it only ‘offered a small and sometimes opaque window into the total situational awareness of the USN’s battlespace.’\(^47\) Indeed, despite the connections between coalition-wide area networks and the SIPRNET, many coalition officers continue to express some frustration over the difficulties created by the use of separate national and coalition networks because of the demands of national security. One Australian liaison officer working within Central Command (CENTCOM), described the ‘abject failure’ encountered in trying to cross-register US SIPRNET user accounts as ‘CENTRIXS X’ (Australia/UK/US) accounts.\(^48\) Both Australian and Canadian officers remarked on the need for US command oversight, often from the highest levels, in order that coalition network interoperability be made more effective with American ships.\(^49\) Transferring essential planning information to coalition partners occasionally fell through the electronic cracks between networks as units sought to establish who was responsible for releasing information, or because units, challenged by the pressure of operations, failed to post information quickly enough. In this regard, US military forces naturally operated at higher levels of efficiency, due to their ability to look up the information on the US national SIPRNET.\(^50\)

Australia was able to negotiate the installation of a SIPRNET terminal in *Manoora* during the fall of 2002. Placed in a compartment crewed exclusively with US personnel aboard the ship, Rear Admiral James Goldrick noted that he ‘could not have operated as
[the Maritime Interdiction Force] commander without it, so reliant have C2 processes become on SIPRNET e-mail and chat, particularly the latter. It is interesting that despite the limited duration and access of the Australians to SIPRNET, the fact that it existed at all weighed heavily in the minds of Canadian officers lacking similar access, concerned that the Canadian decision not to participate in Iraq had somehow moved them to the outer circle of allies. As one put it:

The true test of whether or not you were an inner circle member: are you on SIPRNET? ... The only coalition partners that have access to SIPRNET now is [sic] the Brits and the Australians ... That to me is the dividing line between those on the inner circle with the US. Because the US does all its (operational planning) on the SIPRNET.

‘Concentricity’ of Access

‘Circles of access’ were reflected in more ways than simply ‘network permissions’. Most officers interviewed perceived the US-led coalition as structured in a series of concentric circles of access, with the UK occupying the closest to the United States at the centre position, other ‘anglo-sphere’ nations falling nearby, other NATO nations still further away, and the rest of the coalition falling in the most distant circles. CENTCOM reinforced this layered structure by refusing to deal with the coalition as a coherent entity, insisting rather on dealing with each coalition member on a strictly bilateral basis. The perception of coalition naval officers serving in the Gulf was that the United States did not want to get into a ‘NATO type situation’ where everything from strategic policy, operational planning, and tactical targeting had to be negotiated in advance. Former commander of the Canadian Joint Task Force South West Asia, Brigadier General Angus Watt, noted:

If you are a coalition member, you plug into the US agenda and if you don’t want to follow (it), you ain’t a member of the coalition. It’s that simple.

The United States was clearly sensitive to any perception that nations were not being treated appropriately, and as a result, worked hard to ensure it treated each nation in a similar fashion no matter what its contribution to the war effort was. Nevertheless, the concentric circles of access became increasingly apparent after the Canadian Government delayed committing forces to operations in Iraq in late 2002 and early 2003. However, the Canadian military was ultimately able to convince the government to establish a liaison team to discuss possible Canadian participation at the end of November 2002. Australia had indicated its willingness to discuss options very early on in 2002 and was included in a Navy Forces Central Command (NAVCENT) IRAQI FREEDOM planning cell in October that year. Following this ‘the Americans appeared to open the doors very wide and gave (Canada) a lot of information about their intentions.’ However, as a Canadian decision continued to be delayed, ‘the doors weren’t closed, but you could feel them closing’. One of the
ways this became apparent was in the nature of the information that was provided to the Canadian liaison staff. Information within US headquarters is circulated in the form of PowerPoint briefing slides. These briefs are often extremely large, sometimes numbering 1000 slides or more as each decision point, ‘branch’ and ‘sequel’ operation has its own set of hidden and embedded slides. The detail that Canadian officers were allowed to see was progressively restricted until it reached the standard coalition release ability level, sometimes referred to dismissively as the *Reader's Digest* version.\(^{57}\)

The physical layout of CENTCOM, both in Tampa and Qatar, also reflected this segmentation of information. Outside the Tampa headquarters is a ‘trailer park’ of coalition members. This was also reflected in the CENTCOM Forward Headquarters in Qatar that maintained a ‘Friendly Forces Co-ordination Centre’ (F2C2) outside the main building. While some coalition members, principally the UK, Australia and Canada operated as liaison officers and embedded planners within the headquarters (HQ), most were restricted to the ‘inflatable tent’ outside it. One Australian liaison officer in the Qatar Headquarters claimed, ‘physically and in a cognitive sense, I was separated,’ (from his other Australian colleagues in the F2C2).\(^{58}\)

Such arrangements within headquarters were not new. Indeed, information within a military headquarters is often controlled even between planners from the same country and service. The physical barriers are replicated electronically, in that it is easy to provide information to the SIPRNET but much more difficult for coalition partners to get information back out of it. As one Australian liaison officer conducting planning within NAVCENT HQ for IRAQI FREEDOM noted, ‘any of the work I would do, would be done on (a) stand alone (system), and then loaded up to the SIPRNET’. Information was downloaded for his work by US officers and only then passed to him: ‘NAVCENT HQ maintained this structure through to execution’.\(^{59}\)

The difficulty posed to coalition members is that unless American users cue them to request specific products, the material provided is likely to be of little value and late. In a large coalition, the partners of who are all requesting information from the SIPRNET, the sheer number of requests for information quickly exceeds the available resources to process them. Those closest to the centre will be best serviced.

**Satellite Communications and Information Access**

In the Gulf, inadequate satellite communications (SATCOM) created a second crucial bottleneck for NCW. As many as six separate networks could be running in a single ship, including classified and unclassified national networks, a coalition network such as COWAN or CENTRIXS, tactical data links like Link 11, Link 16, and GCCS. Access to these networks could only be assured through SATCOM channels, and many coalition members failed to provide any to their forces, or only paid for ‘dial up’ access to commercial communication satellites through INMARSAT, rather than paying for continuously running, leased channels.\(^{60}\)
In this field, Canada had advantages enjoyed by no other coalition member. Because of the role the RCN played in developing its own towed array sonar technology in the 1980s, it has long been involved in the over-the-horizon networking efforts of the US Navy. In addition, Canada helped fund the US Navy’s constellation of fleet satellite communication satellites, gaining eight national channels there. By 2001, Canada had also leased 12 continuously running INMARSAT channels, 6 of which were given to the navy for use in Operation APOLLO. Each of these channels was further multiplexed, allowing a certain division of labour on each channel for running separate networks. This permitted Canadian ships a communications capability that rivalled that of some larger American ships.

At the time, Australian capability was much more restricted. Only the larger amphibious ships maintained a continuous connection to INMARSAT, the frigates being limited to a dial-up basis that was used at particular times of the day, or during the execution of operations. The bandwidth of these connections was also significantly smaller than that of Canadian ships, 64Kbps as opposed to 128Kbps. While the RAN enjoyed the services of SIPRNET briefly, it had to sacrifice one of its two channels in *Manoora* to gain it as American information security protocols demanded a dedicated channel to carry SIPRNET traffic. Moreover, only *Manoora* could multiplex its SATCOM connections.

Bandwidth scarcity also affected US ships to some degree. While primary units such as the carrier and some cruisers enjoyed larger amounts of bandwidth, the increase in the number of American ships in the Gulf region as the war with Iraq drew closer meant a growing scarcity of a fixed resource. From a coalition perspective, bandwidth scarcity is a serious issue affecting most navies. For example, in the major biannual coalition exercise in the Pacific, RIMPAC 2004, the US Navy was managing five separated coalition network domains as well as many national ones. The implications of bandwidth limitations inevitably means that certain networks, especially coalition ones, will be monitored by American crews less frequently, and given lower priority than the SIPRNET.

**Coalition Information Sharing**

Despite the challenges, Canadian and Australian officers described the sharing of information between them and the United States as generally satisfactory, all claiming that they had enough information to conduct their operations. The nature of the threat in some instances dictated the amount of intelligence (and sometimes the lack of it). Intelligence on the movement of small boats and aircraft, for example, was lacking early in the campaign. Canadian Commodore Drew Robertson, who commanded the defensive screen around American amphibious ships in 2001 was extremely impressed with their willingness to share operational planning details with the Canadian task group:
We knew what they were doing ... I knew everyday when they planned to go to and from the beach, or to and from the various operating areas so that I could organise our ships appropriately.67

Still, the separation of networks also presented sharing problems, especially in terms of operational planning. Robertson’s task force lacked both e-mail and voice connectivity with the first amphibious group they escorted as the connections did not have any COWAN terminals. This meant that US plans could not be shared with the Canadian Task Force until they had been finalised, causing Canadian planning staff to wait until the plans had been sent. In the operating environment of the Arabian Sea in 2001, this was a minor annoyance, but Robertson noted ‘in certain situations there won’t be time for that kind of wheel spinning ... Those kinds of inefficiencies can lead to real problems.’68 Later in the campaign, Canadian Commodore Eric Lerhe led an effort to populate COWAN web pages with information to increase the speed and efficiency of coalition force planning at sea. However, time pressures often meant that the United States was unable to maintain its COWAN pages effectively as well as its SIPRNET pages. Lerhe concluded that ‘the bottom line is we are going to have to, for every operation, pull the levers, kick the tyres, and scream to get everybody working. But people who hang their hopes on (multilevel security), I just don’t think they are operating realistically.’69

Classification barriers to information release for coalition networks were particularly evident in terms of the interaction between Special Forces and the coalition. Both the Australians and Canadians experienced at least one incident that nearly resulted in fratricide of US Navy Special Forces SEAL teams. In each case, SEAL teams had failed to keep even their own national forces informed of their activities, leading to widespread confusion as to whether the SEAL team involved was a friendly force or an enemy target. Coordination over radio nets between coalition forces ultimately resolved the situation, although in the Australian case, not before authority to open fire had already been passed.70 The significance of these events points to the challenge that highly classified networks present to coalition operations should information barriers for more conventional operations come to resemble those currently present on special forces networks. In that case, information barriers would cause serious barriers for combined operations between different nations.

In general, intelligence sharing is conducted on special access networks amongst the US, UK, Australian and Canadian coalition partners. However, during operations in the gulf from 2002-03, the quality of some of this material was often suspected. In terms of the LIO being conducted by the coalition against Al Qaeda, good intelligence on intended routes was often lacking.71 So-called ‘actionable’ intelligence was also suspect. As Robertson noted:
I found it useful that actionable intelligence could lead to nothing because it reminded me and it reminded my [commanding officers] that actionable intelligence isn't a certainty, it's a probability ... You wouldn’t want to over-react and find that you had just done harm to some poor merchant mariners of the region.  

Even basic track information shared on the networks could often not be accepted as accurate. For example, the GCCS is used to manage track information on a global basis. However, not all the information is accessible to coalition partners. In Lerhe’s task force, the presence of reservist specialists in naval control of shipping permitted him to develop techniques for double-checking GCCS data through the analysis of port web sites and the information found there. Stark discrepancies between GCCS data and this open source intelligence caused considerable scepticism of the GCCS system within Lerhe’s task force from time to time.

Coalition forces ultimately developed a series of databases contained on Excel spreadsheets in order to track the enormous amounts of shipping passing through the region. These were important for three separate reasons. First, the maritime task forces in the Persian Gulf, the Gulf of Oman, and the Horn of Africa did not possess adequate resources to interpret properly the data they were collecting. Each task force thus shared its database with the others and with NAVCENT HQ, where naval intelligence specialists could ‘mine’ it for more specific data. Second, the sheer number of vessels passing through the region compared with the relative scarcity of coalition crews meant that the coalition had to be very selective in terms of who they would board. Repeated boardings of ships already cleared were an obvious waste of resources. Third, the database helped the coalition to establish the appearance of a professional and competent boarding regime in the theatre. The perception by ships’ masters that boardings did not take place on a whim increased trust in the coalition and led to a higher compliance rate. This was true even for the small boats transporting economic migrants between Pakistan and Persian Gulf states. When boat captains realised that coalition forces were only interested in determining the presence or absence of terrorist suspects amongst their passengers, they too became much more compliant.

The sharing regimes that were ultimately established between coalition partners resulted in considerable synchronisation, innovation, and self-adaptation, as the theorists of NCW had anticipated. The importance of this self-adaptation became apparent during the naval gunfire missions HMAS Anzac conducted with UK Royal Marine units on the Al Faw Peninsula on 21 March 2003 during IRAQI FREEDOM. The frigate, HMS Chatham was one of three Royal Navy warships also participating in this mission, but a misfire interrupted its ability to support the Marines. Anzac was able instantly to take over the fire mission it had been following over the network, having already entered all the fire control data into its own system. The increasingly vital role played by networks in sharing information amongst partners was summed up by Lerhe, who noted:
What’s your level of tolerance for going into the ops room and saying ‘Tell the Italian ship Euro to go north and intercept that ship’ … and my guy turning around and telling me ‘Sir, we don’t have comms with the Euro.’ … Sure it’s extra work, but COWAN is 100%. What’s the alternative? Is 96% really the alternative? No! Because Al Qaeda’s going to be on the 97th. So it’s all or nothing.76

The Human in the Loop: Liaison

Given the organisational and electronic challenges of sharing information amongst coalition partners, the human element was often decisive in making the growing electronic environment effective. Liaison officers, long used to coordinate coalition operations, played a critical role in ensuring that information gaps did not persist. So vital were these players that often the most important members of a task force’s team would be sent to ensure proper communications between coalition units.78 However, the location of liaison officers within a foreign headquarters was a key consideration for national commanders when deploying them. A liaison officer’s value could also be further enhanced by the roles they played there. Taking on planning duties within a foreign headquarters reduced the ‘burden’ of liaison officers on US forces.78 In effect, a liaison officer’s:
... value was enhanced when they became useful to the Americans as an embedded staff member ... And so all of [the Australian liaison officers] picked up, to a certain extent, tasks within the headquarters that they were attached to.79

While status as an embedded planner also increased the quality of information they could send back to their own forces, that information was very much dependent on which aspect of the plan they were allowed to work. Liaison officers located on the ‘fringe’ of activities might get a good picture of that fringe, but little else. Moreover, the US command could easily sideline liaison officers if they failed to perform adequately in their planning responsibilities, or if their political utility to the United States declined. Still, within the large US HQ where personnel were continuously moving in and out, coalition liaison members could actually contribute substantially to the ‘corporate knowledge’ necessary for an effective operational plan.80

Rules of Engagement: Intersection of Strategic and Operational Policies

While coalitions present operational problems for the United States, they present strategic problems for its partners. Coalition partners may fear that they are too closely aligned with American policy, and/or that the need to give America operational control of their forces challenges their sovereignty.81 As American planning for operations against Iraq intensified during 2002–03, the concern of states opposed to such action, but supportive of American policy in Afghanistan and against terrorism in general, posed both strategic and operational problems.

For coalition partners, the question was how they could continue to support the United States in its war on terror even as they opposed its plans for Iraq. For the United States, the question was how to structure the two operations so that neither would suffer because of differences in strategic policy. On the land and in the air, the issue was fairly straightforward as the theatres of operations were widely separated and there was no possibility of confusion between them. This situation was different at sea. Since late 2001, coalition units had been operating in support of ENDURING FREEDOM in the southern Persian Gulf and the Gulf of Oman, the same area in which IRAQI FREEDOM naval operations would also be taking place. Task Force 50 included both coalition forces conducting counter-terrorist leadership interdiction operations and general sea control and escort duties, and US Navy carrier strike groups that would conduct air operations over Iraq.82 The solution was the creation of two separate coalition task forces, Combined Task Force (CTF) 150 – in support of Afghan operations and commanded by Europeans – operating in the Horn of Africa region, and CTF 151 conducting counter-terrorist leadership interdiction operations in the Gulf of Oman under Canadian command. This permitted a ‘clear separation of activities between the overt warfighting of IRAQI FREEDOM and the picture compilation and maritime interdiction of ENDURING FREEDOM’.83
The creation of CTFs 150 and 151 highlight how strategic policy differences within coalitions (here in terms of differing national policies towards the danger Iraq presented to international stability) affected the management of military operations. These manifested themselves in terms of distinctive rules of engagement (ROE), which were ultimately managed by coalition commanders using the networks they had already established. Indeed, ROE became as critical an issue in the shaping of operations as connectivity and capability. In anticipation of action, coalition commanders created hypothetical scenarios that permitted all parties to explore what they could and could not do in light of their national ROE, thus enabling the early assignment of tasks and the positioning of forces. This allowed differing ROEs to be ‘blended’ together, enabling coalition forces to achieve their maximum potential without violating any partner’s strategic policy.

While ROE are critical in all operations, in the littoral environment they can pose delicate challenges. The maritime environment of the Persian Gulf and the Gulf of Oman is highly complex in terms of their environmental features and political geography, as well as the maritime traffic passing through the region. Maritime borders are disputed, radio communications are difficult at the best of times, linguistic and cultural challenges confront extra-regional forces operating there, and the relatively confined nature of regional waters amplify threats posed by submarines, anti-ship missiles, and the many small craft operating in the area. According to Lerhe:

\[(\text{Divergences in ROE}) \text{ meant some nations would not react as robustly as US forces} \ldots \text{many contributing nations lacked the ROE that would have allowed them to forcibly board ships or capture terrorist leaders and would only assist in such secondary but important tasks as providing surveillance}.\]

Nevertheless, Canadian commanders utilised even ships with extremely restrictive ROE. For example, Japanese ships escorting their AORs, provided radar data on distant traffic, giving the task force an additional day’s warning of approaching targets of interest. The basis for some ROE was dictated by strategic policies that were unrelated to the Gulf or the conflicts there. Canada’s recognition of Iranian territorial waters, limiting the area in which it could operate in ‘hot pursuits’, was related to its straight baseline rule for claiming Canadian sovereignty over its arctic waters.

Despite the complications of differing national strategic policies, networks enabled naval commanders to stay in close operational touch with each other, and also provided opportunities to discuss sensitive issues privately before they became serious operational problems. Private chat boxes were established to ‘express private reservations or concerns ... candidly, while maintaining more public chat circuits that were more disciplined and with many participants for rapid exchange of information’.
An excellent example of the networked management of ROE was the management of the Iraqi tug *Proton*, discovered at anchor two days after the start of IRAQI FREEDOM in the Southern Persian Gulf on 23 March, the day after Australian forces had discovered a similar vessel loaded with mines in the Khawr Abd Allah. Because mines posed a ‘maritime safety’ issue Canadian Commodore Roger Girouard in command of CTF 151 in 2003 felt that he had sufficient authority under his ROE to board the vessel in order to inspect it for the presence of those weapons. No mines were found, though gas masks, atropine injectors and Molotov cocktails were present, and the crew appeared to behave suspiciously. However, none of this made it a matter for CTF 151’s leadership interdiction operations. Girouard informed NAVCENT HQ of the discoveries made but was told by NAVCENT to release the vessel. He found this request ‘strange’, but complied. Later it seemed, NAVCENT realised its error and requested that *Proton* be reboarded; however, at this point Girouard refused, as this would have contradicted his ROE - the only reason to reboard the ship which had been cleared already of any suspicion of carrying mines was due to concerns over the activities of the crew. Two days later, however, *Proton* was spotted alongside a barge also suspected of carrying mines. At this point, Canadian ROE permitted a reboarding, again because of the maritime safety issues associated with mining international waters.

As complex as this issue episode was, the fact that Girouard was a Canadian commanding a Canadian boarding party lent it a degree of simplicity. Had he been distant from the scene and reliant on another nation’s boarding party, the situation might have been even more complex. The incident highlighted not only the value of a network permitting all participants to exchange information, and to communicate securely, but also the significance of the transition from COWAN to CENTRIXS in the region. Canadian commanders initially resisted the transition as it effectively meant that 49 additional nations would be added to the network, with a resultant decline in the ‘richness’ of information residing on the network because of information security concerns. However, CENTRIXS also expanded the means by which all coalition ships could communicate securely and reliably over digital links. While less robust in terms of access to classified information, in terms of managing the coalition, CENTRIXS was superior to COWAN in linking all the players together.90

**Networking the Coalition: Social and Digital Factors**

For coalition naval operations in the Gulf, networks were an important enabler of a very traditional naval mission, not unlike the gunboat diplomacy familiar to 19th century naval commanders. While the naval operations in the gulf in 2002–03 succeeded in that all the missions undertaken were accomplished and no casualties were sustained, the absence of serious opposition raises questions as to how they might have proceeded in a scenario ‘more closely envisioned by the proponents of NCW’.91 For as much as networks were critical to the sharing of situational
awareness, and assisting with mission planning, operations APOLLO and SLIPPER/FALCONER were very different from those envisaged by Gartska and others who enthused about the potential of NCW. The need for information security ensured that there was no ‘seamless architecture’. Indeed, the information release protocols of every networked participant have engineered just the opposite: a proliferation of networks and thus the number of ‘seams’. Virtual electronic borders mimic first, real national boundaries, and later, the special intelligence relationships that have been brokered between trusted partners. Moreover, computer networks have not stopped the need for personal interaction. Indeed, the evidence suggests that in order for computer networks to function as efficiently as possible, social networks needed to be established first. While building an electronic network is a relatively simple matter of capital investment and proper training, a social network is a much more complicated matter.

The challenge of establishing social networks in a coalition environment is the timeless one of building both strategic and professional trust. Put simply, US commanders need to win: non-US commanders in the coalition need to make a meaningful national contribution, but also minimise the risk of casualties. The stakes involved differ considerably as each perspective fundamentally challenges operational thinking by changing the nature of trust. Can the United States trust an ally or coalition partner to do what is necessary to accomplish a mission, or are such partners just operational burdens, there merely to show their national flags? The coalition partner’s concern is whether it will be allowed to play a meaningful role and whether the missions planned by the United States will be politically acceptable. The need to accommodate a coalition partner’s desire for a significant mission (and thus its influence over an operation) has to be carefully balanced against their capacity and willingness to see it accomplished effectively as determined by the coalition leader.

The fulcrum determining this balance is that of trust. As one Australian commander pointed out, ‘to the USN a new ... (foreign) command team was a completely unknown quantity. Only through your actions could confidence be built up with you and your team.’ Further, even if trust were established between individual commanders, it still had to be communicated both upwards to higher headquarters, and downwards within planning staffs. In the gulf, memos clearly articulating what commanders could and could not do were widely distributed amongst command and planning staffs in order to minimise ‘second-guessing’ during operations. Commanders also took time to meet on a regular basis so that their staffs could see how well the multinational leadership got along together. Repeatedly, commanders referred to the great traditions of naval operations, frequently invoking the pre-electronic example of Admiral Nelson’s ‘band of brothers’ who fought at Trafalgar.

The Persian Gulf’s various coalition networks were undoubtedly successful affairs: they created operational and tactical situational awareness, which was shared effectively amongst partners. However, several caveats apply. High-end coalition
partners like Australia, Canada, and the UK have sufficient access and professional trust within the US Navy to guarantee their own connectivity and subsequently, ensure that other coalition members enjoy relatively similar benefits. In the Gulf of Oman, American trust permitted considerable innovation by the RCN to develop the coalition network, ensuring continued coalition support for the ‘war on terror’ even as the coalition was fractured by the 2003 invasion of Iraq. In this instance, a close ally like Canada was available and capable of leading the segmented operation in the Gulf of Oman – a situation which is not necessarily guaranteed in the future. Again, it is doubtful that other nations could have played similar roles as effectively. The lack of access and professional trust would have crippled cooperation at the start.

Conclusion

Thus we see that the principle issues that are likely to frustrate greater efforts at multinational naval cooperation are not those of technical standards, or inadequate capital investment in high technology. While these are challenging issues, where the will exists, suitable remedies can often be found. The single most pressing issue on whether navies will be able to implement broad concepts of maritime security on the high seas will be found in the policy arena. Here there will be no technical solutions to the problem of international distrust the international environment provokes.

Within any information sharing enterprise, three concepts find themselves in fundamental tension. Information exchange is predicated on notions of efficiency, usually delimited in terms of both an increased speed and an increased effectiveness of decision making that comes from superior situation awareness. Butting up hard against this notion in a coalition environment is that of national security, typically expressed through a country’s information release policy. Simply put, states are reluctant to freely share information regarding their own security either for fear of revealing closely held secrets or national vulnerabilities. Last, coalition operations are predicated on notions of scarcity, usually in terms of limited operational resources or levels of political legitimacy. Cooperation to reduce these scarce resources revolves around issues of influence over the strategic direction and control of cooperative enterprises.

The challenge that confronts both the US Navy as well as the US Coast Guard in translating their own successes in networked operations into more generalised enhancements in international naval cooperation will be in finding the balance between efficiency, security, and influence in networked coalitions. Efficient networks require the free exchange of information on them. Moving information from one independent network to another is like the ponderous movement of a train from one rail gauge to another. The price for such efficiency, however, is not just technical cooperation in developing common data models and technical standards, but also deep political trust between cooperating partners. National security, however, is about protecting vulnerable resources. Information release policies are specifically designed to be inefficient in order to prevent inadvertent exchange.
Information by its nature does not fundamentally advertise its releasability for one nation or another, but must be analysed and interpreted by human agents to determine this status, and only then digitally categorised for release on coalition networks. Capping these two extremes are the political vagaries of coalitions. Just how scarce a resource is will determine the nature of the cooperation that can be arranged amongst partners. Complicating these operations for the United States is the fact that most partners bring relatively few operationally effective assets with which to bargain. In most circumstances, the United States seeks partners to remediate low levels of international political legitimacy.

These three aspects exist in a complex balance of forces, like a particle suspended between three carefully positioned magnets. Subtle shifts of even one aspect will have dramatic effects on overall policy. High levels of network efficiency will require a great deal of political and operational trust amongst partners. This already marks the networks established between the so-called ‘four-eyes’ nations of Australia, Britain, Canada and the United States. Similar levels of cooperation are not even found in NATO’s alliance networks and are much less probable in networks supporting nebulous ‘coalitions of the willing’.

Success may be possible: maritime security networks envisioned by the 1000-Ship Navy are not the sensor to shooter networks of classic NCW theory. Enhanced situational awareness need not rely on tightly classified information. The coalition networks in the Persian Gulf region largely traded unclassified information and their close links were maintained through simple chat rooms. Further, unlike most of America’s coalition efforts, maritime security has significant resource scarcity issues: the US Navy and Coast Guard do not have enough ships to be everywhere all the time. In this, coalition partners bring important bargaining chips with which to leverage American policy.

However, the challenges of maritime security for most littoral states is closely related to sensitive sovereign concerns of maritime boundaries and associated resources. Some of these issues bear little relationship to American security objectives. American efforts to secure greater levels of cooperation in these areas will prove difficult precisely because there is already a high degree of localised conflict over how to define them. This in turn will likely frustrate broader objectives like the evolving Proliferation Security Initiative. In these cases, networks will only be able to follow where the situational politics will allow.
Notes

6. One need only think of the Battle of Midway and the challenges presented to naval commanders in terms of locating the enemy’s carriers, launching strikes of various aircraft types, all armed with different weaponry, while maintaining combat air patrols of friendly fighters and keeping task force ships all in formation. The challenges of three-dimensional warfare presents far more complex command and control issues than the traditional naval battleline. Karl Lautenschlager, ‘Technology and the Evolution of Naval Warfare’, *International Security*, vol. 8, no. 2, 1983.
7. In the spring of 1942, Admiral Ernest J King asked Vannevar Bush of the Office of Scientific Research and Development to examine the possible development of a system of radar relays that would permit ships to share radar information thus expanding the range of awareness commanders had of the tactical situation. The project later switched to a system of air based radars that ultimately saw the development of the first airborne early warning aircraft in the form of modified Grumman Avengers carrying APS-20 radars. Edwin Leigh Armistead, *AWACS and Hawkeyes*, St. Paul, MBI Publishing, 2002, pp. 3-7.
8. In 1957, after three years of deliberation, the CANUKUS Naval Data Transmission Working Group ratified the technical standard for data exchange. Originally named the Tactical International Data Exchange (or TIDE, ‘good for cleaning up messy tactical pictures’), it later became known as Link 2 (given as ‘I’ in roman numerals) in the Royal Navy, which was already using forms of data sharing technology to distribute tactical information among its ships. As other NATO links became established, Link II became known as ‘Link 11’ (that is, eleven). Norman Friedman, *World Naval Weapons Systems 1997–1998*, Annapolis, Naval Institute Press, 1997, p. 28.
40. The RAN maintained frigates in the Persian Gulf and Red Sea throughout the 1990s, supporting the Maritime Interdiction Force enforcing various UN Security Council Resolutions under the rubric of Operation DAMASK. Canada also sent frigates for similar purposes throughout the 1990s.


44. James Goldrick notes, ‘The battlespace was measured in just a few miles and the time available was minutes rather than hours. We could not afford mistakes.’ J Goldrick, ‘In Command in the Gulf’, *US Naval Institute Proceedings*, vol. 128, no. 12, December 2002; and Author interview with Rear Admiral J Goldrick, RAN, Customs House, Canberra, Australia, 30 May 2006.


In a large measure I believe his view is that of an East coast ship that continued to lag the West coast fleets NCW progress. I suspect his ship was thrown in at the last minute into a confusing Operation Iraqi Freedom picture where the USN was necessarily rebuilding its networks. Moreover, they were concentrating on Iraq and thus the UK and Australia. During my watch COWAN was where the real battle during Operation Enduring Freedom was fought and there is no doubt whatsoever about that. Further as you make clear later with the GCCS/secondary sources example of shipping, my situational awareness was likely better than the USN’s in this most critical of contact sets.

Email correspondence between author and Commodore Eric Lerhe (CF Rtd), 10 August, 2006.


49. Author interview with Commodore Peter Jones, RAN, ADF HQ, Canberra, 2 June 2006; Author interview with Commodore Eric Lerhe, Halifax NS, 30 September 2005.

50. Author interview at Australian Air Power Development Centre, Tuggeranong, 31 May 2006; Author interview with Rear Admiral Drew Robertson (CF), NDHQ, Ottawa, 28 September 2005.

51. Interview with Rear Admiral Goldrick.

52. Author interview with Major General Angus Watt (CF), NDHQ, Ottawa, 28 September 2005.

53. Bycroft, ‘Coalition C4ISTAR Capability AUSCANUKUS’, p. 4; Interview with Major General Watt; and Author interview with Commander Mark DeSmedt, NDHQ, Ottawa, 28 September 2005.

54. Interview with Major General Watt.

55. Author interview with Air Commodore Mark Lax, RAAF, ADF HQ, Canberra, 31 May 2006; Interview with Major General Watt.

56. Author interview with Captain Phillip Spedding, RAN, ADF HQ, Canberra, 1 June 2006.

57. Interview with Major General Watt.

58. Interview with Captain Spedding.
59. Interview with Captain Spedding.


62. Multiplexing a satellite channel allows several different communication streams to be run on the same channel. Thus a multiplexed satellite channel might have 70 per cent of its capacity devoted to a national secret level network and the remaining 30 per cent devoted to a national unclassified administrative network; and Interview with Commodore Lerhe.


64. Interview with Rear Admiral Goldrick.

65. The number of satellite channels is dependant on the capacity of communication satellites already in geo-stationary orbit, a resource that can not be changed rapidly. Interview with Rear Admiral Goldrick, 30 May 2006; and Interview with Commodore Jones.

66. These included CENTRIXS, CENTRIXS GFE, CENTRIXS J, CENTRIXS C, and CENTRIXS, English et al, Beware of Putting the Cart Before the Horse, p. 15.

67. Interview with Rear Admiral Robertson.

68. Interview with Rear Admiral Robertson.

69. Multilevel security would allow sharing of information on networks between individuals, organizations, and nations all cleared for differing levels of classification. Interview with Commodore Lerhe.

70. Interview with Rear Admiral Robertson; Interview with Commodore Jones; and Ivan Ingham ‘Naval Gunfire Support for the Assault of the Al Faw Peninsular’, Journal of the Australian Naval Institute, no. 109 Winter 2003, p. 36.

71. Interview with Commodore Lerhe.

72. Interview with Rear Admiral Robertson.

73. Interview with Commodore Lerhe.

74. Interview with Rear Admiral Robertson; and Interview with Commodore Lerhe.

75. Ingham, ‘Naval Gunfire Support for the Assault of the Al Faw Peninsular’, p. 34.

76. Interview with Commodore Lerhe.

77. Commodore Jones sent his own chief of staff, somebody ‘ugly enough and strong enough to give honest answers to an Admiral and come back and tell me what I was doing was wrong.’ Commodore Lerhe noted, ‘if it doesn’t hurt (in terms of human resources) to send liaison officers, then you are sending either the wrong people, or not enough of them.’ Interview with Commodore Lerhe; and Interview with Commodore Jones.


79. Interview at Air Power Development Centre; and Interview with Captain Spedding.

80. Interview with Captain Spedding; Field, p. 11.


82. Gimblett, Operation Apollo, p. 108.

84. Interview at Air Power Development Centre. Commodore Steve Gilmore noted that in the planning of coalition operations, knowledge of a nation’s rules of engagement was as important as understanding the capabilities of the type of kit and the professionalism of the crews they sent. Interview with Commodore Steve Gilmore, RAN, ADF HQ, Canberra, 2 June 2006.


87. Interview with Commodore Lerhe.

88. Interview with Commodore Lerhe.

89. Interview with Rear Admiral Robertson. Similar issues were raised by Rear Admiral Goldrick and commodores Jones and Gilmore in their interviews as well.

90. Interview with Commodore Lerhe, 30 September 2005.

91. English, Gimblett, & Coombs, *Beware of Putting the Cart Before the Horse*, p. 14

92. Interview with Commodore Jones.

93. Interview with Commodore Gilmore, 2 June 2006; Interview with Commodore Jones; and Zelibor, ‘FORCEnet is Navy’s Future’.
Let me begin looking for Admiral Mullen’s ‘international city’ in an odd place, because my professional roots lie there. I have spent the past two decades working with submariners and writing about the science and technology of undersea warfare. So let me begin at General Dynamics Electric Boat Division in Groton, Connecticut. In spite of the irregularities in institutional and personal relationships that make their history fascinating, the US Navy has had, by any standard, a productive relationship with this submarine builder. Since the turn of the 20th century, they have disagreed on design matters, battled to frustration after World War I over defective diesels, worked together with Portsmouth Naval Shipyard to set production records after the attack on Pearl Harbor, and produced, with then Captain Rickover, the first nuclear submarine less than a decade after V-J Day. In the end, the scientists and engineers, naval and civilian, created the first true submarine and harnessed a basic force of nature to drive a ship.

When we ask ourselves how they did this, the thoughts that immediately leap to mind include everything from electrons to seamless stainless steel tubing. As historians, we must fold every possible source into our analysis. We do not have the luxury of selective omission or assuming certain factors will remain constant. Human activity, much like the nuclear activity that first generated steam for the nuclear-powered submarine USS Nautilus in 1955, unfolds much like a chain reaction with all of the players having some influence, but others more, and for reasons that the context of the time can explain if we look close enough.

Regardless of the subject of our inquiry, we need to find a perspective that will allow us to establish intellectual command over the seeming serendipity we find in our sources. Looking historically for the 1000 ship navy, I found most illuminating the words of the general manager of Electric Boat when he searched for the best way to describe the reasons for the success of the US Navy’s Polaris program in 1960 and the swift construction of USS George Washington, the first nuclear-powered ballistic missile submarine. In his 1973 oral history with John Mason of the US Naval Institute, Carleton Shugg of Electric Boat explained:

My man responsible [for placing orders] came over to my house on Christmas Day with all of the mill orders for steel, which were based on an estimate of what we would need, and we got the steel on order before even seeing a piece of paper [that is, a contract]. And we made
other heavy commitments, and that was the way the relationship was between [Electric Boat] and the Bureau [of Ships] … it’s the way business should be done more often. I mean, we each knew the other.\textsuperscript{1}

They knew one another. Shugg and his staff at Electric Boat prized this personal knowledge. They knew the Bureau of Ships’ (BuShips) supervisor of shipbuilding resident at Electric Boat and the officers responsible for the various aspects of construction at the bureau. Indeed, Henry Nardone of Electric Boat and 17 of his colleagues actually worked at BuShips with navy engineers in 1957, and at times sent instructions from Washington to bureau personnel in Groton with full navy authority.\textsuperscript{2} Polaris had the Navy’s top project authority, Brickbat 01. Everything, except security, took second place to bringing a successful project in on time. Three decades later, in his new capacity as Trident Program Manager for Electric Boats, Nardone lamented the frequent absence of this professional intimacy, commenting that ‘I don’t think you can do that nowadays … the bean counters have inherited the earth.’\textsuperscript{3}

Historically, the human network made George Washington and the Polaris system possible. It permitted Carleton Shugg to trust the navy commitment. This professionally intimate communication system gave access to navy spaces and systems to Henry Nardone as an Electric Boat employee because the mission demanded it. Without an effective human network, collaboration in the shipyard, creating a weapons system, or conducting combined operations will not work.

In late 2006, my work took me to the National Geospatial-Intelligence Agency (NGA), after nearly two decades at the US Naval Historical Center. While I left behind research that had held my attention and interest for years, I looked forward to studying and historically analysing a truly innovative group within the intelligence community; experts in communication who generate significant knowledge for those who go in harm’s way. I am currently working on a project designed to illuminate the origins of modern geospatial intelligence, introduced by NGA’s predecessor agency the National Imagery and Mapping Agency (NIMA) in the late-1990s.

While it initially seemed very new and certainly absorbing, my exploration of geospatial intelligence as a synthesis of intelligence tradecrafts has already begun to verify the significance of the human network as a major factor in the history of naval communication, but one often overlooked, occasionally ignored, and frequently underestimated. Let me draw briefly on my present historical effort to give you a sense of my meaning. It will help us find our way historically to the 1000 ship navy.

On 1 November 1995, US President Bill Clinton called on the warring factions in Bosnia to end a conflict that had cost over 300,000 lives since 1991. He invited their representatives to come to Wright-Patterson Air Force Base in Dayton, Ohio to negotiate an end to the ethnic discord.
At Dayton, the US delegation relied on a technical team led by the US Defense Mapping Agency and the US Army Topographic Engineer Center. Using automated cartography, computer-assisted map tailoring, and spatial statistical analysis, the team regularly furnished fresh maps reflecting territorial dispositions negotiated less than 30 minutes earlier. These cartographers and analysts together contributed to the Dayton Peace Accords, leading to a temporary, but significant, suspension of regional violence.

In this case, the professional lesson did not go unlearned. Combining people and talent from eight agencies and offices the following year into a National Imagery and Mapping Agency certainly reflected initiatives underway, but also spoke to the wisdom of asking those involved in defence imagery and mapping to emulate the Dayton collaboration on a more permanent basis.

Of course the agency’s enabling legislation simply brought people together and initially could do nothing more. For many months after the creation of NIMA, imagery analysis and geospatial information services within the agency remained in separate and culturally distinct worlds. Strong identities on all sides at times made regular collaboration a very difficult and most unlikely prospect. We have all encountered this kind of cultural incommensurability in our professional activity.

Seeing potential in combination, a number of people stepped forward hoping to bridge the gap. After 12 years at the Naval Research Laboratory, cartographer Joan Burke found herself in a position to help. Working with the NIMA Production Cell on the fifth floor at the Washington Navy Yard, she gained approval for a plan to blend the analytical skills applied to imagery with those of the geospatial arts and sciences. In 1999, she began to hire cartographers, geographers, and other geospatial professionals for possible placement in some of NIMA’s imagery analysis offices.

The bloody conflict in Chechnya presented the perfect opportunity. Driven for a time by this civil war, NIMA’s Eurasian Branch turned potential into practice. Welcomed by branch chief Edward Cicali, in 2000 Burke asked Bethesda-based cartographer Jeffrey McCay to join the Eurasia group to merge his talent with their imagery analysis.

McCay, Cicali, and the other group members successfully set cultural barriers aside, listened, shared, and proceeded to issue intelligence products that had their customers immediately clamouring for more, describing the output as ‘phenomenal’. As Joan Burke remembered it, ‘Jeff McCay was a rock star’: He provided the magic ingredient that brought the effort and the output to another level. Intellectual insight into a crisis situation expressed in a tight, complementary symphony of image and idea quickly set a new standard for professional achievement. Cicali’s pioneering group arrayed their early products on a display surface at the Washington Navy Yard that quickly became known as the ‘Wall of Fame’. Starting with McCay and seven other geospatial specialists, within six months Joan Burke had little trouble placing eighteen more in various imagery offices in NIMA.
The success of the Navy Yard Eurasia Branch significantly eroded cultural barriers and promoted professional integration. Coming together as NIMA certainly created the critical mass of talent and insight, but many people willing to trust, to collaborate, to broker relationships, and to experiment, provided the catalyst. NIMA’s customers understood the crisis in Chechnya as never before only because individuals with vision and a willingness to translate culturally between tradecraft communities took the initiative. They saw the possibilities in a single intelligence product that emerged from a synthesis of multiple approaches to the same requirement. Geospatial intelligence has quickly proven very powerful and useful as an intelligence tool.⁹

Most fundamentally, this had very little to do with strategy, tactics, technology, or platforms. It had everything to do with conversation, collaboration, personality, face to face communication, integrity, and trust. The human network enabled the NIMA combination to become different and more powerful than simply the sum of its parts.

Addressing the 17th International Seapower Symposium on 21 September 2005 at the US Naval War College in Newport, Rhode Island, the American Chief of Naval Operations (CNO), Admiral Michael Mullen, USN, explored the possibilities of calculating another sum, and on a much greater scale:

As we combine our advantages, I envision a 1000-ship Navy – a fleet-in-being, if you will, made up of the best capabilities of all freedom-loving navies of the world ... This 1000-ship Navy would integrate the capabilities of the maritime services to create a fully interoperable force – an international city at sea.¹⁰

For a few of us in naval history, the admiral’s statements at the war college seemed timely indeed. With the opening of Operation IRAQI FREEDOM roughly two years before and the subsequent debate in the United States about the coalition of the willing, historians in the Contemporary History Branch of the US Naval Historical Center joined the discussion by reflecting on the nature of effective coalitions. Under what circumstances did various national command authorities adopt a combined or allied solution to an external threat rather than acting alone? What did these international coalitions look like? What assets, talents, and attributes did the combined force need? Did naval efforts of this sort in the recent past work effectively given the mission? What critical factors contributed to the success or failure of a combined effort?

Those of us involved in this discussion soon realised that historical analysis, approaching problems as it does from the humanities perspective, could address these questions in an informative, unique, and stimulating way. Thus the growing public debate presented us with an unexpected opportunity to apply history directly to immediate naval needs in an age partly defined by 11 September 2001.
In the end, the subject and the ongoing public debate proved too compelling, and the occasion to apply historical methodology proved too opportune to permit all of this to remain academic.

As branch head at the time, I initially conceived this project as an American endeavour, but it soon seemed counterproductive not to seek out other naval history programs both officially pressed and intellectually stimulated by the same issues and possibilities. I asked a good friend, Michael Whitby of the Directorate of History and Heritage (DHH) in Ottawa, to reflect on the possible profit in informing the present by evaluating naval coalition experiences of the recent past. Together, we and other colleagues might examine a number of combined operations as case studies. Did he think my scheme worthwhile given the current interests of his navy and, perhaps more important, would the proposal interest his director, Dr Serge Bernier?

I laid before him a plan to initiate a project involving four national navies, frequent allies, in an effort to examine historically the nature of naval combined operations. The project would endeavour to derive conclusions and lessons that serving naval officers might find immediately useful in their effort to address missions in the Near East, the Indian Ocean, and the South-West Pacific. My plans called for participation by Canada, the United Kingdom, Australia and the United States.

Dr Bernier emerged from his discussions with Michael and the DHH Senior Historian, Dr Steven Harris, convinced that I was not mad and that my proposal actually had merit. He assigned one of his more capable people, Mr Robert Caldwell, as the Canadian member of the team. With the credibility provided by Dr Bernier’s generosity and his willingness to take a measured risk, I recruited the balance of the team. Mr Stephen Prince came to us courtesy of Captain Christopher Page, RN (Ret), director of the Royal Navy’s Naval Historical Branch in Portsmouth. Dr David Stevens of the RAN’s Sea Power Centre in Canberra, assisted by Commodore Jack McCaffrie, RANR, completed our very able cast. For the Naval Historical Center, I asked Dr Jeffrey Barlow and Dr Randy Papadopoulos to take responsibility for most of the analysis the US Navy would contribute to the mix.

An inaugural team meeting hosted by DHH on a cold winter day in Ottawa in 2004 determined the best and most evocative cases for study. Within a 1991 through 2003 timeframe, the team would look at maritime interception operations in both the 1990-91 Gulf War (2 August 1990 – 28 February 1991) and in Operation ENDURING FREEDOM (7 October 2001 – still ongoing); Operation SHARP GUARD in ethnically torn Yugoslavia through 1996, and Operation STABILISE, the United Nations mandated action led by Australia to bring peace to East Timor in 1999.
The outcome of the ‘Combined Operations Project’, as we christened it, called upon policymakers, strategists, and operators living in a 21st-century coalition world to recognise the very human nature of combined operations. When the CNO said:

> The US Navy is in a unique position to facilitate the voluntary enlistment of nations as members in this global partnership by stressing the individual security, economic, and political benefits of participation, but the Navy cannot do this without strong and sustained support from coalition partners across the globe.\(^{11}\)

What did those words mean in practice? The Combined Operations team looked for answers with help from historical sources and many of the prospective coalition partners. While policy and technology certainly directed and enabled naval action, our analysis revealed the great degree to which combined operations relied upon personal and professional relationships formed and reformed by sailors of all ranks across national and cultural boundaries. Without careful attention to the personal and individual at every command and service level, the partnership or coalition would lose its coherence.

In each of the case studies, communication and trust emerge as paramount. Without the trust engendered by effective, well-trained liaison officers and frequent collaborative exercises at sea, combined operations can quickly become an exercise in futility. Deliberately frequent contact regularly allowed people to broker the mutual understanding that served Vice Admiral Viscount Nelson so well within...
his own fleet more than two centuries ago. This dynamic has become even more necessary today given the potential contemporary barriers of language, national culture, technology, and operational experience. We discovered that the history of recent combined operations repeatedly speaks to these critical, but often overlooked, personal aspects. In short, history suggests that you cannot surge trust.\textsuperscript{12}

This type of analysis, while not often granted the authority of the statistics, social science, and models purchased from consultants, can help address current operational problems by more completely revealing the varied nature of coalition war. Unfortunately, national navies of the 21st century rarely look to history to provide this service. My colleague, Professor Andrew Lambert has reminded me more than once that historians recall with some envy the role played by historian and strategist Sir Julian Corbett in educating and advising the leadership of the Royal Navy at the turn of the twentieth century. His applied history became critical to understanding the adversary and planning accordingly.

Considering a formula in 1914 that might lure Kaiser Wilhelm’s High Sea Fleet out of its secure bases and into a decisive defeat, Admiral Sir John Fisher repeatedly looked to Corbett for insights into German military behaviour that extended as far back as England’s participation in the Seven Years War (1756-63), a conflict once described by Winston Churchill, with some validity, as the first true world war. Fisher concluded that only by actually or apparently threatening the German Baltic coast would Great Britain pose a threat sufficient to precipitate a decisive encounter at sea between the two major fleets. Drawing much of his preliminary planning from historical analysis, Fisher then asked his historical partner to prepare a paper on employing the fleet to gain control of the Baltic. With a nearly unrivalled knowledge of history across the entire experience of the Royal Navy, and access to both Fisher and the sources emerging from the current war, Corbett complied. He provided the admiral with a conceptual foundation, resonating with past experience, which supported fleet expansion as well as the distribution and commitment of valuable assets.\textsuperscript{13} The relationship between Corbett and Fisher proved not only constructive but essential to the Royal Navy.

The Combined Operations Project team discovered that this relationship remains every bit as essential in our new century, in spite of a reluctance within modern navies to follow Fisher’s lead in permitting past human behaviour, historically evaluated, to inform the present significantly. In our own time, advanced technology and its solutions represent the present and future in a very immediate and dynamic way. For many, history pales by comparison and seems out of place and out of step. Indeed, to use history a la Corbett and Fisher implies that you have become an artefact rather than a modern player. In response, this historian asks, can technology provide an understanding of our own professional behaviour, that of our adversary, and insight into the very nature of the war currently claiming precious lives? Is our otherwise capable technology truly effective without such understanding? Naval ships and weapons systems can only serve as outward tools and choices.
Only sailors and their supporting cast form the substance of any naval endeavour. The Combined Operations team demonstrated that through humanities analysis, the historian can make common human experience speak in ways immediately valuable to the contemporary sailor. If those who waged the Seven Years War can inform and influence naval strategy nearly two centuries later in World War I, who are we to ignore an invitation to have a historical conversation with those involved in combined operations over past last two decades.

Historical analysis suggests that the recently proposed 1000-ship navy coalition, this ‘international city at sea’ so essential to a vision of the maritime future embraced by the American CNO, will not take shape without the aforementioned historical conversation. Thus far, that dialogue strongly suggests that the level of international professional intimacy required to achieve Admiral Mullen’s excellent goal makes recognising and further enhancing the human network illuminated by the Combined Operations Project absolutely necessary.

In the *Navy Strategic Plan* published by his office in May 2006, Mullen highlighted the necessary tools to achieve the international city, but with classic generic naval policy vocabulary. He asserted that:

> No single nation has the sovereignty, capacity, or control over the assets and resources needed to meet this challenge. Policing the maritime commons requires substantially more capability than the United States or any individual nation can deliver.14

In close historical analysis, human beings emerge strongly as the primary asset or resource needed to police the maritime commons. Naval component commander, Commodore James Stapleton, RAN, made the very same point in reflecting on the reasons for success in East Timor in 1999. In my interview with him in 2004, he recalled that:

> They’d all come from a major exercise that was called off, the one that I was going to go to. So they’d had time in company and they’d worked with [USS] *Mobile Bay* before, they’d worked with [HMS] *Glasgow* ... they’d worked with [HMNZS] *Te Kaha* ... I’d worked with these ships before, I knew the COs [commanding officers], I knew the capabilities of each of the ships. So we’d worked together pretty much for a lot of the time.15

Combining proved relatively easy, as long as the relationships remained fresh and current and drew on strong common experience:

> We’ve worked together all the time. We have common doctrine and procedures. It’s pretty easy actually ... it was very much a one-on-one. And it was a one-on-one with every country, but the way I spoke
to them and the operation order for communications, the operation order for the flying program or what have you, was the standard NATO signal which they all have.16

You had to consciously take measures to build and renew the network, which cannot have the flavour of a single nation alone:

[I had people] from each country on my staff. And I was trying to replace the Australians with internationals. I had a Frenchman on my staff, I had a Canadian or two, engineers. I had New Zealanders. This became a problem for me then about classification, and what I could leave lying around and what I couldn’t leave lying around. Issues like that. And what was privileged information, and what wasn’t ... It does make problems, but if you don’t manage it, and I didn’t have those guys and girls on my staff, for sure, then the coalition thing doesn’t work.17

It had to become as natural as the first cup of coffee in the morning, a fit so well engineered over time, socially and professionally, that it could become second nature:

Again I go back to the NATO [model] ... You hear people say, ‘I’m an Australian’, but people in Australia still know what you mean when you say ‘I’ll have a brew’, a coffee, ‘I’ll have a NATO standard’ (that’s white and two [sugars]). Maybe that’s because that reflects my age ... and I did a lot of training in the UK. So I knew NATO, and I know the publications. But if you’re using ATP, the tactical publications, you can talk to any navy in the world, because everyone’s got Allied Tactical Publications. You can also use international codes. So it was never really an issue about integration ... Everybody just fitted in.18

If we are tempted to say, ‘of course’, we need to remember that history recently accomplished by the Combined Operations Project strongly suggests that we have very often placed our emphasis elsewhere or viewed people as extensions of platforms and technologies. In addition, we must recognise that the cultural expectations that shape a naval career have long mitigated against the role the international city needs many officers to play.

We need only examine the uncertain fortunes of liaison and exchange programs and the personnel in them to realise the significance of internal culture on careers. After we presented our preliminary conclusions to a Royal Navy audience in Portsmouth in 2006, I had a conversation with an American commander, who, by his own admission, had made the mistake of serving two tours as a liaison officer simply because he loved the work. He told me quite frankly that his career might well never recover because so many of his peers now had more time at sea. In spite of its importance to the international city, this work often becomes a professional liability for those who enjoy it and prefer to continue beyond a strictly advised limit.
Indeed, in Australia in 2005, we encountered a RAN captain who lamented the regularity of budget reductions in exchange programs in his own country and others. He argued, as Commodore Stapleton did earlier in our research, that these programs held our collaborative ventures together, potentially supporting and refining the human network into a very potent tool. Without them, the human network falters, indeed international city becomes little more than momentary imagination.

If navies intend to keep the ocean open in an age of regional instability and pervasive terrorism, combined operations regularly informed by professional historical perspective must become a permanent and essential part of naval practice. After all, for history, ways and means actually play a supporting role. History is about people and what transpires between them.

Notes
5. Oral History with L Puetz by GE Weir, 22 January 2007, NGA Historical Research Center, Bethesda. I shall use aliases for the names of currently serving intelligence officers to enable me to tell this story without compromising individuals and to ensure the release of this essay for public use. A version of this essay with all of the proper names and the selected aliases is on deposit at the NGA Archive in Bethesda.
12. Dr Steven Harris coined this phrase during one of the team’s combined analytical sessions in Australia in July 2005.
13. This discussion of Julian Corbett owes a great deal to conversations via email with Professor Andrew Lambert, Laughton Professor of Naval History at Kings College, London.
14. Office of the Chief of Naval Operations, Navy Strategic Plan in support of Program Objective memorandum 08, p. 20.
17. Weir interview with Stapleton.
18. Weir interview with Stapleton.
Communications dominate war; broadly considered, they are the most important single element in strategy, political or military.

Captain AT Mahan, USN, 1900

The object of naval warfare is the control of communications, and not, as in land warfare, the conquest of territory.

Sir Julian Corbett, 1911

Sea communication has opened up the whole world, and has played the greatest of all parts in spreading both knowledge and civilisation.

Captain WHCS Thring, CBE, RAN, 1928

The quotations above by Sir Julian Corbett, and captains Mahan and Thring provide a firm footing from which to begin our investigation of communications in maritime operations. These three distinguished naval scholars spoke of the larger issue of communications – the need for navies to protect the sea lanes to allow a free flow of goods and services. This chapter will focus on that ‘other’ communications – the exchange of information during maritime operations.

Navies have communicated at sea for several millennia and naval coalitions have communicated with each other for most of recorded history – reaching back at least as far as the Greco-Persian War (499-449BCE). The fact that navies have done this with some degree of adequacy leads both naval strategists and lay people to assume that with the arrival of new technologies, communications with coalition partners has become easier.

The assumption that technology – mobile phones, broadband internet access, and satellite communications – has helped speed along naval communications in recent decades is true to an extent. Modern information and communications technologies are currently being used to create a common operating picture that can be shared and accessed by commanders and operators at different points on the globe. However, that ability to share a common operating picture with navies from different nations has been problematic. The very technology that has helped each navy communicate between and among forces within that navy, has often impeded effective communications with forces of other navies.
Ultimately, the technical community will be charged with providing the means to enable the ‘seamless interoperability’ among the navies of maritime coalitions. The latter part of this chapter will focus on a study involving a multi-year project being conducted among the five AUSCANNZUKUS nations, to provide the analytical backbone that demonstrates the enhanced warfighting effectiveness than can be achieved when coalition naval forces network effectively. This is just one model for effective naval cooperation and collaboration, but it is one that can be extrapolated to other naval coalitions.

A Brief History of Naval Communications: From the Flame to the Net

The focus of this chapter is on coalition communications and how far we have come in communicating at sea, and some of the challenges that we still face. The term communications, as it relates to maritime affairs, has two meanings. The first meaning, which we will refer to as maritime communications with a big ‘C,’ refers to the sea lanes that encircle the globe. Communications in this regard refers to the means of the movement of commercial goods and services along with military supplies and troops via sea lanes. The second meaning of communications at sea refers to what Webster’s Dictionary defines as ‘a process by which information is exchanged between individuals through a common system of symbols, signs, or behaviour.’ This meaning of communications with a small ‘c’ is what this chapter will discuss – the continuing evolution of how maritime forces exchange information at sea.

The key part of our definition of communications is ‘information exchange’ – the ability to exchange information between members of one nation’s naval force or across a maritime coalition. In the arena of naval warfare, communication is needed to maintain dominant battlespace awareness – to know where your own forces are arrayed and where enemy forces are located. Out of this knowledge comes the ability to plan and strategise to defeat the enemy. The Duke of Wellington aptly noted:

> All the business of war, and indeed all the business of life, is to endeavour to find out what you don’t know by what you do; that’s what I call guessing what’s on the other side of the hill.

Since the beginning of time, humans have tried to guess what is on the other side of the hill, and as part of that effort, has developed means of communication to build that common tactical picture of the battlefield.

Our discussion of the development of naval communications begins with the Greco-Persian War. Naval communications at this time were characterised by rudimentary forms of communications from shouts of command from ship-to-ship to the lighting of signal fires on board to signal the start of action. Ancient naval warfare relied heavily on galleys – ships of war manned by 50 or more rowers. Galley warfare was usually limited to simple ship formations lining up parallel to each other and attacking. On occasion there were some rudimentary formations that called for arranging of the fleet in the form of a huge wedge or triangle.
Communications between ships were usually limited to signalling the start of the attack by the sound of a trumpet or trumpets or by a shouted command:

And the trumpet, with its clang inflamed their whole line; and forth-with at the blow of the dashing oar, at the word of command they smote the roaring brine.⁹

At the campaign of Cyprian Salamis around 306 BCE, shields were used to signal the beginning of the attack.¹⁰

The heart of naval communications during this time period was within the individual galleys because of the need to ensure that all 50 or 170 rowers maintained a constant rhythm and that the oars struck the waters at the right time in order to maintain ramming speed:

Smooth co-operation between all members of the crew was vital: information and orders needed to pass quickly and clearly from the bow-officer to the helmsman, from the helmsman to the rowing-master, and from him to the rowers. ‘Order and silence’ were therefore vital aboard a trireme, and noise interfering with the chain of command could have catastrophic consequences.¹¹

Naval communications in the age of galley warfare were rudimentary, as tactics were basic and did not require complex coordination.¹² Galleys were usually lined up along the most optimal formation to ram the opponent’s ship and the rest was up to the individual galley to hit its target and survive the melee that followed. This was the nature of warfare from the time of the Greco-Persian War to the last great galley war in 1571, when the Christian fleet clashed with the Ottoman Empire’s galleys at the Gulf of Lepanto. By that time, shipbuilding had evolved to include galleys armed with cannons. The heavily armed galleys at Lepanto proved the superiority of cannon warfare.¹³ The age of the galley had ended, and the need for ships that could handle the new armaments brought about the age of the sailing ship.¹⁴

Sailing ships made it possible to expand the area of operations from coastal waters to the open sea and thus led to the development of more complex means of naval communications. The invention of the telescope and binoculars in the early 1600s also facilitated the ability of ships to communicate with each other at a greater distance.¹⁵ The primary means of communications were signal flags used to convey simple instructions and warnings to the fleet. In addition to signal flags, cannon fire, lanterns, and messages sent by small boats between ships were also used to communicate commands or information.¹⁶ Commands were conveyed by a series of flags or a single flag in accordance to a common signal book. For instance, if an admiral needed to communicate with his fleet commanders he would order a signal flag to be hoisted to summon the fleet captains to his ship.¹⁷
Admiral Nelson took great advantage of these flag signalling techniques to obtain a tactical picture of the French and Spanish fleet harboured at Cadiz. In the days leading up to the Battle of Trafalgar in October 1805, Nelson had positioned his fleet out of sight of the coast of Cadiz in order to trick the combined fleet of French and Spanish ships to leave for open water. At 80 kilometres away, Nelson was unable to keep the enemy fleet in sight. To compensate for this he established an information relay system of frigates that would pass back information on the movements of the enemy fleet. The method of communications was a combination of flag signals based on Rear Admiral Popham’s numerical flag system and night signalling – usually a series of lanterns set at agreed-to patterns. The relay system allowed Nelson to obtain a better picture of the French and Spanish fleet than they had of the British fleet. The combined fleet under the command of Vice Admiral Villeneuve was not able to keep similar tabs on the British as they did not have scout ships deployed due to the earlier British blockade; they could only see to the horizon from their position in the Cadiz harbour.
Nelson’s ingenuity in developing his information relay system provided him a view of the pending battlespace that allowed him to position his fleet to intercept Villeneuve before he could escape. However, the relay system was cumbersome as it took two hours for the signal that the enemy ships were leaving port to be relayed from one British ship to another to reach Nelson. Had the successful execution of his plan required more information or had he needed to issue further guidance to either his observers at the port or his battle line, his communications structure would have failed him.

**Naval Communications in the Electronic Age**

The industrial revolution ended the domination of the sailing ship as it brought about the application of the steam engine, the iron hull, and electronic communications to naval warfare. These advancements in naval technology allowed ships to operate in more complex manoeuvres and allowed them to travel faster than when they were at the mercy of the wind. The most important contribution of electricity to naval warfare was the increase in the speed of communications. Naval communications between ship and shore before the electric telegraph took weeks or months, as dispatch ships and land-based semaphore relay systems were used to carry messages over long distances. For example, during the Mexican-American War (1846-48), the Navy Department in Washington was not aware that conflict had broken out until a ship carrying the message arrived on the east coast months later.

Electricity shortened the communications time on land and sea. On land, electricity allowed for the development of the electronic telegraph that used Morse or other similar code systems to send messages rapidly across great distances. At sea, the benefits of electricity came in the form of electric lights used for ship-to-ship communications using Morse. The speed-up of communications due to the electronic telegraph allowed naval commanders to keep better track of their forces and ongoing events around the world. Ships in port could receive updated information from the shore command through the world-wide land and submarine telegraph cable system, and could conversely send information back to their command. This new information exchange capability was a precursor to the development of what would come to be called Network Centric Warfare (NCW) where commanders on land could conceivably pull together a common tactical picture of the world’s oceans.

In 1904, Britain’s First Sea Lord, Admiral John Fisher, took advantage of the new technology and developed what Dr Norman Friedman calls ‘picture-based’ warfare. Admiral Fisher used the information gleaned from shipping reports and reports from his own fleets to build a tactical picture of where pirates were attacking British merchant ships. Information from these sources was fed into two different war rooms – the first war room tracked ship movements around the world while the second war room tracked ship movements in the North Sea. Armed with this ‘picture-based’ view of the world, Fisher was able to direct warships to the spots where British ships were
being attacked by pirates.\textsuperscript{28} In the time period between Fisher’s establishment of war rooms and World War I (WWI), radio technology had matured and was slowly being adopted in Britain as well as in the United States and other countries.

The introduction of radio revolutionised naval communications by allowing speedy two-way communications not only between ship and shore but also between ships. The first iteration of radio communications came in the form of the wireless telegraph in the early 1900s that used low and medium frequency signals.\textsuperscript{29} The effectiveness of radio communications as an important tool in naval warfare was first realised during the Russo-Japanese War (1904-05). Both the Russian and Japanese imperial fleets employed radios on their ships to maintain communications with their far-flung fleets and headquarters. Wireless telegraphy allowed the Japanese Navy to obtain the upper hand in the decisive naval battle between the two navies in the Tsushima Straits. The Russians sent a large contingent of their Baltic Fleet to reinforce their garrison in Port Arthur in an attempt to break the Japanese control of the Pacific. The Russian fleet, led by Vice Admiral Zinovi Petrovich Rozhdestvensky, had used their wireless systems to intercept Japanese communications, and used that intelligence to plot a path around the Japanese patrols in the Pacific region.\textsuperscript{30} However, the Japanese scouts patrolling the Straits spotted the arriving Russians and used their wireless transmitters to inform the Japanese fleet commander, Admiral Togo. The Japanese fleet, armed with this intelligence, manoeuvred into a favourable position to intercept the Russians. ‘This operational use of wireless telegraph transmissions marked the advent of a new era in naval warfare.’\textsuperscript{31}

Successful radio use in naval warfare helped push forward the development of radio-based naval communications. Naval combatants in WWI employed high-frequency (HF) radios to maintain a connection between headquarters on shore and between ships.\textsuperscript{32} The Battle of Jutland – despite the fact that the battle itself was a near disaster for the British – reiterated the importance of radio technology as a tool for intelligence gathering and vectoring. The British code breakers intercepted German signals and were able to determine that the German fleet had left port. The British Grand Fleet was then directed to intercept the Germans in the North Sea, catching them by surprise.\textsuperscript{33}

By the time of World War II (WWII), radio technology had incorporated the use of very high frequency (VHF) and ultra high frequency (UHF) that allowed better quality information to be passed between ships and between ships and aeroplanes. The advantage of VHF and UHF signals were that both required smaller antennas and could carry more data that allowed for clear voice conversations.\textsuperscript{34} The disadvantage of the VHF and UHF signals is that their effective range is short – mostly limited to line-of-sight communications.

Radio technology combined with a successful intelligence gathering apparatus – for example the Pearl Harbor Combat Intelligence Unit – gave the United States a tactical advantage during WWII. The United States ability to combine communications
technology and intelligence gathering to form a common tactical picture for all commanders to see was evident during the Battle of Midway. Admiral Nimitz was able to anticipate the planned Japanese attack on Midway because the code breakers at the Pacific Fleet Headquarters in Pearl Harbor had intercepted several Japanese communications alluding to the attack.\textsuperscript{35} The early warning allowed Admiral Nimitz to organise his fleet, and in the battle that followed, US dive bombers were able to catch the Japanese fleet in the middle of re-arming their planes. In one decisive action the US carrier forces crippled Japanese naval capabilities in the Pacific and quickly hastened the end of Japanese dominance in that region.\textsuperscript{36}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{midway_battle.jpg}
\caption{The Japanese cruiser Mikuma on fire and sinking after attacks by US carrier aircraft at the Battle of Midway.}
\end{figure}

As WWII communication technology advanced, its application brought about changes in what we now refer to as ‘command and control,’ altering the way navy commanders employed their forces. Exploiting the advances in both communications and sensors was a process that had to be learned by naval forces, often at a price. For example, during the Naval Battle of Guadalcanal in November 1942, US task force commander Rear Admiral Dan Callaghan found himself overwhelmed by a flood of confusing radar reports over the new ‘Talk Between Ships (TBS)’ voice radio and his hesitancy cost him the battle and his life.\textsuperscript{37} Communications and the ability to share increasing amounts of information required the commander to revisit both tactics and his role in implementing them.
After WWII and through the early part of the Cold War period, from the Korean War to Vietnam, radio systems remained the chief means of communications for naval forces. During the Vietnam War, the US Navy converted small aircraft carriers into radio relay ships to provide reliable radio communications between ship and shore as well as between ships. These radio relay ships and the various radio relay stations established by the US Navy around the world would eventually be replaced by satellites.

Satellites – with their persistent line-of-sight capabilities – allowed for the expanded use of high radio frequencies like UHF, VHF and super high frequencies. The advantage of these frequencies is that they can carry large amounts of information and smaller antennas can be used to transmit and receive the signals. In the years through the Cold War era, satellite transmissions were the main form of naval communications allowing for high tempo manoeuvres at sea and real time coordination between the commanders on shore and at sea. The establishment of a global satellite communication system has prompted many naval forces to consider networking their forces together to obtain the best timely and accurate tactical picture of the battlefield.

Modern Naval Communications: The Networked Navy

The end of the Cold War roughly coincided with rapid advances in commercial technology that made possible the long-sought-after goal of improving naval shipboard communications. To the extent that it was possible to effectively realise Fisher’s vision of ‘picture-based’ warfare a century after he created the concept in a pair of Admiralty war rooms.

During the Cold War, naval communications technology advanced steadily, enabling ships to communicate over greater distances. Much of the focus, understandably, was on the NATO alliance, and the navies of these allies evolved communications protocols that enabled them to operate effectively at sea to the extent that technology would allow it. Outside NATO, the US Navy did not have a compelling need to improve communications with other navies.

Since much of the focus of the Cold War was on gathering political allies and preparing for a land battle on the German plains, with navies operating at the periphery of the main event, it is understandable that there was not an overwhelming focus on networking navies at sea. In fact, some have argued that the US Navy’s Maritime Strategy, unveiled with much fanfare in the mid-1980s, may have inadvertently impeded effective US Navy networking with NATO allies and other potential naval coalition partners, as portions of this strategy envisioned the ‘600-ship Navy’ taking the fight to the Soviet Navy virtually alone.

But as the US Navy continued to evolve and refine its strategy in documents such as …From the Sea and Forward…From the Sea, there was increasing recognition of the need to operate with NATO and other coalition partners and to communicate more
effectively with these navies. These documents even offered examples of ‘coalition partners around the Pacific rim, Norwegian Sea, Persian Gulf, and Mediterranean basin’. In the 1990s, naval leaders began to recognise that coalition partners could contribute much to a US Navy comprised of fewer ships as the end of the Cold War ushered in what is euphemistically referred to as a ‘procurement holiday’ for the US military.

NCW has evolved over this same time period to describe the modern equivalent of Admiral Fisher’s concept of ‘picture-based warfare’. For a variety of reasons, principally necessity being the mother of invention, naval forces led their land and air based brethren in their ability to network. Navies – especially larger navies – have been early adherents of NCW because of the traditional style of operations, which entailed the continuous forward deployment of a distributed naval force.

Operation DESERT STORM in 1990-91 presented the first major post-Cold War test of the ability of military forces in general – and naval forces in particular – to operate in concert with large numbers of coalition partners. While a full discussion of the lessons learned in that conflict is well beyond the scope of this chapter, one of the compelling lessons of that war was that the outcome turned as much on the superior management of information as it did on the performance of people or weapons.

As the world’s militaries and navies assimilated the lessons of DESERT STORM, there was increasing recognition within military circles that the command, control and reconnaissance systems that under-girded the entire coalition war effort were, on the one hand, the most important key to victory, while on the other, the systems that needed to become more adaptable to link partner militaries and navies. Concurrently, the world’s major maritime powers also began to realise that DESERT STORM was likely the last force-on-force war they would see for some time, and that the world was rapidly becoming a place where ‘brush-fire wars,’ would require agile coalitions of nations operating in virtual ‘pick-up games’ to deal with emergent crises. Additionally, as globalisation became a motive force for the world economy, especially in tearing down barriers between nations, that emerging breaking of barriers also led to the globalisation of terror, and throughout the 1990s the world witnessed more and more acts of terror – principally against the major maritime powers.

The attacks on the United States on 11 September 2001 instantly crystallised the extent of the world-wide terrorist network and the concomitant vulnerability of peace-loving nations to terrorist attacks. This ushered in the era of the global war on terrorism as these same nations recognised the necessity of working together to defeat terrorism rather than waiting for terrorists to attack their citizens at home.

As the United States came to grips with the extent of the global terror network and as Operation ENDURING FREEDOM demonstrated the value of coalition partners, the nation moved from a ‘go-it-alone’ approach to one that sought to work in concert with other nations in the global war on terrorism. For the US Navy, this translated
to the idea of a 1000-Ship Navy which later became known as the Global Maritime Partnership. Proposed for the first time by US Chief of Naval Operations, Admiral Michael Mullen, USN, at the US Navy’s International Seapower Symposium in late 2005, the idea represented a stark recognition by the US Navy that the world’s maritime fleets need to work together to maintain global maritime security.\(^{52}\)

Later that year, Mullen and Vice Admiral John Morgan, USN, the Deputy Chief of Naval Operations for Plans and Strategy, appeared at the Royal United Services Institute’s Future Maritime Warfare Conference to reinforce the commitment to ‘a global maritime network to provide maritime security.’\(^{53}\) The theme of international naval cooperation and the Global Maritime Partnership continues to feature prominently in national and international naval publications as part of an ongoing US Navy campaign to signal the importance of international maritime cooperation.\(^{54}\)

**Perspective on the Global Maritime Partnership**

From the perspective of the US Navy, coalition operations are an increasingly important consideration. This comes not from ‘policy wonks’ or from those working in various parts of the shore establishment, but from the operators, those ‘on point’ and charged with achieving mission success when undertaking an important operation with coalition partners. Each year, the five numbered fleet commanders in the US Navy submit their ‘top ten C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) requirements.’ For years, these ‘desirements’ have been literally all over the map, with ‘more bandwidth’ often taking top billing. Today, these fleet commanders are universal in identifying one C4ISR issue as their top priority – coalition communications.\(^{55}\) These warfighters recognise that the ability to communicate and exchange data with coalition partners is important to their success across a wide range of mission areas, especially as a shrinking US Navy is stretched increasingly thin to carry out its myriad of missions.

The US Navy – perhaps more so than any other US military branch – recognises the challenges of coalition communications and has moved out smartly to address this issue. In a series of memoranda to his staff, the then Deputy Chief of Naval Operations for Communications Networks, Vice Admiral Mark Edwards, USN, stressed the crucial importance of networking coalition partners. In a memorandum to the Director of the Warfare Integration Division entitled ‘FORCEnet for the 1000-Ship Navy’, Edwards directed his staff to:

\[
\text{Lead an effort to articulate the strategy to network the 1000 Ship Navy ... identify the funding, personnel, organization, and processes for ensuring interoperability with coalition navies at the sensitive but unclassified level where possible ... ensure coalition interoperability is considered at the earliest stages of capability development.}\(^{56}\)
\]

This strong focus on coalition interoperability is rapidly gaining traction throughout the US Navy.
From our experience with colleagues in the Australian, Canadian, New Zealand, United Kingdom and US navies, there is recognition at the working level that there is a need for better coalition networking, especially at sea. The discussion usually involves one or another of our colleagues saying to the US member:

Look, we want to work with you folks in the United States Navy, but we can’t buy all the gear you have on your ships. What is the price of admission to work with you US Navy guys? What do we have to buy or install so that we can communicate with you and exchange information?

But this is only half the question. We should also be addressing this in precisely the opposite manner, asking, ‘What is the price of omission if our navies go off and do things individually and as a consequence cannot communicate and exchange data as members of a coalition?’ It was not that long ago, at the height of the Cold War, when coalition partners worked together, or in the naval parlance, steamed together, with ineffective communications. That might have been all right then, for in the Cold War standoff, there was a high premium on coalitions and alliances from a political standpoint – how many nations were on each side of the line. Sometimes it did not matter whether coalition partners could actually work together, what was important was that each nation had chosen sides.

Today, we have moved beyond merely political considerations. While politics can never be ignored, it is now operational necessity that dictates the importance of coalition operations, and it is the operators who are saying that the price of omission – of having coalition partners who cannot operate together seamlessly – is far too high. This was put most directly by Admiral Robert Natter, USN, then Commander of the US Navy’s Fleet Forces Command, when he noted:

The significant involvement of coalition forces in Operation ENDURING FREEDOM – including over 100 ships deployed in Central Asia for an extended period – has reemphasized the requirement for improved internet protocol data systems’ interoperability with allied and coalition forces.

Natter could not have picked a more striking example. A snapshot of ships deployed to the US Central Command’s Area of Responsibility during ENDURING FREEDOM included 91 ships of 12 nations. Sixty ships belonged to one of 11 US coalition partners while only 31 ships were from the US Navy, one indicator of how heavily the United States depends on its coalition partners, especially in the maritime domain. More recently, Lieutenant General Michael Mattis, USMC, then-Commanding General of the US Marine Corps Combat Development Command, referenced this major coalition operation when he pointedly noted:
You cannot do anything today without being part of a coalition. In OEF [Operation ENDURING FREEDOM] the majority of forces were coalition forces. This is a military consideration, not a political one. Coalition warfare is a reality and a fact.\textsuperscript{60}

The leadership of other major navies also recognise the importance of coalition interoperability. For example, The RAN’s former Chief of Navy, Vice Admiral Russ Shalders, RAN, has indicated that Australia has adopted a doctrine of naval cooperation that will lead to ‘a maritime neighbourhood watch scheme’ involving joint exercises with old foes such as Russia and China.\textsuperscript{61} The Royal Navy’s former Chief of Naval Staff and First Sea Lord Admiral Sir Jonathon Band, GCB, DL, ADC, RN, has argued that the Royal Navy should accept sacrificing quality for quantity if it is to maintain a surface fleet of sufficient size to contribute to maritime security operations on a global scale.\textsuperscript{62} This interest spreads beyond traditional naval allies to include emerging regional and global naval powers such as India who are exploring the potential benefits of sharing information about maritime threats and situations.\textsuperscript{63}

The importance of the ability to communicate with coalition partners transcends warfare and impacts coalition naval partners in literally every endeavour. This was dramatically demonstrated in December 2004 and early 2005 during the tsunami relief efforts in the Western Pacific, where 18 nations worked together, primarily on and from the sea, to deliver relief supplies from naval vessels.\textsuperscript{64} Interviews with naval officers involved in that effort indicate that while the forces ultimately got the job done, coalition communications at sea remain an ongoing challenge.

However, policy decisions to effectively network coalition navies must be supported by the technological means to do so. And in an era when the majority of coalition naval operations may well be ‘pick-up games’, this technology must be devised that enables various combinations and permutations of naval coalitions to operate together effectively. This is an area fraught with many challenges – challenges well-known to the technical community, but often not yet effectively grasped by policy and military people.

**Challenges to Effectively Networking Navies**

Clearly, the available evidence suggests that like-minded peace-loving nations recognise the importance of coalition networking and that naval operators of all nations - the men and women ‘on-point’ in this effort - recognise it perhaps more so than others. At the very pinnacle of the US military, this notion is articulated perhaps most clearly in *The National Military Strategy*, which notes:

> Achieving shared situational awareness with allies and partners will require compatible information systems and security processes that protect sensitive information without degrading the ability of multinational partners to operate effectively with US elements.\textsuperscript{65}
But how important is coalition networking and what is the ‘state of play’ of this networking today, especially when US Navy combat formations attempt to communicate and share data with coalition partners and achieve this ‘shared situational awareness’? Some would say that it is not yet where it should be. Writing in the authoritative *Naval War College Review*, Professor Paul Mitchell, Director of Academics at the Canadian Forces College, asked the key question:

Is there a place for small navies in network-centric warfare? Will they be able to make any sort of contribution in multinational naval operations of the future? Or will they be relegated to the sidelines, undertaking the most menial of tasks, encouraged to stay out of the way – or stay at home ... The ‘need for speed’ in network-centric operations places the whole notion of multinational operations at risk.

Professor Mitchell did not ask this question off-handedly. For a number of years the Royal Canadian Navy has deployed a surface combatant with US Navy carrier strike groups (CSGs) for an extended six-month deployment. This was an environment where the effectiveness of coalition interoperability moved from theory to the reality of high-tempo, forward-deployed naval operations – and operations that often involved combat. As part of his research, Professor Mitchell interviewed the commanding officers of seven Canadian ships that deployed with US Navy CSGs to determine how effectively they were able to communicate with their US Navy partners. The results indicated that while significant progress has been made, more work needs to be done.

As Professor Mitchell noted in his article, the experience of these Canadian commanding officers, as well as the experience of others working with US naval forces in NATO exercises or operations, was that the ‘need for speed’ in network-centric operations may often result in the exclusion of even close allies. Thus, he notes, while the guiding principle of NCW is to increase the speed and efficiency of operations, coalitions are rarely concerned about combat efficiency. Rather, they are challenged by the demands of operating with scarce resources and the need to maintain political legitimacy, or both. This led him to conclude that in a dynamic coalition environment, because of the impact of slower networks or non-networked ships, the prospects of the US keeping ‘in step’ with its likely coalition partners, or even its allies, is not high – absent enlightened efforts by all governments concerned.

At a 2002 international C4ISR symposium, Professor Mitchell put it more directly when he said during the question and answer period following his presentation:

We have been trying to work with the US Navy for a long time. Ten years ago when we basically communicated by the red phone (tactical voice nets) we did all right because it was pretty much a level playing
field. Five years ago, with Challenge Athena and the beginnings of networked communications, it started to become more difficult for us as the US Navy sped away from its partners. Today, with IT-21 and the emerging FORCEnet, the US Navy is in danger of leaving behind other navies because all of the background and decision making that goes on over networks like SIPRNET [Secret Internet Protocol Router Network] is lost to us, thus, when the order is given to do something we have none of the background for it and we are not in the battle rhythm of the operation.\textsuperscript{69}

While some might say this is merely anecdotal information, for these authors and our colleagues from other navies, the situation Professor Mitchell describes represents the reality of current coalition operations at sea and indicates that there is important work yet to be done. Additionally, this is consistent with what proponents of network-centric operations have been advocating for some time. In a capstone publication of the Department of Defense Office of Force Transformation, the late Vice Admiral Arthur Cebrowski, USN, considered by some to be the ‘father of network-centric warfare’, opined:

\begin{quote}
The United States wants its partners to be as interoperable as possible. Not being interoperable means you are not on the net, so you are not in a position to derive power from the information age.\textsuperscript{70}
\end{quote}

If this is such an important issue, then why have naval professionals not worked harder and more vigorously to solve it and why have we not found a solution yet? Part of the problem may lie in the relative success that navies have had networking at sea. Even in the days of signal fires, ships at sea found a way to communicate to some degree. As technology advanced from signal flags, to wireless telegraphs, to tactical radio voice circuits, to satellites and tactical data systems, ships at sea often had it better than forces ashore on expanded battlefields. The fact that ‘we’ve communicated at sea before and we’re doing so today’, often obscures how well we could communicate and exchange data if the right technology, doctrine, tactics, techniques, and procedures were in place.

For the US Navy, there is another complicating factor. Almost all officers who attain high rank in the US Navy have served as CSG commanders at some time during their career, typically as their first afloat assignment as flag officers. As a CSG commander embarked in a \textit{Nimitz} class aircraft carrier, the communications and data exchange capabilities – with robust displays, ample switching and routing capabilities, and high bandwidth – the admiral has experienced the ‘best of the best’ in this area. Additionally, with respect to communicating and exchanging data with coalition partners, coalition nets such as Combined Enterprise Regional Information Exchange System (CENTRIXS) are likely to be installed on the aircraft carrier where coalition naval officers embark for most exercises.\textsuperscript{71} Thus, as these officers mature through policy and acquisition assignments, their collective memory of
coalition communications and data exchange capabilities is often quite positive – but it should not be, for they have not seen it from the position of coalition surface combatants attempting to work with US Navy ships.

Given the importance of coalition networking and in the face of the operational challenges to achieving the requisite degree of networking, it might seem that like-minded navies would be on a sharp trajectory to solving these problems. However, this is not always the case. For the US Navy, part of the problem could be the aforementioned collective experience of senior flag officers. But there is another, perhaps more important, reason that an effective solution still eludes the leaders from all navies who want to solve this issue.

Coalition interoperability does not fit neatly into any requirements ‘bin’ for the US Navy or for the navies of other major maritime powers. It does not fly, float, or operate beneath the seas. It does not strike the enemy from afar like cruise missiles. It does not enhance readiness like spare parts or training. Thus, it often does not always have the requisite degree of high-level advocacy. This is not to imply that those in charge of setting requirements or acquiring weapons systems are not keen on doing the right thing – clearly they are. However, defining operational needs, the requirements generation process and acquisition practices have grown up over decades, and changing these processes to adequately factor in coalition communications takes a great deal of time and attention. As yet, it is a journey that is incomplete.

Rear Admiral Nora Tyson, commander of Carrier Strike Group 2, speaks with Commander Andrew Quinn, RAN, commanding officer of HMAS Toowoomba, during the Australian’s visit aboard the aircraft carrier USS George HW Bush in the Arabian Sea in August 2011. (USN)
Part of the reason for this lack of advocacy and difficulty in reorienting requirements and acquisition practices in the case of the US Navy – and perhaps on the part of likely coalition partner navies too – is the inability to quantify the ‘goodness’ derived from coalition networking. With naval establishments and acquisition bureaucracies increasingly driven by the rules of the marketplace – measures of effectiveness, return on investment and best business practices – the lack of ability to quantify the benefits derived from effective coalition networking augers against spending scarce research and development, and especially acquisition, dollars to enhance something that has not yet been effectively quantified.

Fortunately, some grass-roots efforts are underway to do just that – quantify the degree of benefit delivered by effective coalition networking. These efforts have not received much visibility outside of the communities of interest working the issue, but excellent work is underway in a number of venues, primarily among five English-speaking nations: Australia, Canada, New Zealand, the United Kingdom and the United States.

Much of these groups work deals with near-term solutions to emergent operational interoperability issues. However, there is one group that is chartered to look for longer-term solutions to interoperability among the military forces of Australia, Canada, New Zealand, the United Kingdom, and the United States and one that is populated by scientists and engineers with an understanding of the technology issues that need to be addressed in order to achieve the desired level of interoperability. That organisation is the Technical Cooperation Program (TCP). A link to The Beginners Guide to the Technical Cooperation Program provides further links that explain the purpose and construct of the TCP in more detail.72 The remainder of this chapter will illuminate these TCP efforts and present them as a potential ‘process model’ to achieve similar results in other fora – particularly in the area of coalition naval interoperability.

The Technical Cooperation Program: One Vehicle to Achieve Coalition Networking

Although it has been around in various forms for almost half a century, the TCP is not well known, and some background is in order to explain how this program facilitates the current efforts to address coalition interoperability.73 The TCP is a forum for defence science and technology collaboration between Australia, Canada, New Zealand, the United Kingdom and the United States. It is probably the largest collaborative defence science and technology activity in the world.74

The aim of the TCP is to foster cooperation within the science and technology areas needed for conventional (that is, non-atomic) national defence. To do this, the TCP provides a formal framework that scientists and technologists can use to share information amongst one another.
The TCP consists of 11 Groups: Aerospace Systems; Command, Control, Communications and Information Systems; Chemical, Biological and Radiological Defence; Electronic Warfare Systems; Human Resources and Performance; Joint Systems and Analysis; Land Systems; Maritime Systems; Materials and Process Technologies; Sensors; and Conventional Weapons Technology.

Three types of bodies sit under each Group and perform collaborative activities: the semi-permanent Technical Panels; the temporary Action Groups; and the project-specific Project Arrangements. Technical Panels are designed to manage a continuing program of work and will generally oversee a number of subordinate activities. Action Groups are initiated to investigate a specific issue and, on completion, will recommend if and how any further work on the subject should be undertaken on a more permanent basis. Project Arrangements are a more binding form of cooperation, used to support a specific project or collaboration.

With this description of the TCP as background, we are ready to understand the work that has been conducted under the auspices of the Maritime Systems Group (MAR) Action Group 1 (AG-1) Net-Centric Maritime Warfare Study and Action Group 6 (AG-6) FORCEnet Implications for Coalitions. This ongoing work is offered as one model to dealing with the technical challenges of communications and networking for the global maritime partnership.

One Model for Enhancing Communications and Networking for the Global Maritime Partnership – The TCP MAR AG-1/AG-6

One TCP entity, MAR AG-6 and its predecessor AG-1, have been involved in an analytical effort for the past six years to examine maritime NCW and FORCEnet implications for coalitions, and these teams have generated metrics that show how much more effective a networked coalition maritime force is over one that is not networked. AG-6 has generated analytical data and conducted modelling and simulation to demonstrate that if the US Navy’s FORCEnet is developed in a way that is inclusive of likely coalition partners, who, in turn, build their national systems to be compatible with FORCEnet, the naval forces involved will enjoy a quantum increase in capability.75

AG-6 took the MAR terms of reference and developed three premises and a hypothesis to inform its work. The first premise, derived from the Naval Network Warfare Command’s capstone document, FORCEnet: A Functional Concept for the 21st Century, was that FORCEnet will empower warfighters at all levels to execute more effective decision-making at an increased tempo, resulting in improved combat effectiveness and mission accomplishment.76 The second premise, derived directly from the MAR terms of reference, was that the warfighting benefits of FORCEnet in a coalition context can be assessed through analysis and quantified to provide input to national balance of investment studies of the five member nations. The third premise, derived from the aforementioned US Navy fleet commanders’
top C4ISR priorities, was that it is necessary that FORCEnet address current and near term information system requirements that support operations in the joint and coalition environments. Coalition Communications was the clear number one priority of all numbered fleet commanders and is a critical enabler in leveraging coalition partners in the global war on terrorism.

Based on these premises, AG-6 developed a working hypothesis that has informed its work from the outset. This hypothesis being:

- Conducting modelling and simulation and detailed analysis to demonstrate the enhanced warfighting effectiveness of coalition partners (in this case – the AUSCANNZUKUS nations) netted in a FORCEnet environment can help inform national naval C4ISR acquisition programs.

This not only set the tone for the group’s work, but also provided visibility throughout the naval establishments of all five member nations regarding the group’s efforts. The compelling nature of this hypothesis has caused other organisations not initially involved in AG-6’s work to ‘jump on board’ and join this team.

The full details of AG-6’s efforts are beyond the scope of this chapter. Briefly, a scenario was devised which coalition partners might likely participate in, one that began as disaster assistance/humanitarian relief, then morphed into a counterterrorism effort, and ultimately turned into high-tempo conflict at sea. Then, four principal measures of effectiveness: time to capability (number of major amphibious units delivered on time in the area of operations); economy of effort (cost of munitions, fuel and other consumables used in the campaign); risk (blue attrition in all phases of the campaign: assembly; littoral transit; anti-submarine warfare; anti-surface warfare; anti-air warfare; offload; naval fire support; and mine warfare); and campaign success (success in the aforementioned campaign phases and ultimately, the safe delivery of ‘campaign effectors’ the landing force ashore). These were devised to measure the effectiveness of a robustly networked coalition force that fully leveraged the US Navy’s FORCEnet capability over one that was not networked.

Concurrently, the AG-6 members liberally shared the ‘technology on-ramps’ of their acquisition communities to find those windows where similar technological capabilities could be inserted into their naval C4ISR systems. By modelling the planned capabilities of these ‘on ramps’ against the scenario, the impacts and value of alternative coalition network structures was assessed. The resulting analysis will be used by AG-6 members to make specific communications technology procurement recommendations in their respective countries.

The advantages that can accrue to the world’s peace-loving nations by leveraging the tremendous investment the US Navy is making in FORCEnet cannot be overstated. Far from a US Navy-only standard, FORCEnet – and especially a currently-fielded prototype called ‘Composeable FORCEnet’ – is a publish-and-subscribe system
based on open architecture and open standards that other nations can leverage with minimal investment. An analogy familiar to most nations in the Pacific Rim involves Singapore. In 1998, Singapore made an enormous investment in the Singapore ONE project, which provided broadband infrastructure of high capacity networks and switches, with the goal of providing broadband access to the entire nation. Singapore then went out to the international business community and said, in essence, ‘Come join us. We have made the investment in building world-class infrastructure. This is a great home for your business.’ Attracted by that world-class infrastructure, those businesses came, and Singapore’s standing as a hub for international business and as a strong node in the Asian economy is a matter of record. The question for AG-6 is whether FORCEnet can play a similar role in the development of maritime coalition capabilities.

While the efforts of the TCP MAR AG-6 remain a work in progress, the initial reviews within the naval and defence establishments of the five nations have been overwhelmingly positive. Within the US Navy in particular, one measure of the group’s success is the number of organizations outside the naval laboratory and acquisition community – The Office of Naval Research, the Naval War College, the Naval Postgraduate School, and others – who have placed members on this team because they recognise the importance of its work.

But the TCP in general, and AG-6 in particular, represents just five nations, and as good as the group’s work products might be, the circle of influence of these products is limited to these five countries. For the envisioned Global Maritime Partnership to succeed, a variety of navies capable of operating together on short notice and across a spectrum of missions is required, and similar analytical work will need to be undertaken – and soon – in other venues. NATO offers one potential forum that would include a large number of navies. The Association of South East Asian Nations represents another group of nations that would likely work together across a wide spectrum and that would benefit from enhanced communications and networking at sea.

The TCP model provides a means for the laboratory communities in the nations that will likely work together at sea to analyse technical communication and networking needs in an operational framework. The application of the TCP model to current and future efforts to build effective coalition communication networks can be an important step in realising the goals of the Global Maritime Partnership.

Summary and Conclusions

The issue of ‘Communications for the Global Maritime Partnership’ is a large one and has taken a ‘long chapter’ to properly address the issue. A long chapter might imply that there will be an extensive summary and conclusions – but this is not the case. What this chapter has demonstrated can adequately be summed up in just a few points:
Navies have been communicating at sea for several millennia.

Over time, the need to communicate at sea has morphed to the need to network at sea.

The globalisation of commerce has increased the need for a global maritime partnership to protect this trade between nations and support worldwide prosperity.

Navies are crucial to securing the free flow of trade and networking navies effectively is necessary for a global maritime partnership.

Technological advances among navies have often been uneven – impeding effective networking between navies.

We have ‘beta-tested’ and have shared one methodology for networking navies more effectively – and offer this as a way for other navies to do the same.

There are any number of combinations and permutations of nations and navies that could be involved in efforts to enhance networking between and among peace-loving navies. However, absent rigorous analytical underpinning that conclusively demonstrates the enhanced operational effectiveness one navy gains by networking with its coalition partners, naval leaders will not be convinced to provide the resources – the ‘kit’ – to enable this networking at sea. And absent the requisite technology infusion within all of these navies, the dream of a Global Maritime Partnership will not be realised.

We have offered one example – the TCP MAR AG-1/AG-6 – of a methodology that enables nations – at the laboratory level – to begin the design process to ensure that their navies are able to effectively network at sea. This model is readily exportable to other groups of nations and navies – all that is needed is the will to do so.
Notes

1. During the early months of Operation ENDURING FREEDOM in 2001, a secured internet based information-sharing portal called Knowledge Web was used by the commander of the USS Carl Vinson Carrier Strike Group (CSG) to manage the command and control of a 59-ship taskforce that included a large number of coalition ships. Office of Force Transformation, ‘Network Centric Operations (NCO) Case Study: US Navy’s Fifth Fleet Task Force 50 in Operation ENDURING FREEDOM’, <www.oft.osd.mil/library/library.cfm?libcol=6> (10 July 2007).

2. Webster’s Ninth New Collegiate Dictionary, 9th edn, sv ‘communication.’

3. Naval force, here, refers to communications within a single navy while a maritime coalition refers to communications between ships of many nations working together.


5. This is the earliest time period where historians have adequate historical records. As Arthur Shepard noted:

   Fleets of war had existed, fair-sized naval battles had been fought, long before that date; but the records of these are so scanty, the details so sparse, that a chronological narrative would performe be little more than a catalogue of dates and events.

   See, Arthur MacCartney Shepard, Sea Power in Ancient History, Boston, Little, Brown, and Company, 1924, p. 40. Shepard’s observations still apply years later but research in ancient Western and non-Western naval warfare is now on the rise. One example would be Gregory Gilbert’s Ancient Egyptian Sea Power and the Origin of Naval Forces, Foundations of International Thinking on Sea Power No. 1, Canberra, Sea Power Centre - Australia, 2008.


7. The most popular version of the galley was the trireme, a galley with three banks of rowers working in unison. Naval battles fought by these ancient warships were limited to coastal waters. This was due to the instability of the galley in other than calm waters and the sheer amount of food and water needed for rowers to generate the needed power.

8. Shepard, Seapower in Ancient History, p. 150.


10. A different battle from the famous Battle of Salamis during the Greco-Persian War. The Campaign of Cyprian Salamis occurred in 313 BCE during the military battles between Antigonus and Ptolemy to control the sea routes to the Western Mediterranean. Ptolemy (Ptolemy I Soter) was the ruler of Egypt from 323 BCE to 283 BCE and Antigonus was a Macedonian governor. An example of the use of shields to signal:

   The two fleets being then about 600 yards apart, Demetrius gave the signal to engage by hoisting a golden shield which was seen by all ... Ptolemy did the same and the two fleets closed quickly with each other, as the trumpets sounded the charge and the crews cheered.

   Rodgers, Greek and Roman Naval Warfare, p. 241.


26. Howeth wrote of the US Navy’s experience with the electric telegraph:

   By 1890 commercial telegraphic or cable facilities were available in practically every port frequented by the Navy. These facilities provided rapid communication between the Navy Department and the commanders of squadrons, when in port. This permitted the Navy Department to keep its commanders advised of the political situation, but lessened the amount of discretion allowed them.


   Very low and low frequency signals are in the 10 - 300kHz range while medium frequency signals are found in the 300kHz - 3MHz range. For an account of the US Navy’s early radio development and VLF/LF radio see, PM Hansen and AD Watt, *Technical Report 1904: VLF/LF High-Voltage Design and Testing*, San Diego, SPAWAR Systems Center San Diego, 2003, p. 1-12.


32. High frequency radio signals are in the 3 - 30 MHz range. While VLF/LF signals provided long distance communications their effective range was usually several hundred miles from the signal stations. HF signals provided an easier means to transmit at a greater distance thanks to the use of radio stations:

   By exploiting this new science of HF radio propagation it was possible to transmit message TO [sic] fleets at sea, no matter where they were located, by using worldwide network of radio stations, each broadcasting on a different series of frequencies.


33. Norman Friedman, ‘Making NEC Worthwhile,’ *RUSI Journal*, vol. 149, no. 6, December 2004, p. 45-46. Jutland was also an early case study of the limits of the use of new communications technology to inform command decisions. For a more detailed explanation of the problems of the Admiralty’s use of the information from British code breakers during Jutland see Tim Coyle’s chapter in this volume.


38. Norman Friedman, ‘Wide Open Space: Navies Exploit Satellite Revolution,’ *Jane's Navy International*, vol. 105, no. 3, 2000. Radio relay ships were classified as AGMR and were known as Major Communications Relay Ships. AGMRs were converted World War II aircraft carriers that patrolled the coasts of Vietnam, providing a sea based radio relay system to allow ship to shore and ship to ship communications where land based radio stations were hard to come by. More information on AGMRs can be found at the website for the USS Annapolis AGMR-1, <www.boston.quik.com/kurtdold/tonkin1.html>.

39. Super high frequency signals are in the 3 - 30GHz range.


43. Department of the Navy, … *From the Sea: Preparing the Naval Service for the 21st Century*, Washington, Department of the Navy, 1992; and Deparment of the Navy, *Forward … From the Sea*, Washington, Department of the Navy, 1994, p. 3.


We define NCW as an information superiority-enabled concept of operations that generates increased combat power by networking sensors, decision makes, and shooters to achieve shared awareness, increase speed of command, higher tempo of operations, greater lethality, increased survivability, and a degree of self-synchronization.
46. Loren Thompson, *Networking the Navy: A Model for Modern Warfare*, p. 8. Thompson cites the US Navy creation of ‘Copernicus’ in the early 1990s as one example of the way that navies have been ‘early adapters’ of networking technologies – technologies that have the potential to revolutionise military operations. Thompson’s view, that, by their very nature, navies had adapted networking and ‘pushed the edge of the networking envelope’ is widely shared by a wide range of naval experts. See, for example, Friedman, ‘Netting and Navies: Achieving a Balance’; and Hagan & McMaster, ‘The Demise of the Maritime Strategy and the Search for a Replacement 1984 – 2006’.


56. Deputy Chief of Naval Operations (Communication Networks), ‘FORCENET for the 1000 Ship Navy,’ *Memorandum for Director, Warfare Integration Division (N6F)*, Washington, Department of the Navy, July 24, 2006.

57. This experience is the net result of the authors’ years of working with both uniformed and civilian colleagues in these navies during exercises and under the auspices of AUSCANNZUKUS and the Technical Cooperation Program.


59. The coalition partner navies deployed during this snapshot in time in early 2005 included Australia, Bahrain, Canada, France, Germany, Greece, Italy, Japan, Netherlands, Spain, the United Kingdom and the United States.

61. Russ Shalders, Remarks at the 10th Western Pacific Naval Symposium, October 29 - November 2, 2006, Honolulu.


66. US Navy battle formations are most often deployed as CSG or as expeditionary strike groups (ESGs). CSGs are built around a large-deck aircraft carrier operating tactical jet aircraft, and ESGs are built around a large-deck amphibious ship operating vertical and short take-off and landing aircraft and helicopters.


74. The statistics alone give some indication of the scope of this effort; 5 nations involved, 11 technology and systems groups formed, 80 technical panels and action groups up and running, 170 organisations involved, and 1200 scientists and engineers directly accessed.

76. Naval Network Warfare Command, FORCEnet.


79. Singapore has attracted a number of IT companies like Hewlett Packard and Motorola who have established an R&D division to team with Singapore companies to develop new networking technologies. Hewlett Packard’s Singapore R&D division is working on next-generation networking servers and Motorola has teamed with the Singapore Design Center to work on new mobile equipment designs. Intelligent Nation 2015 Steering Committee, ‘Innovation. Integration. Internationalisation,’ June 2006, <www.in2015.sg/pdf/01_iN2015_Main_Report.pdf> (10 July 2007).
Throughout the 20th century, the US Navy fought all of its wars in what to it were far distant places. In order to do so, it had to establish logistical and other communications networks that would guarantee a reliable flow of men and materiel to the battlefields. Three case studies illustrate how the US Navy established and maintained its wartime sea lines of communication, or sea lines of communication (SLOC), to defeat the tyranny of distance in different wars and in entirely different regions: the North Atlantic in World War I (WWI), the South-West Pacific in World War II (WWII), and the Indian Ocean in the 1990-91 Gulf War.

In each case, distances of several thousand miles separated the political and industrial homeland from the fields of combat. In each case the soldiers could not have fought had not the sailors brought the arms, ammunition, food, and medical supplies. In each case the tyranny of distance was overcome with different measures, but always with dependence on vital bases located in England, its colonies, or the Commonwealth nations. Finally, in two of the three case studies the Navy established its crucial SLOC prior to winning ‘command of the sea’ – it chose Sir Julian Corbett over Captain AT Mahan.¹

Admiral William S Sims, World War I and the U-Boats 1917-18

Germany’s declaration of unrestricted submarine warfare on 31 January 1917 was the most momentous single event in the professional life of Rear Admiral William S Sims, USN. He had barely assumed the presidency of the US Naval War College in Newport, Rhode Island, when he received a telephone call from Washington ordering him to report at once to the Navy Department. There he learned that in a cable dated 23 March, the American ambassador in London, Walter Hines Page, had requested the immediate dispatch of ‘an Admiral of our own Navy who will bring our Navy’s plans and inquiries’. Page explained the benefits that would accrue to the United States: ‘The coming of such an officer of high rank would be regarded as a compliment and he would have all doors opened to him’.² President Woodrow Wilson, who had decided for war, informed Secretary of the Navy Josephus Daniels:

> The main thing is no doubt to get into immediate communication with the Admiralty on the other side (through confidential channels until the Congress has acted) and work out the scheme of cooperation.³
Sims was the man of the hour, chosen despite – perhaps because of – his well-known pro-British sympathies. He departed New York on 31 March carrying no war plans, only verbal orders. On 6 April, while Sims was at sea, the United States declared war against Germany. Four days later, on 10 April, Sims met in London with the First Sea Lord, Admiral John Jellicoe, an old comrade from their days as leading gunnery officers. The initial meeting and subsequent ones were a sobering experience for Sims, who had arrived in England confident that the British had the war at sea well in hand. On the contrary, Jellicoe sombrely informed him, German submarines were ravaging British and neutral shipping at such a rate that the Allied Powers unquestionably would lose the war for want of food and materiel, possibly as early as August, certainly by October 1917.

Within four days of his first meeting with Jellicoe, Sims fired off a cable to the Navy Department outlining the desperate plight of Britain and prescribing the remedy. The US Navy must immediately dispatch a ‘maximum number of destroyers ... accompanied by small anti-submarine craft’ and the government must provide an unlimited volume of merchant tonnage. He also encouraged the Admiralty to place much greater emphasis on convoys. On 30 April, the Sea Lords agreed to experiment with the convoying of merchant vessels by destroyers ‘as the general plan of campaign’. This concession would lead to Allied naval victory in WWI, but only after Sims convinced his own government that convoys held the key to the defeat of the U-boats.

For at least four months American naval strategy during WWI was the subject of an acrimonious transatlantic debate. From London, Sims and Ambassador Page beseeched Washington to send every seaworthy destroyer to escort convoys of transports through U-boat infested waters off the English coast. For a time, President Wilson thought that direct attacks against bases on mainland Europe and massive mine laying would prove more destructive to the U-boats than convoys of cargo ships and troop transports escorted by destroyers. Wilson, Daniels and the doubters within the Navy Department were finally won over by the accumulating documentation of the gradual but inexorable reduction in the monthly rate of U-boat sinkings of merchant ships as the convoy system was expanded by the Admiralty and the US Navy’s man in London. At that point, they suspended the scheduled construction of capital ships and put the US shipbuilding industry to work building destroyers and other escorts.

At the height of the war, Sims oversaw 370 ships of all classes, 5000 officers, and 70,000 enlisted men distributed among 45 bases in the British Isles and on mainland Europe. He divided most of his days and nights between his London residence in the Carlton Hotel, the Admiralty, and his own headquarters near the American embassy in Grosvenor Square. As a commander of operating ships, the Admiral enjoyed the perquisite of a flagship, the destroyer tender USS *Melville*, which together with the repair-ship USS *Dixie* remained moored throughout the war at the Royal Navy’s base in Queenstown, Ireland.
Sims was drawn to Queenstown because it was home for the American destroyers that escorted the merchant cargo vessels on the last leg of their journey from New York or Hampton Roads to their destinations in southern England. He was especially intrigued by the British commander at Queenstown, Vice Admiral Sir Lewis Bayly, whom the eminent naval historian Sir Julian Corbett considered ‘the father of destroyer tactics and organization’. Nicknamed ‘Old Frozen Face’ by irreverent American sailors, Bayly exercised command over the US destroyers when they were at sea on convoy duty. Their arrival at Queenstown, he later said, had made ‘all the difference’ to the success of the convoys. Together, Bayly and Sims proved that in an Anglo-American naval war against a continental European power’s unleashed submarines, the convoying to safety of cargo vessels loaded with war materiel held the best hope for maritime victory.

Vice Admiral William S Sims (second from right) with Admiral Beatty, Rear Admiral Rodman, King George V and the Prince of Wales, on the occasion of the German Fleet’s surrender.
The figures speak for themselves. When Sims first arrived in London, Admiral Jellicoe predicted that in April 1917 the U-boats would sink 900,000 tons of merchant transports. By December 1917 the Allies were losing 350,000 tons per month. In October 1918, the month before the war ended, the U-boats could sink no more than 112,427 tons. This massive reduction in loss, with the corollary monthly increase in tonnage of materiel being shipped from the United States, was accomplished between May 1917 and November 1918 by 1500 convoys of 18,000 ships. The US Navy provided about 27 per cent of the escorting destroyers in British waters, the Royal Navy 70 per cent. Simultaneously, the United States initiated a separate category of shipments: troops and their equipment which were routed to Brest, France, on a more southerly track around the British Isles. The two million American soldiers who would reinvigorate the Allies were convoyed to England and the Continent of Europe by Sims and the Admiralty ‘without any loss from enemy action’.  

SLOC and the US Navy in World War II: Guadalcanal

Following the Japanese attack of 7 December 1941 on Pearl Harbor, while re-evaluating its limited options in the Central Pacific, the US Navy’s attention was drawn to a vast and distant area where it had not planned to fight: the South-West Pacific. The post-Pearl Harbor retreat from the Philippines of the politically powerful General Douglas MacArthur, first to Melbourne and then to Brisbane, guaranteed that there would be a major American military commitment to Australia and to traversing the long maritime route back to the Philippines, to which he had sworn he would return.

Meanwhile, the Japanese assaulted the oil-rich Dutch East Indies and threatened to conquer New Guinea. Their operations plan envisioned an amphibious assault on Port Moresby, the loss of which would open Australia to potential invasion. Learning of this imminent danger through electronic intelligence and ‘coast watchers,’ the US Pacific Fleet commander, Admiral Chester W Nimitz, committed his only two available carriers, US Ships *Lexington* and *Yorktown*, to the defensive. In the Battle of the Coral Sea of 7-8 May 1942 the US Navy lost *Lexington*, ‘Lady Lex’, but the Japanese recalled the invasion force headed toward Port Moresby.

The looming Battle of Midway, which Americans universally regard as the crucial turning point of the Pacific war, drew the Navy’s attention momentarily back to the Central Pacific. In the engagement, that took place less than a month after Coral Sea, on 4 June 1942, US naval aviators sank four Japanese flat tops, and the rest of the Japanese fleet withdrew. The thwarted and frustrated Imperial Japanese high command refocused on the South-West Pacific. Because Midway had given Nimitz a new sense of security in the Central Pacific, and because the naval build-up prerequisite to a Mid-Pacific offensive had barely begun, he was willing to look southward once again.
On 3 May, on the eve of the Battle of the Coral Sea, the Japanese had seized a small island suitable for sea plane operations, Tulagi, which is located about 18nm north-by-northeast of Lunga Point on the larger island of Guadalcanal in the southern Solomons. They now began to build an airstrip on Guadalcanal itself, as part of a general augmentation of land and air forces preparatory to an all-out overland assault on Port Moresby. If successful there, they also would have the air cover needed to start another offensive, this one directed toward Noumea and Fiji. That they failed was owing to the offensive all-navy spirit of the Chief of Naval Operations, Admiral Ernest J King, Jr.

On the very day after the Battle of Midway Admiral King had learned that UK Prime Minister Winston Churchill strenuously opposed a 1942 cross-channel invasion of occupied France. Instead, the Anglo-Americans would assault the Mediterranean and Atlantic coasts of North Africa, but Operation TORCH would not begin until November. King saw his chance to take a naval initiative in the South-West Pacific. He began to move landing craft – in critically short supply – from the Atlantic to the Pacific.

Fortuitously learning of Japan’s plans for a new offensive, King berated the Joint Chiefs of Staff until they authorised Operation WATCHTOWER on 2 July, the invasion and seizure of Tulagi and ‘adjacent positions’—soon defined as Guadalcanal. The Japanese were most intent on capturing all of New Guinea, but the Americans feared they would try to move much farther eastward. Naval historian Samuel Eliot Morison puts it best in saying Guadalcanal was the tollgate on what MacArthur saw as the ‘main road ... to Tokyo ... If we don’t pay the toll, the Japanese will — and sail through in the contrary direction to Noumea, Fiji and Queensland.”

By moving the line of demarcation between the commands of MacArthur and Nimitz slightly westward, King made the operation a purely Navy-Marine Corps affair. The Marines went ashore at Guadalcanal on 7 August. It would take until February 1943 to decide whether the American or Japanese offensive would prevail.

In the first three months of bitter fighting for the island there were no less than three major and discrete naval battles: Savo Island, on 9 August, the Eastern Solomons on 23-25 August, and Cape Esperance on 12 October. These were battles over logistics primarily – the landing of men and supplies on Guadalcanal – and only secondarily for command of the sea. In fact, Esperance left command of the seas around the Solomons still in dispute, and on 15 October Admiral Nimitz said:

> It now appears that we are unable to control the sea in the Guadalcanal area. Thus our supply of the positions will only be done at great expense to us. The situation is not hopeless, but it is certainly critical.

But in fact the worst had passed. Nimitz put Vice Admiral William F (‘Bull’) Halsey, USN, in command in time for the Battle of Santa Cruz Island on 26-27 October, when the Japanese again vainly tried to drive the Americans from the
waters off Guadalcanal. They sank the carrier USS *Hornet*, but the navy with Halsey in command showed a new aggressiveness and tenacity. It now stood as an effective sentinel guarding the maritime entry points behind the Marines. US ships and airplanes could bring in fresh men, food and ammunition – and evacuate the wounded.

The furious Naval Battle of Guadalcanal, ‘an unplanned, wild and desperate melee in black darkness’ took place less than a month after Santa Cruz, on 12-15 November. This fight successfully protected the nearly 35,000 soldiers and Marines on Guadalcanal and finally broke the Japanese spirit. In January the Imperial High Command decided to discontinue the effort to reclaim the island, and on the night of 7 February 1943 all remaining Japanese troops were evacuated.

The Americans had won the logistical struggle over Guadalcanal by means of naval battles fought at an average straight-line distance of some 5180 miles or more from San Francisco, the largest port on the continental west coast, and 3100 from the large naval base on Hawaii. The logistical hurdles posed by such a stretch have not caught the attention of historians the way that the battles have, and all we can do here is sketch in the outlines of the process.

As soon as Coral Sea was over, King had moved to counter Japan’s acquisition of Tulagi by directing Vice Admiral Robert L Ghormley to move into Espiritu Santo and start building a base of operations. This he did on 28 May – three days before Japanese midget submarines attacked Sydney Harbour. Everyone else was racing north for what became the Battle of Midway. Espiritu Santo, 3014 miles southwest of Pearl Harbor, thereby became one of the US support bases for Guadalcanal that were constructed concurrently with the final planning and preliminary movements of the invading force.

One naval officer who participated in the establishment of base facilities in the South-West Pacific, Worrall Carter, was caustic about the situation in June or July 1942. With ‘poor bases’ at Auckland, Fiji, Noumea (New Caledonia), and Efate (Vanuatu), and the beginning of another one at Espiritu Santo (Vanuatu), the Guadalcanal operation was begun. Carter says:

> Not one of these bases was much more than a small airfield and a protected anchorage for ships while they took on fuel or supplies from service vessels. Auckland was the best because New Zealand could furnish food and some repair facilities, but it was too far from the scene of operations.

Carter disdained Efate because its two harbours were small and vulnerable to submarine attack, and Fiji because its harbours were either small or unprotected. He was unduly critical of Auckland. Although it lay 5680 miles from San Francisco and 1825 miles from Guadalcanal, Auckland became central to the American
operation because it was the most readily available deepwater harbor ‘equipped with berthing, lighterage, warehouses, cranes, and stevedores’. Of the American forward support bases, only Noumea had an anchorage ‘large enough for all our ships, and was quite well protected against submarine attack by islands and mine fields’. It would become the centrepiece of the logistical backdrop to Guadalcanal as the struggle to secure the island dragged on, although another participant in the Navy’s logistical improvisation of WWII notes that this development was achieved ‘by unplanned accretions’. As late as May 1942, the Navy’s function at Noumea was envisioned as being one of harbor defence for an Army base. The requirements of Guadalcanal and the attendant sea battles changed this status so rapidly that by 17 October, on the eve of his replacement by Halsey, Vice Admiral Ghormley was recommending a total complement of 20,000 men at Noumea. By then, because of limited docking facilities, the harbour was jammed with 86 ships, which had become ‘in effect substitutes for nonexistent warehouses’. Earlier, at the time of the decision to assault Guadalcanal – soon after 2 July 1942 – the nearest US combat troops consisted of the 1st Marine Division, commanded by Major General Alexander Vandergrift, much of which was caught ‘in the middle of a move [from the United States] to New Zealand’. One infantry regiment was at sea and not due to reach Vandergrift until 11 July, only 21 days before he was expected to land at Guadalcanal. Another infantry regiment had been detached to garrison Samoa, a US possession with a fine harbour but too distant from Guadalcanal to be of much help. Only a single regiment was in New Zealand and ready immediately to begin to prepare for the operation. Its equipment had not been combat-loaded, so a total restowing of materiel was necessary before getting underway. More broadly, as historian Colin Bruce observes:

> No firm plan for the logistical support of the landing force could be made because no-one was sure where the supplies would come from, or indeed whether they could be found at all.

Whatever could be found was thrown on ships that steamed ‘from points as widely separated as Wellington, Sydney, Noumea, San Diego, and Pearl Harbor’ to Vandergrift’s final rendezvous at the Fiji Islands, a British possession since 1874. On 31 July, the hastily assembled invasion force of some 80 vessels set sail for Guadalcanal. Joined at sea by a battalion coming down directly from Hawaii, they headed westward, passing south of Efate and Espiritu Santo. In the Coral Sea, just south of Guadalcanal, the invaders shaped course to the north, landing on the morning of 7 August 1942, to the complete surprise of the Japanese.

Resupply and reinforcement of the US troops ashore was absolutely critical, as was delivery of aviation fuel once the Marines began to launch combat aircraft from Henderson Field shortly after 12 August. Equally important was oiling and arming warships before the battles, and saving and repairing those damaged but not sunk
in the battles. Some of this was done at the bases on Noumea, Efate and Espiritu Santo. These were American undertakings, and they were the logistical bases closest to the combat ashore and the fighting at sea, but throughout the campaign major support for the US Navy was provided by the industries and dockyards of Sydney and Brisbane, Auckland and Wellington. It was to these Anzac refuges that damaged ships were brought, unless they were actually sent all the way back to Pearl Harbor or the continental United States.

Guadalcanal began a year before the US Navy would inaugurate its fight for a Mahanian control of the Central Pacific. It was made possible and it succeeded only because of the availability of British and Commonwealth logistical facilities. But for at least the first four months it was a desperate enterprise in every conceivable way, especially in terms of logistics. Richard B Frank, the author of the definitive history of Guadalcanal, is scathing in his assessment of the lack of pre-war planning:

> Routine fleet exercises in the interwar period failed to accustom commanders to grappling with complicated logistical problems. Although considerable attention and practice had drafted a doctrine of amphibious assault, little searching thought and no realistic practice had been afforded in conducting a sizeable landing from crude bases 6000 miles from the United States.\(^\text{26}\)

This neglect on the part of the nation’s high command constituted, in Frank’s opinion, ‘a gross failure in Washington to appreciate the time required to move supplies in the South Pacific or to construct airfields and bases’ prior to commencement of a combat operation.\(^\text{27}\)

**Overcoming the Tyranny of Distance in the Indian Ocean: Operation DESERT SHIELD 1990-91**

In the build-up to the 1990-91 Gulf War, a British possession once again would prove instrumental to the creation of a viable logistical line stretching from a secure but not too distant base of supplies into the theatre of operations.

By August of 1990, when Iraq invaded its oil-rich neighbour Kuwait, the US military had been planning on how to meet such a contingency for well over a decade. In October 1973 American attention was dramatically drawn to the region when the Persian Gulf OPEC nations embargoed the shipment of oil to the United States. The sky-high prices of petrol at the pumps infuriated American drivers and drew unprecedented US governmental attention to the oil-producing states. The result was a protracted, decade-long restructuring of American overseas bases to permit a rapid military response to future crises in the Persian Gulf and the surrounding nations. The US military understood that it needed to reduce the time it took to react to a crisis – to devise ways to shorten the sea lines of communication – and overcome the time-distance disadvantage.
Political sensitivities precluded gaining easy access to many of the regional countries. Even if access was obtained it would be politically risky for the governments of allies in the region to allow the United States to preposition massive amounts of military hardware ashore. Although countries such as Kenya, Somalia, and the Omani island of Al Masirah entered into agreements for limited access, most war-fighting materials for US forces fighting in Arab states would have to travel from the continental United States, a distance of nearly 12,000nm when transiting by sea from the US west coast to the Persian Gulf. This distance precluded a rapid military response to a crisis, unless a secure base for prepositioning equipment could be found or built somewhere in the western Indian Ocean. The site chosen was Diego Garcia.

Diego Garcia is part of the British Indian Ocean Territories. It was acquired by the British Government from Mauritius in 1965, and leased by the United States from Britain for 50 years in 1966. The island was initially used as a communications station by the US Navy with the commissioning of US Naval Communications Station Diego Garcia on 20 March 1973. Taking advantage of this strategically located base, the US military spent the decade before Operation DESERT SHIELD improving the infrastructure and increasing its military presence and logistical capabilities on the small 44-square mile atoll. The military advantage in the eyes of the United States was clear: the sea line of communication from the west coast of the United States to Saudi Arabia was over 11,300 miles. Prepositioning equipment and supplies in Diego Garcia would shorten the transit time, at a nominal speed of 15 knots, to the Persian Gulf by over three weeks, that is, from 11,300 miles to 2600 miles.

In addition to Diego Garcia, the United States in the 1980s began to preposition materiel in the Pacific Ocean island of Guam, which had become a US territory after the Spanish-American War of 1898. Over 5300 miles from the west coast of the United States, Guam was 6300 miles from Saudi Arabia. Prepositioning military equipment on ships in Guam would eliminate 14 days of a 31 day transit, at 15 knots, from California to Southwest Asia and the Persian Gulf.

In January 1980, Secretary of Defense Harold Brown informed Congress of the Defense Department’s desire to create a force of ‘Maritime Prepositioning Ships’. The Secretary said the new force,

... will carry in dehumidified storage the heavy equipment and supplies for three Marine Brigades. During peacetime, these ships will be stationed in waters near areas where US forces might be needed... [Although] not designated for amphibious assault landings against enemy opposition ... they will be able to debark their equipment over the beach if no port is available. Marine Corps personnel (and equipment not well suited to storage) will, as necessary, be airlifted to
the vicinity of the ships, where they will marry up with their gear and be ready for combat on short notice.\textsuperscript{30}

Thus was born the concept that would be tested in DESERT SHIELD, the build-up to the 1990-91 Gulf War.\textsuperscript{31}

The initial prepositioned force was modest and ready for tasking within seven months of the Secretary’s speech. Known as the Near-Term Prepositioning Force (NTPF) program, it consisted of seven ships in anchorages in Diego Garcia. These ships were ready to deploy within 24 hours and were loaded with equipment and 15 days of supplies for a notional 12,000-man Marine Amphibious Brigade.\textsuperscript{32} The NTPF became the nucleus for a much more robust prepositioned fleet being created under the auspices of the Military Sealift Command.

The Military Sealift Command had been the single managing agency for the Department of Defense’s ocean transportation needs since 1970. They would be responsible for organising the military’s vastly expanding prepositioning program, known as the Afloat Prepositioning Force. By 1986 the program that had been put in place consisted of 25 ships sub-divided into two categories based on the US military customers that they support. The first of these, the Maritime Prepositioning Ships (MPS), initially included 13 ships divided into three squadrons. These ships were specifically designed to support Marine Corps forces with each carrying equipment and supplies to marry up with a Marine Expeditionary Brigade (MEB) that was to be flown in on strategic airlift. The MPS squadrons would be prepositioned with one squadron in Diego Garcia, one in Guam, and a third on the Atlantic Ocean. Twelve additional ships, known as Prepositioning Ships, would carry army and air force equipment and supplies. These ships would be anchored in Diego Garcia along with one squadron of MPSs.\textsuperscript{33}

On 7 August 1990, five days following the Iraqi invasion of Kuwait, the Afloat Prepositioning Force in Diego Garcia and Guam was alerted for the first time. On 8 August, eight ships were underway \textit{en route} to Al Jubayl, Saudi Arabia. Three ships of MPS Two from Diego Garcia carrying equipment and supplies for the 7th MEB would be the first to arrive, on 15 August. The 7th MEB, located in Twentynine Palms, California, would deploy by air and meet their equipment in Saudi Arabia.\textsuperscript{34} On 14 August, the first of the 7th MEB Marines arrived in theatre, meeting the MPS ships that arrived the next day.\textsuperscript{35} By 25 August, the 7th MEB was combat-ready.\textsuperscript{36} Over 15,000 Marines, 123 tanks, 425 heavy weapons, and 124 fixed and rotary-wing aircraft had been delivered by airlift and sealift and was combat-ready half a world away 13 days after it began its deployment. These Marines, plus elements of the Army’s 82nd Airborne Division and the lead helicopter units of the Army’s 101st Air Assault Division ‘established the initial US ground presence and helped “hold the fort” until additional Marine and heavier Army divisions arrived.’\textsuperscript{37}
The four ships from MPS Three were underway in the vicinity of the Marinas Islands when the activation order came. They headed west on 8 August. These ships would arrive in Saudi Arabia between 25 and 30 August carrying over 52,000 tons of equipment and supplies for the 1st MEB.38

The 12 Prepositioning Ships delivering US Army and US Air Force equipment and supplies departed Diego Garcia on 9 August. These ships included four tankers and eight cargo ships. They had all arrived at their sea port of debarkation at Al Jubayl, Saudi Arabia by 21 August.39

Although, as in any large military deployment, there were some problems with the marrying up of forces and their equipment, this first real-world test of the Afloat Prepositioning Force was touted as a success. A Center for Naval Analyses report included in US congressional hearings stated:

Afloat prepositioning proved itself in Desert Shield. MPS Squadron 3 from Diego Garcia arrived at C+8 [C-day being the day a deployment operation commences], PREPO ships began arriving in theater at C+10, and MPS Squadron 2 from Guam at C+18. The APF brought critical ordnance and other supplies for the Air Force and early arriving Army units. The MPSs enabled the Marines to fill a crucial niche in the sequencing of forces.40
Over 280,000 tonnes of pre-loaded equipment and supplies had been delivered by ships and crews ready and *en route* within 24 hours of notification that the Afloat Prepositioning Force was being activated. With the equipment pre-loaded and the ships forward-deployed, valuable time was gained that otherwise would have been spent loading the ships and transiting from more distant ports, time that the enemy could have used to prepare for and launch an offensive. Lighter combat forces arriving on faster strategic airlift allowed operational planners to negate some of the disadvantages of time and space. Shortening the sea lines of communication provided a lethal force that was combat ready much sooner than if it had been necessary to load the ships and sail them from the continental United States.

In addition to the leasehold and base structure on Diego Garcia, two other major factors allowed for the success of the initial surge of prepositioned combat materials and forces for DESERT SHIELD. These factors were control of the sea lines of communication (or at least uncontested use of the sea lines of communication), and friendly and modern ports to offload the equipment and supplies. General Hansford Johnson, the Commander in Chief United States Transportation Command, stated:

> We are proud of our successes. We certainly deployed a large force halfway around the world from a standing start, but we also must admit we didn’t have the worst case scenario. We didn’t have to fight our way in. We had no combat losses of transportation assets. We had the best infrastructure of any area we would want to go to in the Persian Gulf: seaports, airports, highway infrastructure.\(^{41}\)

**Conclusion**

The example of Diego Garcia and DESERT SHIELD differs from the two earlier case studies of this chapter in that in 1990, the United States clearly had command of the sea before undertaking the prepositioning and the subsequent deployment of supply ships to the Persian Gulf. In the examples from both World Wars, command of the seas had not been established prior to commencement of the logistical and combat operations. But in all three cases, the availability of British or Commonwealth bases was an indispensable precursor to success. For the United States, a country that historically has viewed itself as a military autarchy, these examples about the limits of autonomy should be illuminating.
Notes

1. See, for example, Julian S Corbett, Some Principles of Maritime Strategy, London, Longmans, Green, 1911; edited and republished by the Naval Institute Press, Annapolis, 1988; and Captain Alfred Thayer Mahan, The Influence of Seapower upon History, 1660-1783, Boston, Little, Brown, 1890; republished by Hill and Wang, 1957.

2. Josephus Daniels, Our Navy at War, New York, Doran, 1922, p. 36.


4. Sims and Jellicoe immediately became socially intimate. On 10 and 11 April, Sims dined at the Jellicoes’ house and spent time with the children. See Sims to Mrs Sims, 10 and 11 April 1917, William S Sims Collection, No. 168, Box 9, Archives, Naval War College, Newport.


11. Samuel Eliot Morison observed that Coral Sea was ‘the first naval battle in which no ship on either side sighted the other’. Samuel Eliot Morison, The Two-Ocean War: A Short History of the United States Navy in the Second World War, Boston: Little Brown, 1963; reissued by Galahad Books, New York, 1997, p. 142. It was in a morbid way the perfect complement to Pearl Harbor: the underwater battle in which the aircraft carrier finally and definitively replaced the battleship as the premiere capital ship of the US Navy, a position it has yet to relinquish.


15. Morison, The Two-Ocean War, p. 165. The logistical tyranny of distance for Guadalcanal was about twice that of Operation TORCH. New York City is separated from Liverpool or Casablanca by only about 3500 miles.


22. Frank, Guadalcanal, p. 137.
27. Frank, Guadalcanal, p. 136. For Frank’s most recent take on Guadalcanal, see his articles in Naval History, August 2007.
31. The US code name for the war itself was Operation DESERT STORM. The war lasted from 16 January to 28 February 1991.
33. As of May 2007 the Afloat Prepositioning Force had expanded to 35 ships; 16 Maritime Positioning Force ships supporting the Marine Corps, 10 Army Prepositioned Stocks-3 ships supporting Army forces, and 9 Navy, Defense Logistics Agency and Air Force ships carrying navy and air force munitions, DLA petroleum products, Marine Corps aviation logistics support and support to the Third Marine Expeditionary Force. See www.msc.navy.mil/factsheet/apf.asp for the names and types of ships.
34. Airlift for the 7th Marine Expeditionary Brigade was not a small matter. ‘Plans for deployment of a Marine Expeditionary Brigade required 250 sorties, 30 of which had to be C-5, 35 of which could be Civil Reserve Air Fleet, and the remainder should be military (C-141, C-5, or C-17).’ See James K Matthews & Cora J Holt, ‘So Many, So Much, So Far, So Fast: United States Transportation Command and Strategic Deployment for Operation Desert Shield/Desert Storm’, Joint History Office, 1996, p. 131.
38. The four ships of Maritime Prepositioning Ships Squadron One in support of elements of II Marine Expeditionary Force were not activated until 10 November 1990. Underway from North Carolina on 1 November, they arrived in Al Juhayl on 13 December.
Over 80 per cent of the international goods trade is carried by sea.\(^1\) So the smooth operation of the global economy depends on the unimpeded flow of maritime commerce from one country to another. Nearly all of this trade passes through one or more of 116 straits and a handful of canals used for international navigation.

The energy that powers modern economies is part of this expanding sea commerce. About two-thirds of the world’s petroleum trade, including crude oil and refined or processed products, is carried by tankers along international sea lanes.\(^2\) The growing global trade in liquefied natural gas (LNG) also moves by sea.\(^3\) LNG is a major export earner for Australia and a key energy source for Asia, the United States and increasingly for other economies as well. The navies that protect world trade and project national or multinational power must also be able to pass safely through straits and canals.

**Choke Points**

Many of the straits do not carry enough commercial and naval shipping to be considered of global strategic importance. But there are at least eight busy straits and canals that are geographic ‘choke points’. These maritime bottlenecks are in the Middle East, Asia, Europe, Africa and the Americas and include:

- the Strait of Hormuz leading out of the Persian Gulf to the Arabian Sea and Indian Ocean
- the Malacca and Singapore straits that pass through Southeast Asia and link the Indian Ocean with the Pacific Ocean via the Andaman Sea and the South China Sea
- the Panama Canal which provides a short cut between the Pacific and Atlantic oceans
- the Bab El-Mandeb passage linking the Arabian Sea and the Gulf of Aden with the Red Sea
- the Suez Canal between the Red Sea and the Mediterranean;
- the Turkish straits, connecting the Black Sea and the Mediterranean
• the Strait of Gibraltar between the Mediterranean and the Atlantic Ocean
• the Strait of Dover separating England from France and joining the English Channel to the North Sea

A common characteristic of all these waterways is that they are less than 40 miles wide at their narrowest point. The shipping lanes of some of the straits, including the Malacca and Singapore straits, constrict in one or more sections to less than a couple of miles. Of course, the man-made canals are much narrower in places. All these channels are critically important for world trade and naval movement. Yet they are narrow enough to be closed for some time to shipping, by an accident or an attack.

The Strait of Hormuz is the only way into and out of the Persian Gulf by sea. The other seven choke points could be bypassed, although it would often involve a long detour for ships. This would disrupt naval deployments. It would also add time and cost to the global trading and business enterprise network that now depends heavily on keeping inventories low and having supplies delivered just-in-time and in just-enough quantity.4

Threats to Shipping

When ships are on the broad expanses of the high seas, they are relatively safe. In choke points, they become more vulnerable. It is more difficult to manoeuvre and sometimes even to increase speed. Those who might wish to harm passing ships have potential land bases close by from which to strike. They may be hostile states. Or in today’s increasingly chaotic and unpredictable world, they may be non-state actors like terrorists or maritime criminals, who are generally referred to as pirates.5

Whoever they are, they are likely to be much better armed than a decade ago. Since then, law and order in some of the most conflict-prone parts of the planet have deteriorated. Meanwhile, the arms trade has burgeoned. And so has the smuggling of weapons, ammunition and explosives. Both have become lucrative global businesses.6 They are spreading increasingly sophisticated conventional weapons not just to states in conflict but also to armed groups in intra-state civil wars and to other non-state actors, including entities regarded by Australia as terrorist organizations. Among the new weapons that have been transferred to some of these terrorist groups are long-range anti-ship missiles, unmanned aerial vehicles and closer-range armour-piercing missiles and rocket-propelled grenades – all capable of causing varying degrees of damage to ships.

In the Middle East, this proliferation is promoted by Iran, Syria and other governments that provide arms to militia, guerrilla and insurgent groups they support.7 For example, the Lebanese Hezbollah in July 2006 used a Chinese-designed C-802 radar-guided cruise missile supplied by Iran to severely damage
one of Israel’s most modern warships. The missile is one of the most lethal of its kind in the world. If this pattern is replicated in Asia, the potential for terrorism and political violence on land, in the air and at sea will rise. The trade in small arms and light infantry weapons is already extensive in parts of the region and the demand for more advanced equipment is strong.

This chapter focuses on just two choke points:

- the Strait of Hormuz in the Middle East.
- the Malacca and Singapore straits in Southeast Asia.

They illustrate some of the problems that all constricted shipping channels face. They also involve real life activity, both past and looming, that navies, as well as other defence and law enforcement agencies, must grapple with.

**Strait of Hormuz**

The US Department of Energy describes the Strait of Hormuz as by far the world’s most important choke point. It is a vital node in world energy trade. It is also the neck of a key geo-political crucible. As noted earlier, the strait is the only way by sea into and out of the Persian Gulf, also known as the Persian Gulf. This 600-mile long body of water separates Iran from the Arabian Peninsula. Of all the oil exported from the Gulf, over 90 per cent goes via the Hormuz strait.

The Gulf region, both onshore and offshore, produces close to 30 per cent of the world’s oil and a rapidly increasing proportion of its gas. Even more important, the Gulf countries, chiefly Saudi Arabia, maintain almost all of the world’s excess oil production capacity. It can be raised or lowered to meet demand for oil and influence its price. At a time of growing concern about future energy supplies, the Gulf has 57 per cent of all proven oil reserves and 45 per cent of gas reserves.

The Gulf region is also one of the most politically volatile areas of the world. The interests of many major outside powers, including the US, Europe, Russia, China, India and Japan, are deeply engaged in the area - and are often at variance. For America, Iran, terrorism and terrorist-related smuggling are big problems in the Gulf region as US forces struggle to contain Al Qaeda and growing sectarian violence between majority Shiites and minority Sunnis in Iraq, while training sufficiently strong and professional security forces to hold the country together when the coalition leaves. Iran’s rise as a regional power led by a militant Shiite theocracy is challenging the primacy of long-established Sunni-Arab regimes in and around the Gulf. Meanwhile, the US and its ally, Israel, are determined to try to stop Iran from following North Korea and developing nuclear weapons. US officials are seeking to tighten financial sanctions on Iran and accusing Iranian paramilitary forces of siding with Shiite militia factions in Iraq to attack US troops. US aircraft carriers and associated warships are regularly deployed in or close to the Persian
Gulf. Although the Pentagon has said that one of the carrier task forces will simply replace another in the Gulf region, deployments have been seen as a warning to Iran not to underestimate US power and resolve despite its troubles in Iraq.\textsuperscript{13}

**Straits of Malacca and Singapore**

The adjacent Malacca and Singapore straits run between Indonesia on one side, and Malaysia and Singapore on the other. Although thousands of kilometres from the Gulf, maritime trade connects the Southeast Asian straits to the Strait of Hormuz. They are integral parts of the same vast conveyor belt of seaborne commerce that runs between the Indian and Pacific oceans, carrying huge quantities of oil and other cargo. The Malacca and Singapore straits provide the shortest sea passage for ships travelling between South and East Asia. They are part of a lifeline for the export-oriented but oil-short economies of East Asia, among them China, Japan and South Korea. India, too, with its rapidly growing economy and rising demand for imported oil and gas, is locked into this maritime highway. More than half of India’s trade goes through the Malacca and Singapore straits that link the Indian and Pacific Oceans via the Andaman and South China Seas.\textsuperscript{14}

Over 60,000 vessels involved in international trade, or an average of about 170 a day, transit the straits and the traffic is growing. Already, the waterway carries about 30 per cent of global trade, a substantial part of the world’s energy shipments and at least 75 per cent of the oil imported by Northeast Asia’s industrial giants – Japan, China and South Korea.\textsuperscript{15} This is increasing the strategic significance of Southeast Asia’s main maritime choke point. China, for example, fears that its vital energy imports could be blocked here by the US and its allies in a crisis over Taiwan.\textsuperscript{16}

**US Interests**

The US has important military and alliance interests in the Malacca and Singapore straits. Relatively little of America’s oil imports come through the waterway. But the overwhelming proportion of oil reaching its Northeast Asian allies, Japan and South Korea, is carried by tankers that traverse the Southeast Asian straits.\textsuperscript{17} Most laden tankers use the Malacca and Singapore shipping channels. Only the very biggest take a longer route through Indonesia, via the Sunda Strait or the Lombok and Makassar Straits, which are much deeper than the main Southeast Asian shipping artery.

The US also sends warships, including aircraft carriers, from its Pacific Fleet through the Malacca and Singapore straits to reinforce its military presence in the Arabian Sea and Persian Gulf. This naval ‘surge’ capacity through the straits is especially important to Washington at times of crisis in the Gulf or Indian Ocean region. The US Navy’s 5th Fleet is based at Bahrain in the Gulf. It operates under the US Central Command. Drawing ships as needed from the Pacific and Atlantic fleets to augment its force, the 5th Fleet’s mission includes keeping the Persian Gulf and Strait of Hormuz open to international shipping.
Australian Interests

Most of Australia’s seaborne trade with Asia bypasses the Malacca and Singapore straits. The obvious exception is trade with Singapore and peninsular Malaysia, which includes export and import trans-shipments through the hub port of Singapore to and from other parts of the world. This commerce with Southeast Asia via the Malacca and Singapore straits is, of course, significant. Australia’s trade in goods with Singapore and Malaysia was worth nearly $25 billion in 2006. Singapore alone was Australia’s ninth largest export market and fourth biggest source of imports. However, far more important for Australia’s economic health is the energy supply lifeline through the straits to Northeast Asia. Australia’s three top export markets – Japan, China and South Korea – are in Northeast Asia. Just under half of Australia’s exports go to this area. Without the imported oil and gas to power the Northeast Asian economies, demand for Australian commodities and other goods would sag, slowing the country’s economic growth.

Australia has a strategic, as well a commercial, interest in the maritime energy artery between the Persian Gulf and Northeast Asia via the Southeast Asian straits. The artery helps to sustain Japan and South Korea, which are allies of the US, itself an ally of Australia. It also helps to sustain China, the emerging giant of Northeast Asia. And it helps to sustain the broad US engagement with Asia which Canberra sees as an important stabilising factor in the region.

Iran

Both the Strait of Hormuz and the Malacca and Singapore straits are vital nodes in maritime trade between the Middle East and Asia. What, then, are the main threats to their continued normal operation? In the Strait of Hormuz, the threat comes from both state and non-state actors.

Iranian officials have warned a number of times that if the United Nations (UN) Security Council applies the kind of tough financial and trade sanctions being sought by the US to punish Teheran for refusing to halt uranium enrichment and other sensitive nuclear activities, the stability of the Middle East would be affected. The US and its ally, Israel, have said they will not tolerate a nuclear-armed Iran. However, Teheran has vowed to continue its nuclear activities, insisting the program is for peaceful purposes. It has warned that any attack on Iran would endanger the region’s oil supplies. The Iranian military have held naval manoeuvres and fired torpedoes and missiles near the Strait of Hormuz, evidently to show how easily it could be blocked.

Iranian forces are the strongest local fighting units in the Gulf. Using the country’s oil wealth, they have been re-equipped, modernised and reorganised since their nadir at the end of the eight-year war with Iraq in 1988. They could, at least temporarily, halt commercial shipping traffic through the Strait of Hormuz. At its narrowest point between Iran in the north and Oman and the United Arab Emirates
(UAE) in the south, the sharply curving strait is 34 miles wide. It is divided into two-mile wide channels for inbound and outbound tanker traffic, with a two-mile buffer zone between them. Iran has missiles that could strike ships within a minute or two of being launched. They could be fired from the mainland or offshore islands in or close to the strait. These islands include Abu Musa and two smaller bits of land that Iran forcibly seized from the UAE in the 1970s, although joint sovereignty was maintained until 1994. The islands straddle the shipping lanes in the western approaches to the Strait of Hormuz.

Gulf Oil Hub

In 2006, the Persian Gulf states (Bahrain, Iran, Iraq, Kuwait, Qatar, Saudi Arabia and the UAE) produced about 28 per cent of the world’s oil. They exported 18.2 million barrels per day (bpd), including about 17 million bpd through the Hormuz strait. This was about 20 per cent of world oil supply. The group exported the remaining 1.2 billion barrels of oil per day from the Gulf via pipelines through Turkey to the Mediterranean and through Saudi Arabia to the Red Sea. This means that about 93 per cent of all the oil exported from the Persian Gulf was carried in tankers passing through the Strait of Hormuz. These vessels carry approximately 40 per cent of all global crude oil and petroleum products traded by sea. Besides oil, an increasing amount of gas from the Gulf is being exported in liquefied form in tankers through the Hormuz strait, mainly to Asia.

The Gulf is a huge source of energy for the world and one that is predicted to become even more important in future. While some of its oil exports could be diverted into overland export pipelines, any interruption to the supply from the Persian Gulf by sea would panic markets, making prices soar. It would jolt the world economy which struggled for much of 2006-07 to absorb the impact of oil costing over $US60 a barrel.

Australia’s Gulf Oil Dependence

Australia is becoming increasingly vulnerable to any disruption in the flow of oil from the Persian Gulf. This flow includes oil shipped direct from the Middle East to Australia and oil from the Gulf that comes to Australia via Southeast Asia, chiefly as petrol and diesel transport fuel refined largely from Middle East crude oil in Singapore, one of the world’s leading oil refining, trading and petrochemical centres.

Australia’s dependence on imported crude oil is rising fast. In 2006, the country consumed approximately 925,000 barrels of oil per day. Nearly 40 per cent of this was imported, mainly from Southeast Asia and the Persian Gulf. By contrast, in the year 2000, Australia’s oil imports accounted for only 7 per cent of consumption. A report prepared in 2006 for the Australian Petroleum Production and Exploration Association warned that unless substantial new fields are found soon, Australia’s rate of self-sufficiency in oil and condensates production could fall from the current level of around 60 per cent to less than 20 per cent by 2015.
Australia & Oil Supply Security

According to the US Government’s Energy Information Administration, Australia in March 2006 had petroleum stocks of 35 million barrels of oil, all of it in the hands of the private sector, not the government.28 This was enough for almost 38 days supply.

Australia and other member states of the International Energy Agency (IEA) that are net oil importers are supposed to hold emergency reserves equivalent to at least 90 days of their oil imports of the previous year, even though it is expensive to do so. The reserves are designed for use in an oil supply disruption, to cushion the economic impact of any crisis. The IEA was established in 1974 as the energy watchdog of leading industrialised democracies in North America, Europe and the Asia-Pacific region. With 27 member-states, one of its aims is to maintain and improve systems for coping with oil supply disruptions.

The IEA says that the biggest oil shock since 1973 occurred in 1978-79 during the Iranian revolution. This resulted in a supply shortfall in the global market of approximately 5.6 million bpd for a period of six months. The shortfall doubled oil prices, causing consumption to fall by about 15 per cent and plunging the global economy over the next three years into its longest and deepest recession since World War II.

The IEA says that the other three largest oil supply disruptions since 1973 were also related to the Gulf and Middle East. The 1990-91 Gulf War following Iraq’s invasion of Kuwait, the start of the Iraq-Iran War (1980-81) and Arab-Israeli War (1973-74) each resulted in a supply shortfall of over 4 million barrels of oil per day that lasted for more than four months on world markets.29 In fact, four global recessions (1973-74, 1979-81, 1990-91 and 2000-01), are all linked to oil supply restrictions in the periods.

In seeking petroleum supply security, the Australian Government has so far shied away from establishing a special purpose stockpile under government, commercial or shared control, arguing that it would be prohibitively expensive and not necessarily effective to do so. An official estimate in 2004 suggested that it would cost the government at least $2 billion to establish a national strategic oil and/or product stockpile and another $100 million per year to maintain it. The cost would be much higher today because the price of oil has risen substantially since then.

The government says that in recent years, the Australian petroleum industry’s long supply chain has stored on average between 45 and 55 days worth of consumption in both refined products and crude oil stocks. These stocks are held in tankers at sea on their way to Australia from Asia and the Middle East, in crude tanks at Australian refineries while the oil is being processed through the refineries, in product terminal storage facilities, in retail petrol and diesel service stations throughout the country, and by individual motorists who on average have three days supply of fuel in their vehicle tanks. Only about 40 per cent of Australia’s crude oil output goes to local refineries. The rest is sold overseas where it fetches premium prices as a relatively
light density, low sulphur product. The government’s view is that if this outgoing oil was diverted into the Australian market, as it could be in a crisis, it would provide additional consumption cover for Australia of well over the mandated IEA level of 90 days. In early, 2004, the consumption cover for Australia using this method of calculation was about 178 days.\textsuperscript{30}

However, Australia’s approach to supply security is arguably very different from the intent of the IEA. It is certainly different to the policies of the major IEA members, including the US, European nations and Japan. All of them maintain large physical stockpiles of crude oil or crude oil and refined products, in line with IEA recommendations. It is also significant that Asia’s two big emerging oil consumers, China and India, both of them large net oil importers, have taken advice from the IEA on setting up strategic oil stocks, although the consumption cover they provide is well below 90 days and likely to remain so for some years.

**Australia’s Rising Oil Deficit**

If Australia’s self-sufficiency level for both crude oil and products continues to fall, Canberra may well have to think again about establishing a strategic national oil reserve. Another serious global supply disruption would almost certainly hasten this process. Australia’s relative isolation, continental size and reliance on transport fuels make oil supply security vital for its economy.

Australia is becoming an increasingly large importer of refined oil products, especially petrol and diesel, as well as the heavier types of crude oil needed by the seven major domestic refineries to blend with lighter local oil to make the full slate of transport fuels and lubricants essential for the smooth operation of the Australian economy. An official estimate in 2004 indicated that Australian refiners were relying on local crude oil for 40 per cent of their supply, Asian for 40 per cent, and Middle Eastern for 20 per cent.\textsuperscript{31}

About 25 per cent of Australia’s annual petroleum product consumption is imported and the ratio is rising steadily as more big refineries come on stream in Asia able to use economies of scale for both domestic and export output.\textsuperscript{32} Most of Australia’s oil product imports are petrol and diesel from Singapore. Australia’s imports of refined products from Singapore alone in 2006 were worth about $5.7 billion. They accounted for just over half the value of Singapore’s merchandise exports to Australia that year and were worth substantially more than Australia’s total sales of goods to the island-state.\textsuperscript{33}

Using Geoscience Australia projections and assuming oil prices of $US50 per barrel, about a third lower than the current world price, the Australian Petroleum Production and Exploration Association has warned that Australia will have a trade deficit in oil, condensate and other refinery feedstocks of between $12 billion and $18 billion by 2015, two to three times the deficit in the financial year to the end
of June 2006. If the growing net import bill for refined products is added to this tally, the cost of Australia’s overall petroleum deficit will rise to $27 billion by 2015, around twice the 2006 deficit of $12.8 billion.\textsuperscript{34}

**Singapore Offers Assurance**

However, it is important to note that in 2006, Singapore’s oil refineries and independent terminals had a capacity to store 88 million barrels of oil, well over twice the level for Australia recorded by the US Department of Energy. In Singapore, new storage capacity on land, underground and in tanks floating offshore are expected to add at least another 65 million barrels of storage space in the next few years. This will include 25 million barrels in huge rock caverns carved beneath one of Singapore’s islands by the government-linked Jurong Town Corporation.\textsuperscript{35}

This should give Australia and other Asia-Pacific customers of Singapore’s refineries an assurance of continuing supplies in any future Persian Gulf crisis, provided it does not last for too long. However in such a crisis, Australia’s direct imports of crude oil from the Gulf could be cut off, forcing refineries in Australia to draw on limited local stocks in the existing supply chain and then rely entirely on domestic crude oil for feedstock, even though it is not well suited to the capacity and requirements of Australian refineries.

**Asia’s Gulf Oil Dependence**

While Australia could be hit hard by another major disruption in the flow of oil from the Gulf, the repercussions would be most severe in Asia where emergency oil reserves in many countries are far below levels recommended by the IEA. The US gets about 22 per cent of its oil imports from the Gulf. This meets about 12 per cent of America’s total oil demand. Europe buys 30 per cent of its imported oil from the Gulf.\textsuperscript{36}

However, about two-thirds of Gulf oil exports go to Asia. Japan, for example, imports all its oil, with 89 per cent coming from the Middle East (defined as the Gulf oil exporters plus Oman and Yemen). Asia’s two emerging economic giants, China and India, are also heavily reliant on Middle Eastern oil: India for about 70 per cent of its imports and China for around 50 per cent. South Korea, Singapore, Taiwan, Thailand and the Philippines each depend on the Gulf for over 70 per cent of their oil imports. Overall, the Middle East supplies nearly 75 per cent of Asia’s import needs, making the region by far the most important customer. This relationship is expected to strengthen even further as Asian oil production plateaus and demand rises.\textsuperscript{37}

Partly as a result of this dependence, China and many Asian countries are wary of offending Iran and siding openly with the US and Europe in the dispute over Teheran’s nuclear program.\textsuperscript{38} Iran has also been diversifying its foreign trading partners to reduce reliance on the West. Asia’s share of Iran’s trade has increased to nearly match Europe’s 40 per cent share. Teheran sees trade diversification away from the West to Asia as a buffer against efforts to isolate it.\textsuperscript{39}
Costs for Iran

If Iran were to try to close the Strait of Hormuz with its mines, missiles, submarines, small attack craft and larger naval vessels, coastal artillery and aircraft, it could expect widespread international condemnation and retaliatory strikes if the blockade was not ended promptly. US warships routinely work in patrol and protection coalitions with other navies from the Gulf region and much further away, including Pakistan, Singapore, Japan, Australia, New Zealand and European nations.

These coalitions are organised into three combined task forces (CTFs) under the direction of a US Navy vice admiral based in Bahrain. He also commands the US Navy’s 5th Fleet. Its area of operations encompasses about 2.5 million square miles of water, including the Persian Gulf, Arabian Sea, Red Sea, Gulf of Oman and parts of the Indian Ocean. The Strait of Hormuz, Suez Canal and Bab El-Mandeb Strait at the southern tip of Yemen fall within the 5th Fleet’s area of responsibility. CTF 158 works in the northern sector of the Persian Gulf. CTF 152 is responsible for maritime security operations in the central and southern part of the Gulf, while CTF 150 patrols the Gulf of Oman, North Arabian Sea, parts of the Indian Ocean, the Gulf of Aden and the Red Sea. In a crisis that threatened shipping in the Strait of Hormuz, coalition warships would guard convoys and try to protect tankers and other commercial vessels, as happened during the Iraq-Iran War from 1980 to 1988.

Iran’s economy would also be hurt by any prolonged closure of the strait. The Iranian people are clamouring for higher living standards. The country has been heavily subsidising domestic oil prices and was forced to introduce fuel rationing in mid-2007. It is short of refining capacity and must import around 40 per cent of its petrol. The Iranian Government relies heavily on oil export revenues. They provide at least 80 per cent of export earnings and up to half the government budget. Moreover, Iran relies on the Strait of Hormuz to export nearly 2.5 million barrels of oil per day, making it the second largest producer in OPEC, after Saudi Arabia. While Iran has huge reserves of oil and gas, it needs foreign investment, technology and markets to develop them to their full potential and boost overseas sales.

Terrorism in Gulf Waters

In September 2006, as the Iranian backed Shiite Hezbollah trumpeted its claimed victory over Israel in the fighting in southern Lebanon in July and August, Al Qaeda warned that it would be making Israel and the Gulf Arab states its next targets in a campaign it said would seal the West’s economic doom in the world’s top oil exporting region. The implication of this call to arms is that Sunni radicals intend to compete with their Shiite counterparts for control of the Palestine-Israel-Lebanon heartland and the Gulf region.

This threat from Ayman al-Zawahiri, Al Qaeda’s second-in-command to Osama bin Laden, must be taken seriously. Al Qaeda has been responsible for a series of maritime-related attacks in and around the Gulf in the last six years. Its suicide
bombers used small boats packed with explosives to ram and seriously damage the destroyer USS *Cole* in Aden in October 2000. Two years later, off the Yemen coast, they hit the laden French-registered oil tanker, *Limburg*. In April 2004, they tried to attack tankers and pumping and storage facilities in the main export terminal in southern Iraq. In August 2005, Al Qaeda agents fired several Katyusha rockets that narrowly missed two US warships docked in the Jordanian Red Sea port of Aqaba.\(^{46}\)

A number of other Al Qaeda operations in the Gulf were disrupted or aborted. They included an attempt to bomb the US Navy’s 5th Fleet headquarters in Bahrain in late 2002 or 2003. There was a plot at around the same time to crash a small aircraft into the bridge of a Western navy vessel when it was docked in the UAE’s Port Rashid.\(^{47}\) Perhaps most audacious of all, was a plan to attack US warships and other vessels transiting the Strait of Hormuz using a cargo vessel packed with explosives that would offload a number of small, explosive-laden craft to strike different targets. Then the mother ship would blow itself up alongside or near another target vessel. At one point, this operation was timed to coincide with the devastating attacks on the US homeland in September 2001.\(^{48}\)

**Terrorism in Southeast Asian Waters**

In Southeast Asia, both Al Qaeda (through its Jemaah Islamiyah affiliate) and Hezbollah planned to attack US naval vessels using the Malacca and Singapore straits from the mid-1990s.\(^{49}\) However, neither carried out their plans. Instead, Southeast Asia’s most notorious non-state actor, Jemaah Islamiyah, based in Indonesia, has concentrated on land-based bombings in Bali, Jakarta and elsewhere.

There is also no present or foreseeable threat from any state flanking the Malacca and Singapore straits to attack or disrupt foreign shipping. The three coastal countries – Indonesia, Malaysia and Singapore – have cordial relations with the US and other major users of the waterway. Unlike Iran, which has threatened to close the Strait of Hormuz if Iranian interests or territory is infringed, the littoral states in Southeast Asia are committed to keeping the Malacca and Singapore straits open to unimpeded transit by legitimate international shipping, both commercial and military.

**Conclusion**

Choke point insecurity in the Persian Gulf stems essentially from lack of political order in the region. By contrast, Southeast Asia is a relatively stable region. Its ten countries have forged peaceful and generally cooperative relations through ASEAN, the Association of the South East Asian Nations. Unlike the Gulf where Iran, the biggest power in the region, is flexing its muscles, Southeast Asia has been fortunate that Indonesia, by far the largest country in the area and the most populous Muslim nation in the world, has opted for partnership with its neighbours since the 1970s, instead of seeking to assert its will and dominance.
However, terrorism is a problem in Indonesia and in the nearby southern Philippines; although no terrorist attack is known to have taken place on a ship using the Malacca and Singapore straits. Pirate raids on vessels in and around the straits have been a chronic nuisance for many years. Favourite targets have generally been small, slow-moving craft that are low in the water and easy to board while underway. The number of reported sea robberies and vessel hijackings declined sharply in 2006. Nonetheless, some risk remains. Despite this, the need for any foreign naval patrol presence in the Malacca and Singapore straits is, under current circumstances, substantially less than in the Gulf.

Geography has made the Strait of Hormuz between 34 and 60 miles wide. This means that the shipping lanes of the traffic separation scheme are at all times beyond the 12-mile territorial sea limit of Iran in the north, and Oman and the UAE in the south. Under international law, this makes foreign naval operations in the Hormuz strait legally permissible and politically less contentious than in Southeast Asia. It is also helps that the eastbound/outward shipping lane in the Strait of Hormuz, which carries the very large laden oil tankers, is in the southern section of the channel, closer to Oman and the UAE than to Iran.

In the constricted confines of the Malacca and Singapore straits, foreign navies wishing to provide improved choke point security face constraints. Southeast Asia’s main shipping channel is less than 24 miles wide for about half of its 620-mile length. Under the 1982 United Nations Convention on the Law of the Sea (LOSC), a special regime applies when a strait used for international navigation falls wholly or partly within the territorial sea of one or more states. Known as straits transit passage, this permits an unimpeded right of passage through the strait to all ships and aircraft. The shipping lanes of the traffic separation scheme in the Malacca and Singapore straits run through the territorial or archipelagic waters of the three coastal states – Indonesia, Malaysia and Singapore – in the narrowest and most critical choke point section, as vessels approach Singapore. These national waters extend out to a maximum of 12 miles from the coastal baseline or to a halfway point when the distance between two countries on either side of the straits is less than 24 miles.

Indonesia and Malaysia, which together have by far the longest coastlines on the straits, guard their sovereign rights jealously and reject any plans for regular patrols by foreign navies, like those that take place in the Strait of Hormuz and its approaches. Other forms of foreign assistance to the three littoral states are being discussed. The security measures by these three countries include coordinated naval and air patrols of the straits. But this falls well short of comprehensive surveillance.

There is another potential point of vulnerability in the main waterway through Southeast Asia. The eastbound shipping channel in the narrowest section of the Malacca and Singapore straits runs through the national waters of Indonesia.
This vast island-nation forms the southern land flank of the waterway. The giant tankers carrying oil from the Gulf and Africa to Northeast Asia must pass through Indonesian-controlled waters where the straits are most constricted and treacherous. Yet of the three coastal states, Indonesia has the least capacity to patrol and police its extensive section of this critical choke point.\(^5\) It is also very sensitive to any perceived challenges to its national sovereignty and integrity.

In the Persian Gulf, the legal as well as operational conditions could be problematic, if not difficult, for the US and its armed forces in a conflict involving Iran that spilled into the Strait of Hormuz. The US has not signed and ratified LOSC and it is unlikely to do so soon. However, Washington says that in practice it observes nearly all parts of the UN-mandated law of the sea, including those clearly based on customary practice of long standing. When Iran signed LOSC in 1982, it did so with a declaration that only parties to the Convention would be entitled to benefit from its contractual rights, including the right of transit passage through straits used for international navigation.\(^5\) This was an obvious reference to the Strait of Hormuz, even though under LOSC the transit passage right cannot be suspended for any reason. In the event of a crisis, Iran is evidently holding in reserve a legal pretext to deny that the US has the right to move warships through the strait.

Notes
17. FACTS Energy Advisory, ‘Outlook for Crude Oil Demand, Supply, and Trade in the Asia-Pacific Region’, Issue 314, January 2006, pp. 9, 11. Japan imported an average of 4.2 million barrels per day (bpd) in 2005, about 89 per cent of which came from the Middle East. South Korea imported around 2.26 million bpd, about 78 per cent of which was sourced from the Middle East.
19. The Hon Alexander Downer, Speech to Japan Institute of International Affairs, Tokyo, 6 June 2007, p. 10.
22. Lowell E Jacoby, Statement for the Record to the Senate Armed Services Committee, on Current and Projected National Security Threats to the United States, 17 March 2005, p. 7. Jacoby, head of US Defence Intelligence Agency (DIA) said that Tehran had the only military in the region that could threaten its neighbours and gulf stability. He added:

we judge Iran can briefly close the Strait of Hormuz, relying on a layered strategy using predominantly naval, air, and some ground forces. Last year, it purchased North Korean torpedo and missile armed fast attack craft and midget submarines, making marginal improvements to this capability.

His successor as head of the DIA, Lieutenant General Michael D Marples, told the same committee on 28 February 2006 that in the past year, Iran continued testing its medium-range ballistic missile and also tested anti-ship missiles:

Iran recently concluded a deal with Russia for approximately 30 short-range air defense systems, as well as other military hardware. When these systems become fully operational, they will significantly enhance Iran’s defensive capabilities and ability to deny access to the Persian Gulf through the Strait of Hormuz.

27. ‘Australia Facing Crisis on Oil Supplies’, Bloomberg, 8 May 2006.


32. Australian Institute of Petroleum, Submission to the Senate Economics Committee Inquiry into the Price of Petrol in Australia, August 2006.


45. ‘Singapore, Israel and Gulf Next, Warns Al Qaeda’, *Straits Times*, 12 September 2006.


50. KC Vijayan, ‘Malacca Strait is Off Qar Risk List but Piracy Attacks up Last Month’, *Straits Times*, Singapore, 11 August 2006.


PART 3

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Operational Communications
18. Unlikely Partners: 
The Destruction of *Emden* and the 
Paradox of Japanese Naval Cooperation 
with Australia during World War I

Tim Gellel

The outbreak of World War I (WWI) saw a paradox in Australia’s defence. The 
1902 Anglo-Japanese Alliance made Australia and Japan indirect allies, an unusual 
situation given that the Australian Government had earlier identified Imperial Japan 
as its main threat. This contradiction was exacerbated by Japanese contributions 
to the defence of Australia, in the form of patrols by Imperial Japanese Navy 
(IJN) cruisers. Whilst effective, Australian-Japanese naval cooperation was often 
superficial, and not as close as might be expected between allies.

The Impact of the Anglo-Japanese Alliance

It was primarily mutual concerns over Russian ambition that drove England and 
Japan to conclude a formal treaty. Coming so soon after Australian Federation, ‘the 
Anglo-Japanese Alliance, announced suddenly after secret negotiations in February 
1902, was, [nevertheless] ... received in Australian political and commercial circles 
“with marked expressions of approval”’.\(^1\) Seen ‘as a check against a Russian Fleet 
from Vladivostok or a German Fleet from the China Sea, and as a guarantee to the 
trading interests of Australia in the Far East’, the alliance nonetheless confirmed 
that Australia’s foreign and defence policies were still determined by Whitehall.\(^2\)

The years that followed brought an unwelcome surprise for the fledgling Australian 
Government, as Japan’s ascendancy in the Pacific was marked by its decisive 1905 
victory over Russia in the Tsushima Strait. Three weeks after the Tsushima battle, 
the then Australian Prime Minister Alfred Deakin, ‘chief architect of her defence 
and foreign policy from 1903 to 1910’, identified Japan as a ‘defence threat’ for the 
first time.\(^3\) These events unsettled the young Australian parliament such that for the 
next ‘half a century, Australian governments ... tended to treat Japan with a mixture 
of suspicion and mild contempt’.\(^4\) Even before Federation, Australians feared they 
might be overwhelmed in the face of a concerted attack by their more populous 
Asian neighbours. These fears came to be typified as the ‘Yellow Peril’, which ‘in 
most Australian eyes, after 1900, Japan rather than China personified’.\(^5\) Reflecting 
the nation’s sense of vulnerability, successive Australian Governments adopted a 
‘White Australia’ policy that limited Asian (and therefore Japanese) immigration, 
and which became a sticking point in Australia-Japan relations.
Compounding Australian fears, the IJN gradually became a familiar presence in Australian waters. From the first port call by the Training Ship *Tsukuba* in 1878, until their cessation in 1935, IJN ships made 23 visits to Australian ports including one in 1909 in which (the then) Lieutenant Yamamoto Isoroku called on every major Australian port.\(^6\) When added to the Royal Navy’s (RN) need to retire obsolete ships, which led to the withdrawal of its five Pacific Fleet battleships, these factors spurred the enhancement of fortifications at Australia’s strategic ports, harbours and in the Torres Strait.\(^7\) Australian faith in the steadfastness of the British Empire nevertheless ran high, and defence plans rested on Great Britain’s ability to protect Australia in the event of conflict.

‘The Most Cordial Relations Prevailed’: The IJN’s Contribution to the Defence of Australia

In WWI, Australia’s fate was irrevocably tied to that of the British Empire, and that meant a focus on the European theatre. London could not ignore its world-wide obligations however, and the RN identified the need to first deal with the German East Asiatic Cruiser Squadron before suggesting that Australia’s main naval assets be sent elsewhere. Despite having lost their bases in China and New Guinea, German cruisers remained at large, leading Whitehall to invoke the Anglo-Japanese treaty and seek IJN assistance to patrol the Pacific and Indian Oceans, a concept which heightened the Australian Government’s sensitivities:

When in an important speech on 17 March 1914 [then First Lord of the Admiralty] Winston Churchill asked for Australian and New Zealand Dreadnoughts to strengthen the decisive theatre in Europe, he based himself on the premise that Australia was adequately protected by the Anglo-Japanese alliance. Australian leaders, however, were flabbergasted by Churchill’s implication that the Pacific was to be made safe by the treaty with a nation whose people they did not admit to their shores.\(^8\)

Despite these fears, the IJN provided substantial assistance towards ensuring the security of Australian waters, committing 12 light cruiser sorties to southern patrols throughout the war’s duration.\(^9\) Most were conducted after the German cruiser threat had abated, and the Australian Government’s reaction has been described as ‘less than enthusiastically grateful’.\(^10\) Commenting on cooperation with the IJN, the Australian Official History concluded that ‘the most cordial relations prevailed between the visiting Japanese squadrons or ships and the naval authorities in Australia, and the Japanese admirals were supplied with all necessary information’.\(^11\)

The relationship was not without its hiccups, however. One embarrassing incident occurred on 20 November 1917, when a warning shot was fired at the IJN cruiser *Yahagi* as she entered Fremantle Harbour.\(^12\) This incident occurred even though *Yahagi* had taken on the Fremantle pilot about a half hour before, and the Australian
authorities had been notified of Yahagi’s arrival the day before. The Australian Official History is strangely silent about the incident, which obliged Australia’s Governor-General to apologise personally to Yahagi’s captain for this ‘unintentional’ firing.¹³ The following month, Yahagi’s captain complained that the RAN had not supplied him with intelligence concerning German prisoners who had escaped from New Zealand in a small boat.¹⁴

The IJN Cruiser HIJMS *Ibuki* and the First ANZAC Convoy

The most widely-known example of the IJN’s contribution to the defence of Australia involved the inclusion of the armoured cruiser HIJMS *Ibuki* amongst the escorts of the first ANZAC troop convoy bound for the Middle East. Although often cited as the most tangible example of Australian–Japanese military cooperation, this action was not the model of teamwork that it is often held up to be.¹⁵

In late August 1914, in return for British assistance in reducing the German fleet base at Tsingtao, the IJN placed the ‘fine armoured cruiser *Ibuki*’ and the light cruiser HIJMS *Chikuma* at the disposal of the Commander in Chief of the China Station, Vice Admiral Sir Thomas Jerram.¹⁶ *Ibuki* was commanded by one of the IJN’s most capable officers, Captain Katō Kanji.¹⁷ Katō was dux of the IJN Etajima Academy’s 18th Class in 1891.¹⁸ In 1904, he served as the gunnery officer in Admiral Tōgō’s flagship (the battleship HIJMS *Mikasa*), and saw action against the Imperial Russian Navy in the Yellow Sea.¹⁹ But Katō missed out on the crucial Tsushima battle because he had been transferred to the Navy Minister’s staff. In 1909, Katō was posted to the Japanese Embassy in London, where he oversaw construction of IJN warships in British yards. In December 1913, he commanded the armoured cruiser HIJMS *Tsukuba*, before taking up his appointment as the commanding officer of *Ibuki* in May 1914. Upon the outbreak of war, Katō received orders that he was to ‘nominally’ command four ships, ‘which was unusual for a Captain’, but in the end he actually commanded only two ships: *Ibuki* and the light cruiser *Chikuma*.²⁰ Even so, this reflected the IJN leadership’s faith in Katō’s ability as well as his seniority and experience.

**Order + Counter-Order = Disorder**

From the outset, Katō was eager to come to grips with the enemy and showed his frustration with the loose and constantly changing direction he received from his British ally. In mid-September, *Ibuki* was assigned to the Java Sea and the Cocos Islands in search of the German Squadron.²¹ Plans quickly changed, with the intention for *Ibuki*, *Chikuma* and the British light cruiser HMS *Minotaur* to move to Rabaul.²² Events brought further changes of plan such that on 18 September Katō signalled to Admiral Jerram that he found the,
continual changes of plan very confusing, and unless very cogent reasons can be urged, I would prefer to carry out the original plan of operating against the [German light cruiser] *Emden* with the *Minotaur* from the South on our way to Fremantle and to let the *Chikuma* continue her operations against the *Emden* from the North, according to her Captain's discretion.\textsuperscript{23}

Three days later, Katō was still signalling for clear guidance:

(To *Minotaur*. Please send to Command in Chief China.) Respectfully await your immediate instruction for further movements of *Ibuki*. Shall I proceed immediately to Fremantle or shall I return to Singapore?\textsuperscript{24}

The tone of *Ibuki*’s signals reflects Katō’s direct and determined nature, and clearly indicates he had prepared since at least September to meet with *Emden* and sink her. These initial frustrations were eventually resolved, and *Ibuki* sailed southwards with *Minotaur* for Fremantle where they would rendezvous with an Australian troop convoy bound for Europe. Although *Ibuki*’s slower speed meant that the two ships travelled more or less independently, this was the start of the development of a sound working relationship between *Ibuki*’s Captain Katō and *Minotaur*’s Captain E Kiddle.\textsuperscript{25}
With German cruisers lurking in the Pacific, changes were made to the original plan to transport ANZAC troops from Australia and New Zealand to England. In the absence of sufficient escorts to guard two convoys, it was decided that the New Zealand convoy would concentrate with the Australian one at Albany. This delayed the Australian convoy’s departure, as *Ibuki* and *Minotaur* headed east to bring the New Zealand Expeditionary Force convoy to Western Australia. It was in the relatively benign southern waters that Kiddle and Katō consolidated their working relationship, which included the adoption of a diamond-shaped escort formation at Katō’s recommendation.

The war situation remained fluid, however, and there came yet another change when it was proposed that the newly-formed ANZAC convoy proceed via Cape Town (rather than the Suez) in case the ANZAC troops were needed to assist the South African Government. As the convoy and escorts concentrated in Albany’s King George Sound:

> The first business discussed after the *Minotaur*’s arrival was the reconstruction of all convoy plans to suit a voyage round South Africa—which incidentally involved the release of the *Ibuki*, owing to the difficulty of getting enough coal for her on the new route.

At that time, *Ibuki* had been dispatched to Fremantle to collect two transports waiting there, and her log records the following exchange:

> (From *Minotaur*) Arrangements have been made as follows. Convoy is to be divided into sections, first section proceeding via Mauritius at 13 knots, 2nd section proceeding at 12 knots, 3rd section proceeding direct to Simon’s Bay [South Africa] at 10 [and a half] knots, where the other sections would rejoin. It was decided with great regret that without considerably delaying the convoy it appeared impossible to avail ourselves of the greatest increase in protection afforded by *Ibuki* and a telegram has been sent to the Commonwealth Naval Board and [Commander in Chief] China.

*Ibuki*’s response was similarly polite:

> (To *Minotaur*) Exceedingly regret parting company with you so early especially on account of my economical speed. However, I am glad that there is still a hope that I may escort Fremantle convoy to rendezvous some distance further, well clear of the shore, as requested by you. Await your information as to the last mentioned arrangement.

When word came that the South African Government had no need for reinforcements, the ANZAC convoy left from Albany according to the original plan, and on 3 November *Ibuki* joined *Minotaur* and the other two escorts, the light cruisers HMA
Ships *Melbourne* (I) and *Sydney* (I). The 38-ship ANZAC convoy was, however, substantially larger than the earlier 10-ship New Zealand convoy, and the escorts, again deployed in a diamond pattern, were widely separated from each other.31

**A Change in Command**

The ANZAC convoy had not long left the Western Australian coast when on 8 November *Minotaur* was ordered to Africa, and command of the escorts passed to Captain Mortimer Silver, RN, in *Melbourne*.32 Now reduced to three escorts, *Melbourne* took *Minotaur*’s place in the lead of the convoy, while *Sydney* remained on the convoy’s port-beam with *Ibuki* on the starboard.

Silver was unaware that *Minotaur*’s departure was predicated on the Admiralty’s knowledge that only one German cruiser - SMS *Emden* – remained unaccounted for. Instead he understood that another German light cruiser, SMS *Königsberg*, was also at large and probably in the Indian Ocean. If they operated independently, neither German ship represented a great threat to the convoy as any one of the escorts was a match for a lone German light cruiser. But if two German ships were working together, Silver feared they could split the escorts and sink some of his charges.

Silver did not know that machinery trouble had forced *Königsberg* to seek refuge in the German colony of Tanganyika (Rufiji River) and was in fact blockaded there by British warships. It was with this knowledge that the Admiralty had redirected *Minotaur*, reasoning that Silver’s three remaining ships would be sufficient to deal with *Emden*, were she to be encountered.

<table>
<thead>
<tr>
<th>Year of Commission</th>
<th>Displacement (tons)</th>
<th>Designed Speed (knots)</th>
<th>Main Armament</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sydney</strong></td>
<td>1913</td>
<td>5 400</td>
<td>25.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8 x 6-inch</td>
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<tr>
<td><strong>Melbourne</strong></td>
<td>1913</td>
<td>5 400</td>
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<td></td>
<td></td>
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<td>8 x 6-inch</td>
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<tr>
<td><strong>Ibuki</strong></td>
<td>1910</td>
<td>14 600</td>
<td>22(^{33})</td>
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<td></td>
<td></td>
<td></td>
<td>4 x 12-inch</td>
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<td></td>
<td>8 x 8-inch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14 x 4.7-inch</td>
</tr>
<tr>
<td><strong>Emden</strong></td>
<td>1908</td>
<td>4 100</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 10.5cm (4-inch)</td>
</tr>
<tr>
<td><strong>Königsberg</strong></td>
<td>1907</td>
<td>3 390</td>
<td>24.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 x 10.5cm (4-inch)</td>
</tr>
</tbody>
</table>

*Table 18.1: Comparison of Cruiser Strength*
Emden, however, remained at large and was especially regarded as a wily and elusive opponent. In three months she had sunk or captured 25 merchant ships, including the old Russian cruiser Zhemchug and the French destroyer Mousquet. Speed would likely prove an important factor in bringing the Germans to battle, and here the German ships held an advantage over Ibuki only. But that advantage had been eroded because, after three months on the run without access to a port, Emden’s engines which ‘had made 10,000,000 revolutions, representing a course of 30,000 miles’, using an admixture of captured coal types, were in need of maintenance, such that events were to prove that while Sydney ‘nominally ... had little more than a knot the advantage in speed, she had at least four knots actual superiority’.

‘Strange Warship Approaching’

On 9 November 1914, barely 24 hours after assuming tactical command, Melbourne received a wireless signal warning of a ‘strange warship approaching’ Cocos Island. Silver’s first reaction was to make steam and head for Cocos himself, but after some thought he reasoned that his duty was to protect the convoy, and dispatched Sydney instead. Both the Australian and British Official Histories praised Silver’s ‘devotion to duty’, noting his ‘highly meritorious’ action and ‘self-control, which the Admiralty fully approved afterwards’. Ibuki’s actions, however, have received less complimentary Australian and British public comment, instead portraying Katō as unrestrained and uncooperative. One Melbourne officer wrote that, from the outset ‘the Japanese armored [sic] cruiser Ibuki made us angry. Despite warnings to steam smokeless, heavy black clouds continued to pour from her funnels.’

By 0700 Sydney was, away, but to the urgent entreaties of the Japanese captain [Captain Silver] had reluctantly turned a deaf ear, and the two remaining cruisers took station to the southward to cover the convoy.

According to the Australian Official History, when at about 0930, Sydney had reported by wireless that she had sighted [Emden] ... the Melbourne moved over to the convoy’s exposed south-western flank, and called the Ibuki to join her. The Ibuki was not by any means willing to do this; she too had received the Sydney’s message, and at once hoisted all her battle flags, cleared for action, and started at full speed to follow the Sydney, but the safety of the convoy was the primary consideration, and she had to be restrained.

Instead, Sydney engaged the enemy single-handed, and at around 1112 signalled that the ‘enemy [had] beached herself to save sinking’.
The Battle as seen from *Ibuki*

Although the English-language histories tell us that Katō ‘had to be restrained’, in order to prevent him from imperilling the convoy, *Ibuki*’s Log presents a different view. Whereas *Ibuki* had been working with *Minotaur* for two months, she had only joined *Melbourne* and *Sydney* on 3 November, and had not established a working relationship with the RAN ships. The results of this immature working relationship became evident when the action against *Emden* commenced.

Exacerbating the problem of communication was the fact that the convoy escorts had mostly maintained radio silence since before leaving Australia, and the last recorded conference between the captains was on 28 October, at King George’s Sound. *Ibuki* logged no signals from *Melbourne* in the period from leaving the Western Australian coast to when *Emden* was sighted, and only two from *Minotaur*: First on 7 November, when Kiddle passed on the news of the German naval victory at Coronel (on 1 November), and then the following day when he advised, ‘I have received orders to proceed on another service. Captain Silver of the *Melbourne* will assume command of the escort & convoy. Good bye & good luck.’ Katō’s response is not recorded in the Australian and British official histories, but is of interest to us here:

(To *Minotaur*) It is very surprising indeed to hear of your sudden change of service. Personally it is a great regret to me to part company with you after so very a pleasant & happy a cooperation. Please rest assured that I shall use all my power in discharging my duty here, au revoir, success be always with you.

A little later, Katō sent Kiddle and Silver another message, this time with a suggestion:

(To *Minotaur* & *Melbourne*). Japanese 3rd Division consisting of [the light cruisers] *Tokiwa* and *Yakumo* should have arrived at Singapore today to operate against *Emden* & to protect trade routes, under command of Vice Admiral Tochinai. I therefore urgently recommend you to represent to [Commander in Chief] to despatch *Chikuma* and *Yahagi* to escort convoy. It is not in my power as the ships are entirely at the disposal of [Commander in Chief] at present. Direct protection of the convoy is most important.

Katō’s signals highlight that he understood that the protection of the convoy was the first priority and that *Minotaur*’s departure had weakened the escort. Kiddle subsequently responded that he was ‘making strong representations to [Commander in Chief] China in accordance with your [Katō’s] proposals with which I entirely concur’. Less than 24 hours would pass however, before *Emden* was sighted and engaged. Apart from this exchange, *Ibuki*’s log records no official contact with *Minotaur*, let alone *Melbourne*, since late October.
Katō’s biographer tells us that the first he knew of Emden’s sighting came as he climbed up to Ibuki’s bridge around dawn. Scanning the horizon, he noticed that Sydney was not in her usual position off the convoy’s port beam, and called for a report from the signal room. A wireless message had come in from the Cocos Island station, but as it had been sent hurriedly and Ibuki’s signals officer was absent at breakfast, Katō’s signallers had trouble reading the signal.49 Around one hour had been lost, by which stage Sydney was already ‘away’, leaving Katō to catch up with events. A signal logged at around the same time (the exact time was not documented) from Silver outlined the situation:

(To Ibuki). I have sent Sydney to examine Cocos Island and to return with all despatch if she finds nothing there. Will you please take station ahead of convoy. I will take Sydney’s position on port beam until she returns.50

But Katō felt differently. At 0903, Ibuki’s officers logged a signal from Sydney that the enemy was ‘in sight’.51 At around 1000, Ibuki received the update ‘Sydney reports engaging enemy’ from Melbourne, followed shortly after (1012) by the order to ‘raise steam full speed, take station two miles port beam’.52 Whereas the Australian Official History indicates that Ibuki moved to a position astern of Melbourne (which was herself abeam the lead row of the convoy), this is not reflected in Ibuki’s log. Katō noted that
he believed a position ahead of *Melbourne* would be better and moved there instead. Katō’s decision was a departure from his orders, and probably stemmed from his frustration at Silver’s handling of the battle, and particularly *Ibuki*’s role in it. Perhaps smarting from Silver’s curt order ‘stop using wireless!’ sent to all ships at 0949, Katō did not communicate his reasons for this action to *Melbourne*, thereby fuelling the RAN’s assessment of *Ibuki* as being in need of restraint.53

At 1015, another report from *Melbourne*, ‘enemy steering north’, was logged.54 At 1020 *Ibuki*’s diary records that the ship was ready for battle and by 1030 had raised 15 knots.55 At 1035 (not soon after 0930 as suggested by the Official History), the Rising Sun battle ensign had been raised.56 It was probably this combination of activities that form the origin of the description that ‘*Ibuki* ... at once hoisted all her battle flags ... and started at full speed to follow the *Sydney*’ noted earlier.

‘We Must Finish with Enemy Before Dark’

At 1048, *Ibuki* reached a speed of 18.5 knots, and the order to break for meals was given seven minutes later.57 At 1117 the order to reduce to 18 knots was given, but it was not until 1130, five hours after the original message had warned of *Emden*’s approach to Cocos, and two hours after *Sydney* had signalled the commencement of action, that Katō, his patience worn thin, broke the imposed radio silence and signalled Silver to ‘please let me know movements of enemy as soon as possible.’58 Eighteen minutes later, not having received a response, Katō again signalled Silver, ‘we must finish with enemy before dark so that one of us ought to proceed & join *Sydney*. I wish to do so.’59

‘Enemy Beached’

According to *Ibuki*’s log, at 1115 *Sydney* advised that the ‘enemy beached herself to save sinking’, but this message was not deciphered and translated until 1150.60 There are two points to note here. First, *Ibuki*’s signals officer did not decipher and translate that message until 1150, by which time Katō had voiced his impatience with Silver’s handling of the battle and the convoy’s defence.

Second, the signal’s wording as recorded in *Ibuki*’s log contradicts the Australian Official History which records this signal as being ‘*Emden* beached to avoid sinking’ and notes this as ‘the first definite statement identifying the enemy as the *Emden*.’61 That version of history is incorrect, because although Sydney sent a similar message, it was not received by either *Melbourne* or *Ibuki*, and it was not until much later in the day that Silver accepted that the enemy ship was *Emden*.

A review of *Sydney*’s signal and wireless telegraph logs tells us that *Sydney* had sent two wireless messages: the first, to *Melbourne* at around 1112 was ‘Enemy beached herself to save sinking’; and the second, around 18 minutes later and addressed to *Minotaur*, was ‘*Emden* beached and done for’.62 But this second signal is not recorded in either *Melbourne*’s or *Ibuki*’s logs even though it was sent on the same frequency
as the earlier message, and *Sydney*’s logs record no confirmatory response from *Minotaur*. Neither is it recorded in the Royal Navy’s Historical Staff Monographs. And there is no record in the Australian and Japanese ships logs of the signal ‘*Emden* beached herself to save sinking’ as reported in the Official History. Instead, the Official Historian appears to have conflated *Sydney*’s two signals (1112 and 1120), only the first of which was received by *Melbourne* and *Ibuki*.

Scrutiny of *Ibuki*’s diary also reveals that Katō’s signals ‘please let me know movements of enemy as soon as possible’ and ‘we must finish with enemy before dark’ were sent at the same time that *Sydney*’s ‘enemy beached’ signal was received. Thus Katō’s signals were sent under the assumption that *Sydney* was still engaging *Emden* and possibly in need of assistance. Assuming that *Melbourne* received the signals in their correct order (that is, ‘enemy beached’ followed by ‘we must finish with enemy before dark’), Katō’s enthusiasm was perhaps misinterpreted as evidence of his lack of restraint.

Also at 1150, *Melbourne* signalled *Ibuki* to ‘please return to your station on starboard beam’ to which *Ibuki* duly complied. This time the message was passed by semaphore, suggesting that the two ships were then significantly closer to each other than had been the case for most of the morning. Eight minutes later, *Ibuki* received a wireless message from *Melbourne* announcing the results of the battle, ‘General signal from *Sydney* states that enemy has stranded herself to avoid sinking. Casualties 2 killed, 13 wounded.’

By 1205, *Ibuki* had lowered her battle ensign, and at 1220 Katō again signalled to Silver by semaphore, this time to offer ‘hearty congratulations for the success of *Sydney* and for the end of *Emden*, if it is her’. Silver’s first response, ‘name of enemy not yet signalled’, received at 1228, again directly contradicts the Official History’s version that *Emden* had been specifically identified in *Sydney*’s 1150 signal (‘enemy beached to avoid stranding’). Seven minutes later Silver politely rebuffed Katō’s earlier suggestion, ‘very many thanks for your pre-offered assistance to *Sydney*. You and I are out of luck but must solace ourselves that we are doing our duty.’

At 1315 Katō repeated his ‘hearty congratulations message’, this time by wireless, adding the rebuke that:

> I would venture to request that should similar occasion again arise, you will inform me of the number, disposition, course, name, position etc of enemy & what you intend doing; otherwise misunderstandings may arise and co-operation become ineffective.

Two hours later, Silver replied with a longer, more conciliatory signal to Katō:

> I feel very pleased at your congratulations and much regret misunderstanding. I did however send you as quickly as possible *meagre* details telegraphed by *Sydney*. Enemy steered Northwards
and I brought cruisers on that side of convoy. As enemy was signalling in cypher, I did not think it wise to detach you & lessen strength of escort. If I get in touch with enemy again your request will be acceded to as far as possible. Have just received news that she was the Emden.71

Katō’s reply was logged one hour later:

Very many thanks for your signal. I suggest that Emden was signalling to collier in cypher. The only possible German cruiser is Koenigsberg [sic] who was blockaded Rufiji River by British cruisers Nov 1st. Would it be of assistance were I to proceed to meet Sydney and accompany her, assisting her as requested?72

Katō was correct: Emden had signalled to her collier, Buresk, but why Katō took the time to explain that Königsberg was blockaded if he believed Silver already knew this is not clear.73 Equally inexplicably, Silver took two hours to reply to this astonishing news:

Very many thanks for your signal, Sydney however is not in need of assistance. I have no report concerning Koenigsberg [sic] and do not know where she is. Will you please give me the source of your information. Emden has surrendered.74

Katō’s answer that the ‘information is official & from Japanese Admiralty who received it from Japanese Naval Attaché in London’ offered no explanation as to why he assumed Silver was aware of Königsberg’s fate.75 Katō already knew that Königsberg was effectively defeated, having received the message ‘Königsberg blockaded Rufiji River, German East Africa’ on the evening of 2 November.76 At that stage, Katō understood that the convoy would proceed via Cape Town and that Ibuki would not go with them. It also came during a period of enforced radio silence, and Ibuki’s log gives no indication that Katō had sought to confirm whether Minotaur had received the same information (it did not). Instead Katō probably assumed that as the information originated from the British Admiralty it had already been passed through RN channels to Minotaur.77

No Coordination, No Communication

Last minute changes to the ANZAC convoy’s route had initially seen Ibuki detached from and then reattached to the convoy’s escort. These changes meant that the warships’ captains were unable to coordinate their defence plan face to face. Prior to 8 November, Katō had coordinated all his actions through Minotaur (with which he had been in company since September) and had not met with either Silver or Glossop (Sydney’s commanding officer). Had they done so, it is likely that they would have discussed the fundamental issues of the convoy’s defence plan and the
nature of the German threat to it. Instead, Ibuki rejoined the convoy at sea, off the Western Australian coast, and found herself in company with two ships she had not worked with before, Melbourne and Sydney.

Ibuki’s log provides no indication that the defence plan was discussed after she rejoined the other escorts on 3 November, even though it was the first time that all four ships had worked together. When Minotaur’s departure created a gap in the escort cordon, Captain Silver could have been expected to issue his own orders explaining his operational concept should the convoy be attacked. Had he done so, these orders would likely have revealed to Katō that Silver was not aware that he potentially faced only one enemy cruiser – Emden – and not two. That Silver did not undertake such coordination with his new command probably stems from his intention to maintain radio silence. Thus, behind their veil of politeness, when signals were exchanged between Ibuki and Melbourne, they revealed a gulf in both captains’ understanding of the task confronting them.

We can attribute the reason that Katō and Silver did not share a common operating picture to both technical and personnel limitations. Communication was complicated by the distance between the individual escorts as visual signalling methods (semaphore and signal lamp) were not effective at long ranges, leaving wireless as the only other means. But security concerns meant that radio silence was enforced, and this also precluded closing the distance between escorts lest it further weakened the defence cordon. Wireless was also a relatively fickle means of communication, and the escorts regularly noted that ‘atmospherics’ had prevented them from receiving all or part of a wireless message. This is possibly why Ibuki and Melbourne did not receive Sydney’s 1130 message that identified the enemy as Emden. Moreover, Ibuki’s ability to receive and translate English-language messages was good but fragile, dependent it seems on the presence of one signals officer. This slowed the rate of communication, probably resulting in the considerable time lag between messages and led to some messages being read in a different order to which they were sent. Moreover, the lack of prior cooperation between Ibuki and her RAN counterparts was exacerbated by Minotaur’s unexpected departure and Ibuki’s on-again, off-again inclusion in the convoy escort.

Some of these problems should have been alleviated by the presence of a RN Liaison Officer – Lieutenant Hope – assigned to Ibuki. But he seems to have only played a part in the communication between Silver and Katō after the battle had been fought and won. Ultimately, the human limitations probably outweighed the technical ones, demonstrating that successful warfighting relies heavily upon commanders communicating directly with each other to overcome mistrust, unfamiliarity and the limitations of available communications systems. Perhaps not surprisingly, limited coordination and limited communication resulted in limited cooperation.
Minotaur’s departure upset what was always going to be a fragile working relationship between Ibuki and the Australian warships. Firstly, the British Admiralty appears not to have informed Kiddle that his ship was being detached because Königsberg was no longer a threat to the convoy. Why the Admiralty had shared this information with the Japanese naval headquarters but not Minotaur is unclear. Perhaps more significantly though, with Minotaur’s departure went the trust and experience gained from almost two months of operating closely with Ibuki. Wherever the primary cause might lie, the combined result was that lack of communication between Melbourne and Ibuki before and during the action meant they did not share a common understanding of their opposition and the plan to deal with it. ‘Cordial’ the relationship might have been, but it was far from being a close one.

The Verdict of History

This lack of communication is also reflected in the Australian Official History’s representation of Ibuki’s actions. The exchange of signals in the late afternoon and evening of 9 November (beginning with ‘I suggest that Emden was signalling to collier in cypher’) relating to Königsberg are not reflected in the British and Australian Official Histories. Given Melbourne logged all signals sent and received, this omission contributes to the portrayal of Katō as impatient and in need of ‘restraint’.

Sliver’s decision to dispatch only Sydney to deal with Emden was a sensible one, given his understanding that Emden might have been in company with Königsberg. Sydney possessed the speed advantage that Ibuki lacked if the presence of two German cruisers forced a withdrawal, while Ibuki had the firepower advantage to defend the convoy against Königsberg if she attacked independent of Emden. But Katō’s request – if not his actions – to send two ships to ensure that the elusive Emden was pinned down once and for all, also had merit, based upon his knowledge that the convoy was threatened by Emden alone.

Both the British and Australian official histories emphasise that Sydney could not tend to Emden’s casualties for almost 24 hours partly out of the fear that Königsberg might appear. And this excuse was also offered up during the war, when the London Times ran ‘An Officer’s Account of the Sydney-Emden Action’ a little more than one month later. Had Ibuki’s offer of assistance been accepted, then Emden’s wounded might have received aid much sooner.

That there might have been some lingering misunderstanding as to Königsberg’s whereabouts after Ibuki’s exchange of signals with Melbourne seems unlikely. The polite and articulate signals in Ibuki’s diary testify to a high level of English-language comprehension. Indeed Katō ‘had an excellent command of English,’ and had served as an attaché in England between 1909 and 1911. It is difficult to imagine that the strong-willed Katō would have released a signal if he did not understand its meaning.
After the battle, *Sydney* and *Melbourne* departed for the Atlantic, where they eventually joined the RN Grand Fleet, and command of the scattered convoy was passed to the RN light cruiser HMS *Hampshire*, with *Ibuki* the only other escort. The Admiralty’s subsequent decision that, with the threat from *Emden* and *Königsberg* removed, the ANZAC convoy would proceed not ‘in the old marshaled and restricted order, but by divisions sailing independently according to speed’ supports Katō’s assessment that *Ibuki* might have been released from escort duties to assist *Sydney* in finishing off the *Emden* and her collier.\(^8\) However, the decision to release the convoy also reflected a concern that at one point, *Ibuki* might be the sole escort, something which Admiral Jerram recommended against when he signalled the Admiralty on 13 November that such an outcome would be ‘undesirable ... not so much from the point of view of safety as of Australian sentiment.’\(^83\) Perhaps this was also a factor in Silver’s decision that *Sydney* would finish off *Emden* unassisted.

We might also ask why the RAN ships did not know of *Königsberg*’s fate and why Katō did not share his information earlier? The Australian Official History tells us that *Königsberg*’s fate was known in London on 1 November, and was the reason behind *Minotaur*’s detachment from the convoy, but it offers no explanation for why this information was not passed onto the RN and RAN escorts.\(^84\) When on 8 November *Minotaur* turned over to *Melbourne* ‘important order and notifications’ (ironically contained in a black Japanese box) before parting, the last information Kiddle had was that he had been informed on 30 October that RN ships were searching for *Königsberg* along the East Coast of Africa.\(^85\)

Katō excused his inaction in a signal to *Melbourne* nearly two days after the battle:

> Capt to Capt. Greatly appreciate your message entirely relieves my mind. Much regret that my information was not transmitted to you earlier, but I thought *Minotaur* had it. Japanese Admiralty instructed me to keep it strictly confidential.\(^86\)

Had Katō communicated this to Kiddle or Silver earlier, then the battle to destroy *Emden* would probably have been fought differently.

**Epilogue**

Japan’s naval assistance in WWI did not earn it Australian gratitude. At the 1919 Versailles Peace Treaty talks, Australia was among those nations that most vocally repudiated Tokyo’s call for the recognition of the equality of all races. Having checked Imperial Russian expansion in the Far East in 1905, and having helped in 1915 to capture Germany’s Pacific Ocean possessions north of the equator, Japan emerged from WWI as the most credible threat to Australian territory. London decided to allow its 20-year security pact with Tokyo to lapse in 1922, thereafter casting Japan more starkly as the opposing power in Asia, contributing to a sequence of events which culminated in the Pacific War.
Ibuki’s Captain Katō went on to become a leading figure in the IJN. At the end of WWI, Katō again worked as part of an Allied force, commanding an IJN cruiser squadron during the Siberian Expedition, for which he was appointed Knight Commander of the Order of St Michael and St George by the British, and awarded a Distinguished Service Order by the United States.87 In 1922, he served as the senior IJN officer at the Washington Naval Conference ‘where he emerged as an outspoken foe of the arms limitation treaties.’88 Despite his opposition, Japan accepted reductions to its major fleet units, and it was with strong emotions that Katō greeted the news that serviceable IJN warships, including Ibuki, would be scrapped as part of the treaty. At the sinking of one pre-dreadnought in 1924, Katō is said to have tearfully declared that ‘from this day on we are at war with the United States’.89 By 1930, promoted to Admiral and Chief of the Naval General Staff, Katō ‘launched a campaign to block the London Treaty’, and although he was later forced to resign ‘he nevertheless helped engineer the demise of the navy’s moderate leadership in the years immediately following.’90 For the RAN, Emden’s destruction marked an epochal day. Formed only 13 years earlier, an RAN warship had scored one of the first Allied victories over the Imperial German Navy. The fact that ‘most of Sydney’s crew were British’ has not diminished the significance of this event, and a Sydney-Emden mess dinner is regularly commemorated by the RAN.91 Although Ibuki’s actions during the fight remain misunderstood, a model of the ship, presented by the IJN to the RAN, remains on display at the Australian War Memorial as a reminder of the most renowned example of Australian and Japanese cooperation during WWI.

Japan’s role in Emden’s history did not conclude with the German ship’s defeat, however. As early as 1915 a ‘Japanese firm offered to repair’ Emden but the wreck ‘was already too battered by the waves to admit of refloating.’92 A Japanese company nevertheless finished Sydney’s work when Emden’s remains were finally scrapped in the 1950s.93

Notes
1. HP Frei, Japan’s Southward Advance and Australia, Melbourne University Press, Melbourne, 1991, p. 83.
2. Frei, Japan’s Southward Advance and Australia, p. 83.
3. Frei, Japan’s Southward Advance and Australia, p. 84.

7. Frei, *Japan’s Southward Advance and Australia*, p. 84. Although it should be noted that these battleships were old and not-suited to the needs of modern naval combat.

8. Frei, *Japan’s Southward Advance and Australia*, p. 89. In truth, New Zealand did not have a dreadnought, as although HMS *New Zealand* was paid for by New Zealand, it belonged to the Royal Navy.

9. In addition to HIJMS *Ibuki*, the light cruisers HIJM Ships *Chikuma* and *Yahagi* cruised off Northern Queensland between December 1914 and January 1915. In April 1915, the cruiser HIJMS *Nisshin* visited Rabaul and Madang, while between May and July, the training ships HIJM Ships *Aso* and *Soya*, visited Australian ports between Fremantle and Rabaul. In May-July, 1916, HIJM Ships *Azuma* and *Iwate* did the same between Fremantle and Brisbane. In March 1917, three IJN cruisers and eight destroyers were used to escort troopships (none of them Australian) across the Indian Ocean. Between May and June 1917, the cruisers HIJM Ships *Izumo*, *Nisshin*, and *Kasuga* escorted cargo vessels between Fremantle and Colombo. For most 1917, the light cruiser HIJMS *Hirado* reached Thursday Island, and her sister-ship, *Chikuma*, were, in the absence of Australian ships serving elsewhere, employed directly in the defence of Australia, remaining in or near Australian waters until November and December respectively. *Nisshin*, *Kasuga* and *Yahagi* also patrolled the Western Australia coast at intervals during 1917. In March 1917, *Yahagi* visited Fremantle, and in May-October assisted Australian ships in patrolling the northeastern coasts of the continent and the islands northwards. Also from mid-August to the beginning of October *Nisshin* patrolled off Fremantle. *AW Jose*, *The Official History of Australia in the War of 1914-1918*, Volume IX - The Royal Australian Navy: 1914 - 1918, 9th edn, Angus and Robertson, Sydney, 1941, pp. 340-341.


11. Dennis et al, *The Oxford Companion to Australian Military History*, p. 341. This naturally extended to logistical support, such as when in May 1917 *Hirado* was docked at Cockatoo Island.

12. A letter from the RAN District Naval Officer for Western Australia, to *Yahagi’s* Captain and dated 21 November 1917, explained that:

The pilot (who is also the Examination Service Officer) when boarding your vessel yesterday morning, neglected to inform you of the necessity for your ship to fly the prescribed Signals for entering the Defended Port of Fremantle, the Examination Battery fired a plugged shell across, and well ahead of, your bows, which was done solely to attract the attention of the Examination Officer to the fact that, he could not bring the ship into the Port without displaying the prescribed Signals. It is trusted that you will accept my apology for this unfortunate occurrence.

*War Diary of the Cruiser HIJMS Yahagi, Nichi-Doku (Japan-Germany)* T3-171 Yahagisenjihii (Yahagi War Diary) Held at the Japan National Institute for Defense Studies, Archives Section, Volume 11, 7 February 1917 onwards, p. 282.

13. *War Diary of the Cruiser HIJMS Yahagi, Nichi-Doku (Japan-Germany)* T3-171 Yahagisenjihii (Yahagi War Diary) Held at the Japan National Institute for Defense Studies, Archives Section, Volume 11, 25 November 1917 onwards, pp. 286-287. See also Frei, *Japan’s Southward Advance and Australia*, pp. 92-93. *Yahagi’s* Captain (later Rear Admiral), Miyaji Tamisaburo would later be decorated with the Order of Bath by King George V. According to his daughter, who later married an Australian and lived in Melbourne, Miyaji kept on the walls of his study in his family home three botanical paintings:
'There was a rose, a wattle and a chrysanthemum. The rose stood for England, the wattle stood for Australia, and the chrysanthemum stood for Japan.' He pointed at them and said 'They were the countries I fought for.' I didn’t know anything about Australia - but he told me that the wattle was very beautiful and that he had seen it all over the hills there.

J Elder. ‘Time to Remember when a Foe was Once a friend’, The Age, Melbourne, 5 May 2002.

14. War Diary of the Cruiser HIJMS Yahagi, Nichi-Doku (Japan-Germany) T3-171 Yahagisenjihji (Yahagi War Diary) Held at the Japan National Institute for Defense Studies, Archives Section, Volume 11, 24 December 1917, p. 336. The sailors were from the German raider SMS Seeadler.

15. Another, minor episode occurred in February 1915 when IJN and RAN personnel fought alongside each other to suppress a Sepoy mutiny in Singapore. H McQueen, Japan to the Rescue, William Heinemann Australia, Port Melbourne, 1991, p. 26.


17. Although his name was correctly read Katō Hirohara, Katō was more widely known by an alternative reading as Katō Kanji.


19. From the beginning of his career, Katō was known to Tōgō. As a newly graduated midshipman, Katō served aboard the cruiser Naniwa, which commanded by the then Captain Tōgō. Gow, Military Intervention in Pre-war Japanese Politics, p. 41.


23. Ibuki War Diary, Log Entry 144, Signal to Flag Commander Eggerton, 18 September 1914.

24. Ibuki War Diary, Log Entry 152, 21 September 1914.


26. It was originally intended that ANZAC troops would be quartered and trained in England before being committed in France. Their subsequent diversion to Egypt led to their employment in the Gallipoli Campaign.

27. Katō Kanji & Denki Hensankai (eds), Katō Kanji Taishō Den (The Biography of Admiral Katō Kanji), Tokyo, 1941, p. 608. The other two escorts were the light cruisers HMS Philomel (purchased by New Zealand and part of the New Zealand Division of the RN) and HMS Psyche.


31. The Australian Official History tells us that the Australian transports were separated with one mile between each of the three columns, with the next ship some 800 yards astern (for an overall size of two miles wide, by almost 3.5 miles long). Assuming the ten ships of the New Zealand convoy (arranged in two columns of five) were similarly dispersed, the entire convoy would have been approximately 5.5 miles long. Measured across the four points of the diamond, the distance between the starboard and port escorts was about 10 miles, whilst between the lead and rear escorts it was about 14 miles. Jose, The Official History of Australia in the War of 1914-1918, pp. 161-163. Katō’s biography suggests slightly greater distances of 12 miles and around 15 miles. Kanji & Hensankai The Biography of Admiral Katō Kanji, p. 607. These distances were exacerbated by the transports straggling at night such that on one occasion the ‘third division’ spread out over 7 miles when their distance should have been 7. Jose, The Official History of Australia in the War of 1914-1918, p. 163.
33. *Ibuki* was the first IJN ship to be fitted with turbines, and although designed for a maximum speed of 22.5kts, managed only 21kts on trials. See K Jentschura, D Jung & P Mickel, (D Brown & A Preston trans), *Warships of the Imperial Japanese Navy, 1869 - 1945*, Naval Institute Press, Annapolis, 1999, p. 78.
34. *Zhemchug* was, ironically, one of the few Russian ships to have survived the Tsushima battle (by seeking internment in the neutral American colony of the Philippines).
38. RK Lochner, (Thea Lindauer and Harry Lindauer trans), *The Last Gentleman of War: The Raider Exploits of the Cruiser Emden*, Naval Institute Press, Annapolis, 2002, p. 200. Account attributed to Commander CW Stevens, RAN but he is not cited; Stevens was a lieutenant aboard HMAS *Melbourne* (I) at the time of the *Emden* action. The Australian official history similarly comments that *Ibuki* was ‘marked throughout the voyage by her heavy, overhanging plume of smoke.’ *Jose*, *The Official History of Australia in the War of 1914-1918*, p. 163.
42. *Jose*, *The Official History of Australia in the War of 1914-1918*, p. 409. Katō is mentioned by name only once in the Australian Official History.
43. HMAS *Sydney* (I), like *Ibuki*, was a late inclusion to the escort: It had been intended that the *Nisshin* would join *Ibuki*, HMS Minotaur and *Melbourne* in escorting the convoy, but when *Nisshin* ran aground on 12 October, *Sydney* was substituted. The IJN did offer to find a replacement ship, but none were available close enough to Western Australia. *Jose*, *The Official History of Australia in the War of 1914-1918*, p. 158.
44. ‘Thank you for your signal. I propose after midnight tomorrow (26th) not to use wireless except in case of emergency, and I have arranged with the Commonwealth Navy Board accordingly.’ *Ibuki* War Diary, Log Entry 260, 25 October 1914, signal from *Minotaur* and Log Entry 269 dated 28 October.
45. *Ibuki* War Diary, Log Entry 299, 7 November 1914, signal from *Minotaur*; and *Ibuki* War Diary, Log Entry 303, 8 November 1914, signal from *Minotaur*.
46. *Ibuki* War Diary, Log Entry 303, 8 November 1914, signal to *Minotaur*. The message ends with ‘please convey my best regards to Commander Peel & Lieutenant Commander Brandon.’
47. *Ibuki* War Diary, Log Entry 304A, 0730hrs on 8 November 1914, signal to *Minotaur* and *Melbourne*.
48. *Ibuki* War Diary, Log Entry 304C, 1000hrs on 8 November 1914, signal to *Minotaur*.
50. *Ibuki* War Diary, Log Entry 306, on 9 November 1914.
51. *Ibuki* War Diary, Log Entry 306, 9 November 1914. The log notes that the message received was ‘FU HU’ and that while the pre-arranged meaning of ‘FU’ was ‘enemy in sight,’ the meaning of ‘HU’ was ‘unclear’ (*fumei* in Japanese).
52. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*. The log notes the first message was received around ten minutes after an order at 0949 to ‘stop using wireless.’
53. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*. Although what action *Ibuki* had taken to cause *Melbourne* to issue this order is not recorded in *Ibuki*’s Log.

54. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*.

55. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*.

56. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*.

57. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*.

58. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal to *Melbourne*.

59. *Ibuki* War Diary, 9 November 1914, wireless signal to *Melbourne*. Another account attributed to Commander CW Stevens, repeats a version of *Ibuki*’s 1148hrs signal to *Melbourne* - ‘We are of the opinion that the battle should be carried out by daylight and that we should lead the attack forces’ – but makes no mention of the information about *Königsberg*. Lochner, *The Last Gentleman of War*, pp. 200-201.

60. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Sydney*. This signal was received at 1130 but not deciphered until 1150.


62. Wireless Signal Log of HMAS *Sydney*, 9 November 1914, AWM 35 24/47, p. 191. Curiously, in this second entry, the word *Emdeii* or possibly *Emdein* has been re-written in a more measured hand (and misspelled) over the top of an earlier word (which also appears to be a misspelling of *Emden*).


65. *Ibuki* War Diary, Log Entry 306, 9 November 1914, semaphore from *Melbourne*.

66. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*. The Log Entry for 1156 records ‘returning to position’ and at 1205 that the battle ensign had been lowered.

67. *Ibuki* War Diary, Log Entry 306, 19 November 1914, semaphore to *Melbourne*. It is worth noting that at this point, the pages of *Ibuki*’s log are out of date time order, and the two ‘Very Many Thanks’ messages have become confused with each other.

68. *Ibuki* War Diary, Log Entry 306, 9 November 1914, semaphore from *Melbourne*.

69. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*.

70. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal to *Melbourne*.


72. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal to *Melbourne*.

73. It is the first record in *Ibuki*’s log of discussion with *Melbourne* of the German naval strength.

74. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal from *Melbourne*.

75. *Ibuki* War Diary, Log Entry 306, 9 November 1914, signal to *Melbourne*.

76. *Ibuki* War Diary, Log Entry 289, 2 November 1914. At that time *Ibuki* had been detached to collect two transports from Fremantle and rejoined the convoy at sea on 3 November. Jose, *The Official History of Australia in the War of 1914-1918*, Volume I, p. 161.


78. Prior to *Minotaur*’s departure, the four ships had been deployed in a diamond pattern around the convoy, with *Minotaur* in the lead, *Sydney* and *Ibuki* on the port and starboard flanks respectively, and *Melbourne* astern. After *Minotaur* left the convoy, *Melbourne* assumed her place, leaving the rear of the convoy unguarded. It appears that if Silver had formulated a plan to deal with any attack, he did not communicate it to the other escorts.

79. See Wireless Signal Log of HMAS *Melbourne* 10 Nov 1914 to 18 Dec 1914, AWM 35 17/53, pp. 104-105 for signals exchanged between Captain Silver and Lieutenant Hope. The RN and the IJN had a
history of similar exchanges: Most notable was Captain (later Admiral) WC Pakenham; see D & P Warner, *The Tide at Sunrise*, Angus & Robertson, London, 1974, p. 184. Later in World War I (WWI), he was to fly his flag from the RAN dreadnought HMAS Australia. Admiral Suetsugu Nobumasa also served as an observer (whilst a commander) aboard Admiral Beatty’s flagship HMS Queen Mary during WWI, but those arrangements were possibly not in place in November 1914. S Asada, *From Mahan to Pearl Harbor*, Naval Institute Press, Annapolis, 2006, p. 107.


82. Jose, *The Official History of Australia in the War of 1914-1918*, p. 204

83. Signal A 47, No. 275 from Commander in Chief, China to Admiralty, dated 13 November, as Royal Navy Naval Staff, *Naval Staff Monographs (Historical), Volume V*, p. 193.


85. Lochner, *The Last Gentleman of War*, p. 200; and Royal Navy Naval Staff, *Naval Staff Monographs (Historical), Volume V*, p. 103.

86. Signal Log of HMAS Melbourne 3 September 1914 to 11 January 1915, AWM35 17/54, p. 93.


92. Jose, *The Official History of Australia in the War of 1914-1918*, p. 208. The Australian Official History also adds, ‘a visitor to the Cocos group in 1919 reported that almost all traces of Emden had disappeared,’ but a photograph understood to have been taken in the 1930s shows much of Emden’s superstructure intact (Lochner, *The Last Gentleman of War*, pp. 210-211) and at any rate there was evidently sufficient metal to justify salvage.

It is instructive each Anzac Day to experience contemporary interpretations of sacred and unquestionable parables extolling ethical national virtues. These articles of faith probably originated in our unique landscape but flowered as Australian iconography at Anzac Cove and subsequently. We have come to accept that the legend grew from our early military involvement with Great Britain in World War I (WWI) and continues to fit seamlessly into our psyche especially when national emergencies occur.

But the interpretation we have received is almost exclusively illustrated by Australian soldiers. Is there an Australian naval attribution to the Anzac legend forged at Gallipoli?

This chapter briefly summarises:

- a little of the recorded history of the ANZAC force on the evening of the first day of the landing at the ANZAC beachhead on the Gallipoli peninsula
- HMA Submarine AE2’s successful passage through the Dardanelles at the same time as the main landing on the peninsula and the implications of the submarine’s subsequent and very last received signal, also sent on that day
- the little recognised actions of AE2’s telegraphist, William Wolseley Falconer
- lastly, the controversy as to what contribution this signal made to the decision to hold the ANZAC force on its beachhead on the night of 25 April 1915 and the subsequent legend that force created.

The Gallipoli Campaign in Context

Why even address the Dardenelles? Alan Moorehead succinctly put it that German inspired Turkish naval raids on Russian Black Sea ports drew Turkey into the Central Power bloc. This ensured the Bosporus and Dardanelles were blockaded against 90 per cent of Russian grain exports and 50 per cent of all other Russian imports and exports. With the port of Archangel frozen over in winter months and the Baltic blockaded, Russia’s remaining lifeline to the European free world and her allies via the Black Sea was terminated. Economic bankruptcy followed, with heavy Russian losses on the Eastern Front, and Lenin inspired civil disorder. Thus it is not fanciful to requote that the failure of the Gallipoli Campaign also contributed to the rise of decades of Soviet Communism.
An array of over 100 authors, many of whom were players in the campaign, have recorded their experience or opinion as to what led to the ultimately disastrous Allied campaign at Gallipoli. The Churchill inspired strategy to bolster the Czar’s beleaguered southern army against their Ottoman enemy and to free up Russian economic dependency on its trade through the Black Sea, could have been a crowning Allied achievement. Subsequently, if the Allied naval fleet had been successful in 1915 in penetrating past the forts and minefields in the Dardanelles, had entered the Sea of Marmara, and had bombarded Constantinople into submission, that strategy might have been arguably successful in shortening the war by months if not years.

When WWI was declared, the German advisers to the Ottoman Empire quickly organised the seeding of ten lines of fixed mines across the Dardanelles and another string of mines parallel to the southern coast and drifting with the strong current outpouring from the Bosporus through the narrow Dardanelles at a point where major surface units, if forced to withdraw, would turn through an arc of 180 degrees. This is exactly what happened, and the latter mines were to sink three of the Allied battleships attempting to destroy the twelve forts on 18 March 1915. The forts and hidden field artillery ensured it was impossible for the minesweeping force, then made up of civilian manned fishing trawlers, to clear the minefield. The Allied fleet retired. The surface naval campaign came to an abrupt halt. It was then left to its fledgling submarine component to take the fight to the German-supported Ottoman Navy. Indeed, no major surface units were to penetrate the Dardanelles until a fortnight after an Armistice was signed in Mudros harbour on 30 October 1918.3

The Landings on 25 April

The strategic assault on Constantinople thus became a military thrust across the western peninsula that takes its name from the port of Gallipoli sitting at the north western entrance to the Sea of Marmara. On 25 April 1915, the French were to land untroubled at Kum Kale, but later be withdrawn to bolster the British landing at Cape Helles, ironically in sight of historical Troy. The Turks could not understand this withdrawal since they were convinced that this was their Achilles heel.

Then the Australian and New Zealand force, the ANZACs, were landed a mile north of their intended beach, later known as Anzac Cove, bounded by unexpectedly steep ravines, gullies and crests. This made their task of scaling the heights to the dominant mountain ridge so much more exhausting than expected. After scrambling steeply up from the beachhead into the sun and being pinned down as slow moving targets by tortuous thorn, gorse and thicket, there began a series of examples of extraordinary bravery, mettle, mateship, initiative and sheer courage. Nevertheless, there were considerable casualties in junior officers and non-commissioned officers. In many cases leaderless troops lost their direction. Small numbers from the covering force who reached their ridge objectives were forced back or wiped out as the enemy regrouped on the heights, and their incessant and unanswered artillery played havoc among the climbing ANZACs.
One Dardanelles admiral observed that with the advent of wireless telegraphy (W/T) the once leisurely and disconnected nature of army and navy cooperation in joint operations had changed forever.4 This was the first major contemporary amphibious landing and command and control was to be tragically exposed. It is recorded that communications between both services were appalling for some days, communications teams were landed separated from their equipment and procedures, though written, had not been adequately rehearsed. The naval component of the amphibious landing was promulgated in a 31-page operations order! This scenario was to improve, but on 25 April it was the lead act to tragic theatre. At Anzac Cove naval guns stayed largely silent until late in the day against enemy artillery and troop formations, when with better communications they could have provided critical support. By evening, only 50 per cent of targets were achieved and the heights commanding the Dardanelles were never to be secured.

**HMA Submarine AE2**

When the Allied landing force was first cobbled together, and some 200 ships began to concentrate the Allied army from Egypt and the UK at Tenedos and Lemnos Islands at the Aegean entrance to the Dardanelles, *AE2* joined the Eastern Mediterranean Squadron. Her arrival on 5 February 1915 marked the Squadron’s first E Class submarine.

![HMA Submarine AE2 in the Indian Ocean on her way to the Mediterranean.](image-url)
Lieutenant HHG Stoker, *AE2*’s commanding officer, was shortly promoted to lieutenant-commander and, on patrol, began learning something about the complex local eddies and surface and sub-surface currents off Cape Helles. French intelligence had gained recent access to the minefield locations compromised from a Krupp U-boat specification given to the Greeks to influence their selection of a Dardanelles capable U-boat during their earlier spat with the Turks.\(^5\) If the extremely high risk submarine penetration of the Dardanelles was now to be attempted it would have to be the newer E class, or a French boat, both with the superior battery power necessary to transit sub-surface the 35 miles through the narrow Dardanelles, against strong currents, into the much wider Sea of Marmara.

Following an accidental grounding off the entrance to Mudros harbour on the Island of Lemnos, *AE2* was sent to Malta for repairs, at which time the Australian submarine was overtaken by three E class boats, *E11*, *E14* and *E15*, destined to supplement the Eastern Mediterranean Squadron. It is possible these boats may have inspired Stoker to fit *AE2* with a cable cutter and mine jumping wires to negotiate nets and minefields.\(^6\) However, Stoker had already written a letter to a staff officer to Vice Admiral Sir John de Robeck, the new naval commander, with a simple plan to attempt the transit of the Dardanelles. De Robeck’s Chief of Staff, Commodore Roger Keyes, who reviewed the plan, was so impressed that he had taken Stoker directly to see the Admiral to discuss the scheme.\(^7\)

Stoker proposed a night surface start, dodging between the looms of searchlights until forced to submerge, then a dive to 70 feet beneath the known and estimated unswept minefields, surfacing for one or two navigational fixes before finally penetrating the mile-wide eddy swept Narrows. In the interregnum between *AE2*’s repairs at Malta and arriving back at Mudros on 21 April, de Robeck and Keyes discussed Stoker’s plan with the three new arrivals, but only *E15*’s commanding officer, Lieutenant Commander TS Brodie, agreed an attempt was feasible. Thus he got the nod to go first, but *E15* was swept ashore and lost on 17 April. Brodie’s twin brother, Lieutenant Commander (later Rear Admiral) Charles Brodie, also a submariner, was probably the staff officer on de Robeck’s staff to whom Stoker had written. He was actually airborne and witnessed his brother’s submarine swept ashore and lost. This event had a demoralising effect on the submarine force following on from the loss of the French submarine *Saphir* on 5 January 1915. By the campaign’s end, 7 of the 18 submarines involved would be lost.

So it was that subsequent to *E15*’s demise the Fleet Commander, on Keyes’ advice, next accepted Stoker’s high risk proposal to attempt to force the Dardanelles. *AE2* sailed from Mudros on 24 April, after a test dive and a W/T communications check by the tender’s radio staff. Stoker had received a one page typed Sailing Order No. 27, with stark and simple orders:\(^8\)
• To inform the Dardanelles Division guarding the straits when he would pass through the patrol.

• To proceed to the vicinity of Gallipoli, attack vessels lying off the port and watch the approaches until further orders.

• To attack any vessel in the vicinity of Chanak (later Cannakale).

• That a W/T guard ship would be detailed after 2000 with a strict signalling period of 40 to 50 minutes past the hour on the night the passage was attempted.

• To signal, if his passage plan was successful, for other submarines to follow.

Stoker was to have had a reconnaissance flight in the evening together with Lieutenant Commander Brodie. Further, he was to have had a succession of aeroplanes follow \textit{AE2} up the straits to drop bombs on suitable targets as a diversion.\textsuperscript{9} There is no record that this occurred, and since it was after midnight it seems unlikely.

However, when commencing to dive a foremost hydroplane shaft fractured and the submarine’s first attempt was aborted. The repair was quickly made and \textit{AE2} was again authorised to attempt, on 25 April 1915, to force the passage of the straits sealed off to surface vessels. However, Stoker now had two additional verbal directions. First, de Robeck stated that ‘naval aircraft from Tenedos had sighted minelayers at Chanak and since heavy units were to enter the Dardanelles in support of the amphibious landing Stoker was instructed to attack these minelayers’. And second, as Stoker departed from the flagship, de Robeck’s Chief of Staff, Commodore Keyes, told him ‘to run amok at Chanak’ near the port of Gallipoli to create a diversion that other submarines had broken into the Sea of Marmara and cause havoc with troop reinforcements.\textsuperscript{10}

The story of Stoker’s remarkable passage into the Sea of Marmara is increasingly well known. With considerable good fortune he eased \textit{AE2} through the minefields and eddies with mine mooring lines scraping and twanging along the hull and, probably whilst surfacing for navigational fixes, what must have been the underside of mines bouncing along the superstructure without exploding. He was twice swept heavily aground and to the surface by currents and eddies, and so close to forts that their guns could not be depressed sufficiently to target \textit{AE2}. The hull and deck fittings were nevertheless peppered with exploding shrapnel. He attacked and sank what he believed was a mine dropper at Chanak and then, while moving slowly past Chanak, was tracked and struck repeatedly by wire and chain snares. Having reached the Sea of Marmara he lay on the bottom until late in the evening when searching craft had ceased their activity. All told it was a well-planned, lucky, chillingly-cool, courageous and meritorious transit.
Stoker, in his book *Straws in the Wind* remarks stoically that ‘it being Sunday prayers were held before rising from the seabed and charging batteries’, in a coastal marsh infested with fishing craft! It was then Stoker’s primary task to signal that he had forced his planned passage, thus becoming the first submarine to penetrate the minefield and reach into the Sea of Marmara since the war began.

**Telegraphist William Falconer**

The saga now shifts to *AE2*’s telegraphist, William Falconer, who had joined the submarine ten days before it sailed from Sydney, thence Melbourne, for Albany. From Western Australia, *AE2* was towed to Port Said by the armed merchant ship *Berrima* in a sickening and uncomfortable passage. *AE2* had been the sole naval escort for the second Australian troop convoy intended for the Western Front. Falconer, then aged 20, was born in Richmond, Victoria, signed on in the RAN in 1912, gave his next of kin as his sister in Melbourne, and joined on a seven-year engagement from a Tamworth address. He was made a telegraphist in HMAS *Cerberus* in 1913. On his Record of Service he joined ‘Submarines’ from HMAS *Australia* on 1 January 1915, which is clearly incorrect since *AE2* was then in tow on its way to the Middle East. His submarine training in W/T was spartan and it is likely he was also a hydrophone operator and control room note taker.

It was only in 1912 that approval was first given to fit Marconi Type 10 Morse spark transceivers in some C, all D and E class submarines. The .5 KW Type 10 outfit operated in the medium frequency and low end of the high frequency bands and was fitted in *AE2*. It had a range of between 30 to 100 miles. This new and primitive tactical control system added a significant 1105kgs to the submarine’s all up weight.

W/T orders for the operation were issued in a Printed Memorandum No. 17, dated 16 April 1915, in which the submarine’s wave guard was ‘D’ wave. *AE2*’s guardship was the torpedo boat destroyer HMS *Jed*. A copy of *Jed*’s log only records her being guard ship on 26 April but this may be simply because the log appears to have been transcribed from a working log into a fresh deck log, perhaps by the navigator, in view of the small destroyer’s open bridge and inclement weather. On the morning of 25 April, *Jed* was simultaneously also fully occupied shuttling boats and barges.

Falconer had now to transmit in the ordered ten-minute period before 2100. Stoker relates the aerial radiated lurid purple and blue sparks, and that despite thorough testing and tuning, he and Falconer thought the equipment had failed. This phenomenon is described in the system handbook as ‘brushing’, an earthing effect, and a luminous discharge at night, caused by broken aerial strands, a damaged insulator or supporting structure. The damage was almost certainly the result of the morning’s fraught passage when the aerial was either struck by chain snares or peppered with shrapnel from shore batteries. To eliminate this compromising visual display the handbook’s advice was to reduce the transmitter output power, and remarks correctly that aerial earthing simultaneously ‘dampens’ the audibility.
of already normally weak received signals. Thus almost certainly, AE2 was unlikely to have heard from Jed that her transmitted signal was being received. In the event AE2 did not receive an acknowledgement from the guardship, whereupon Falconer using his initiative decided to retransmit this significant message continuously for one half hour before Stoker was obliged to move out of the marsh due to the presence of inquisitive fishing craft.

Neither Falconer nor Stoker were to know fully until they were repatriated from their subsequent brutal incarceration as prisoners of war that Jed, stationed 30 miles to the north-west in the Gulf of Saros, had picked up these fluctuating transmissions. She had reconstructed a more or less coherent message, then passed this message before midnight to the battleship, HMS Queen Elizabeth, General Ian Hamilton’s, the Commander-in-Chief’s, afloat headquarters. There it would have been further checked against AE2’s operation orders. Nevertheless, Falconer’s deliberate action to retransmit continuously beyond the rigid transmission schedule ensured the essential gist of the message got through.

The reconstructed message was passed to Hamilton’s staff with a proviso that the message was slightly garbled. That it took so long to process is indicative of the time taken to check all Falconer’s repeated and doubtless ‘as received’ intermittent transmissions, then decode and on forward any coherent alternate versions on another cluttered headquarters wave band allocated to the many divisional leaders and special guard ships.

The author has not been able to find this signal in any of the London records or senior officers’ personal papers. However, there is sufficient evidence to construct an approximate plain language version of this iconic signal. More likely than not, in WWI ‘signalese’ it would have looked like this:

```
MOST IMMEDIATE DTG 251850Z (-2)
From AE2
To CINC
COMMANDER EASTERN MED SQUADRON
QUEEN ELIZABETH
FLEET CODE
SUCCEEDED PLANNED TRANSIT /
TORPEDOED GUNBOAT CHANAK /
PROCEEDING GALLIPOLI
252145Z (-2) Rx JED
```

Or as eminent submariner Captain George Hunt, RN, suggests, observing that Stoker had a sense of theatre, that he may simply have said something like:

```
NEXT PLEASE.
SANK MINEDROPPER CHANAK.
INTEND RUN AMOK GALLIPOLI!
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The Signal's Impact

Now prior to the receipt of AE2’s signal in the flagship, the scene at Anzac Cove was chaotic at best. The cryptic comments in the Commander-in-Chief’s War Diary by Captain Aspinal, a journalist on Hamilton’s staff and who was to become the official British historian of the campaign, accurately described the logistic as well as communications shambles that prevailed prior to and at the landing. He noted:

Contents of ships, especially in the case of stores and supplies, are not known to the officers on board. This want of knowledge greatly hinders despatch in landing promptly such supplies as are urgently required.\(^\text{14}\)

By late in the afternoon the naval beach master, Captain AV Vyvyan, RN, had to deal with the clutter of fighting paraphernalia that piled up with little order on the narrow beachhead. He had to commandeer incoming craft to ship out the clog of wounded, amounting to some 1700, and by evening incoming troop arrivals had to clamber over the sight of about 300 dead. In error and prior to 1800, the first much needed heavy artillery that could not be immediately manhandled off the beach had been sent back to their transport!

More dramatically, a bizarre influence was accumulating at the beachhead, in the soaking late afternoon Mediterranean rain and rising sea. It took the form of between 600 and 1000 disoriented and exhausted troops who had either lost contact with their units or were escorting wounded mates. They were straggling back from the lines and resting or falling asleep in full view of the beach headquarters staff officers in their makeshift dugout. These same staff officers were beginning to build up a false picture of the morale and fighting stamina of their troops, now in fierce fighting for the first time in our federated nation’s history.\(^\text{15}\)

Anticipating a worsening situation with an expected massive counter-attack from the Turks, the beach headquarters asked Lieutenant General WR Birdwood, the ANZAC Force Commander, who had been briefly ashore and was now back at sea, to return urgently ashore.

Clearly the word was out that things were not going well at Anzac Cove. Two signals of encouragement ashore from Hamilton, in the late evening at 2010 and 2050 and also recorded by Aspinal in the War Diary, indicate that contrary to popular writing the situation was indeed serious, and known by Hamilton. Aspinal, who later had some difficulty having his version of the ANZAC beachhead accepted by Charles Bean and others who produced the official Australian version, had also diarised at midnight ‘… reported situation of Australians serious. Genl (sic) Commanding decided to hold position gained throughout night and with help of Navy to ease task of troops in morning by heavy gunfire’.\(^\text{16}\) I suggest that even Charles Bean, the Australian authority on ANZAC, did not emphasise sufficiently in his eminent histories how serious this situation appeared to the senior military officers on
the beachhead. But not so perhaps with the frontline troops who were fighting courageously for their lives, and despite some of them hearing unconfirmed withdrawal rumours from the beach.

At about 2200, Birdwood came ashore with Rear Admiral C Thursby, the naval support commander for the ANZAC force, who immediately signalled for all small craft to be held ready for the beachhead. Birdwood somewhat unsettled by the beach scenes and staff advice, as well as the rounding up of stragglers, signed an urgent message that eventually Thursby took to Queen Elizabeth at about midnight, just as AE2’s signal, having been passed from Jed, was being processed. The message read:

Both my Divisional Generals and Brigadiers have represented to me that they fear their men are thoroughly demoralised by shrapnel fire to which they have been subjected all day after exhaustive and gallant work in morning. Numbers have drifted back from firing line and cannot be collected in this difficult country. Even New Zealand Brigade, which has been recently engaged, lost heavily and is to some extent demoralised. If troops are subjected to shell fire tomorrow morning there is likely to be a fiasco, as I have no fresh troops with which to replace those in firing line. I know my representation is most serious, but if we are to re-embark it must be at once.

Significantly, on 24 April Aspinal had written a staff report of action in the event that either or both of the landing forces failed to establish themselves on their beachheads. That is, the possibility of withdrawal was in the mind’s eye of all military commanders. Campaign authorship seems not to have addressed this salient factor. With this dramatic message a ‘council of war’ was convened with Hamilton’s senior staff officers. Thursby emphasised he could not now collect sufficient small craft to recover, inside two days, the 15,000 fighting troops then ashore. As Hamilton was in discussion, Brodie, who had just heard a translated enemy propaganda news broadcast that an Allied submarine, meaning AE2, had earlier run aground at Chanak and been captured, was given AE2’s recent but slightly garbled signal. Realising its importance Brodie forced his way into the meeting and gave the message to Keyes.

Keyes, probably unaware of the broadcast, immediately exclaimed somewhat extravagantly:

This is an omen. An Australian submarine has done the finest feat in submarine history, and is going to torpedo all the ships bringing reinforcement, supplies and ammunition into Gallipoli!

After a short interval he came out excitedly to the gathered junior officers beaming ‘It’s done the trick!’
This is compelling evidence that \textit{AE2}'s signal reached Hamilton before a decision was finalised. It is significant that Bean’s detailed \textit{Story of Anzac} makes no mention of Keyes’ recorded conversation with Hamilton. Thursby’s dismal revelation that insufficient small craft were available was compelling enough. Further, when asked by Hamilton, Thursby was the only senior officer to suggest the troops would hold out if it was put to them. But clearly, at that moment, Hamilton had received the only good news of the day’s peninsula fighting and, with an explanation by Keyes of its significance, had decided to direct Birdwood that the ANZAC force must remain on the beachhead. He stresses the success of \textit{AE2} in the fourth sentence of his reply, knowing that other submarines would follow, enemy reinforcements and counter attacks would be slowed and a breathing space was now assured for exhausted front line troops at both Anzac Cove and Cape Helles. If it was not important Hamilton would not have mentioned it. Hamilton’s message read:

\begin{quote}
Your news is indeed serious. But there is nothing for it but to dig yourselves right in and stick it out. It would take at least two days to re-embark you as Admiral Thursby will explain to you. Meanwhile, the Australian submarine has got up through the Narrows and has torpedoed a gun-boat at Chanuk (sic). Hunter-Weston despite his heavy losses will be advancing tomorrow which should divert pressure from you. Make a personal appeal to your men and Godley’s to make a supreme effort to hold their ground. Ian Hamilton.

P.S. You have got through the difficult business, now you have to dig, dig, dig, until you are safe. Ian H.\textsuperscript{21}
\end{quote}

Thus, if \textit{AE2}'s signal had been received while or after this order was being written Hamilton could not have referred to \textit{AE2} except perhaps with his postscript afterthought to ‘dig in’. As the reference to \textit{AE2} is at the beginning of his order, and before mention of the main strike force at Cape Helles, it is more than likely that \textit{AE2}'s new tactical element followed on from Thursby’s compelling argument that not enough small craft were available inside two days. This ties the two naval aspects together and emphasises to the ANZAC headquarters both as a challenge and a fillip, the feat of their countrymen. As Keyes stated, it was as much the signal that ‘did the trick’ in firming Hamilton’s resolve to make his command decision not to withdraw. Lieutenant Commander Brodie’s record of the intimate debate at Hamilton’s ‘council of war’ supports this important interpretation.

There is some dispute as to whether news of \textit{AE2}'s success reached front line troops. Those who have some experience of command and control between a military headquarters and forward troops in an amphibious assault, as at Anzac Cove, would know that in darkness, close coordination with front line formations several hundred yards away would have been vital. In the flow of two-way information, Hamilton’s direction to ‘dig in’ was the key command order for sheer survival. Thus, early in the morning of 26 April 1915, Hamilton’s famous direction based on both the lack
of small craft and the submarine threat to enemy movement in the Sea of Marmara would have been essential for formation commanders and their troops whose survival depended on digging themselves right in with all the encouragement that could be mustered.

The paradox is that it was the senior ANZAC headquarters staff officers who had sought advice as to whether they should remain or withdraw, and they had been answered unequivocally together with the morale boosting paradigm of their brothers in arms in AE2. They had been relieved of any responsibility for a withdrawal decision. There was a new found headquarters mettle that built up a renewed spirit. Perhaps non-military analysts may be forgiven for not fully comprehending the dynamics of the day.

This was to be the start point for legends that the disastrous troop losses and ultimate withdrawal never quenched. The ethos, the myth and parables of ANZAC were in full gestation. Despite AE2’s loss several days later, her very last received signal was pivotal in confirming to the Allied Command that the enemy could be attacked by sea right to his heart (Constantinople). Properly supported, submarine warfare had more than come of age at a time when surface forces were stalled. The next submarine entered the Sea of Marmara within two days. By the campaign’s end ten Allied submarines operated in the Sea of Marmara and destroyed 242 enemy ships and transport vessels.

Aftermath

The commanding officers of E14 and E11, who followed Stoker, were to be awarded Victoria Crosses. Stoker’s duly recognised skilful and courageous adventure was to remain unreported and in obscurity until his repatriation, by which time the Eastern Mediterranean Squadron had either disbanded or moved with their senior reporting officers to other tasks and the Allied nations had lapsed into demobilisation mode. Nevertheless it is instructive to read the citation in the London Gazette for conspicuous bravery in the case of E14 since it mirrors the passage of AE2:

LONDON GAZETTE

Admiralty, 21st May, 1915

The KING has been graciously pleased to approve of the grant of the Victoria Cross to Lieutenant – Commander Edward Courtney Boyle, Royal Navy, for the conspicuous act of bravery specified below:–

For most conspicuous bravery, in command of Submarine E. 14, when he dived his vessel under the enemy minefields and entered the Sea of Marmara on the 27th April, 1915. In spite of great navigational difficulties from strong currents, of the continual neighbourhood of hostile patrols, and of the hourly danger of attack from the enemy, he
continued to operate in the narrow waters of the Straits and succeeded in sinking two Turkish gunboats and one large military transport.

The KING has further been graciously pleased to approve of the award of the Distinguished Service Cross to the undermentioned Officers of Submarine E. 14:—

Lieutenant Edward Geldard Stanley, Royal Navy.
Acting Lieutenant Reginald Wilfred Lawrence, Royal Naval Reserve.

Approval has also been given for the award of the Distinguished Service Medal to each member of the crew of E. 14.22

William Wolseley Falconer had also been recommended for a bravery award but the Royal Navy disapproved the commendation because the Board of Admiralty ‘had not proposed to take similar action for their (communications) personnel’.

This was without any real understanding of the signalling difficulties Falconer had faced, his intuitive initiative or the importance to the campaign of AE2’s successful passage with Stoker’s transit signal, and Falconer’s skillful contribution to its despatch. For that matter neither had the Australian Commonwealth Naval Board subsequently recognised the full significance of this iconic message.

Falconer was returned overland to the United Kingdom from Turkish imprisonment and embarked in the cruiser HMAS Melbourne for his return to Australia. His Record of Service indicates he was paid various Prize Monies and Extra Pay for War Service amounting to some £61.4s.3d. It may have been Naval Board policy, but his service then and as a prisoner of war for four years, is notated ‘VG Supr’. He was demobilised at his own request in September 1919 from HMAS Cerberus, worked at Garden Island Dockyard and finally as a senior clerk in the Commonwealth Electoral Office, Sydney. He married and his last known address was East Gosford, NSW. He died aged 75 on 24 April, 1968. Coincidentally that was an Anzac eve, the anniversary on which AE2 also began her last voyage. Falconer is commemorated in the Northern Suburbs Crematorium, Sydney, in Niche QE 63. Ironically, Queen Elizabeth, or ‘QE’, was the final recipient of his last transmitted, and Stoker’s historic, W/T message.

Without doubt, William Wolseley Falconer is more than worthy of being honoured as an outstanding, if not legendary, RAN communicator, and a submariner to boot. He was never acknowledged for his contribution to the Anzac epic. Unquestionably, Stoker and Falconer deserve to be remembered appropriately in the Australian War Memorial, Canberra, depicted stoically working together in AE2’s tense and cramped W/T Cabinet on the evening of 25 April 1915.
Notes

12. OU 5155, W/T Handbook Type 10 Sets (Submarines), The National Archives: ADM 186/810. (Copy held RAN Seapower Centre - Australia).
24. Letter, Department of Veteran’s Affairs to author, Ph9/1, 18 March 2005.
Adopted belatedly by the British Admiralty during World War I (WWI), convoys of merchant ships escorted by warships proved an effective counter to the emerging threat of submarines. Thus, as the international situation deteriorated towards war in the late 1930s, the Admiralty trade division commenced the process of preparing to re-institute the convoy system. Organisation was the key to success, but efficient and effective communications between ships of the convoy, the convoy commodore and the naval escorts was vital to its execution. The medium by which these communications were to be maintained became an important issue.

Signals intelligence, which had been exercised through the Admiralty’s ‘Room 40’ during WWI, had demonstrated the value of intercepts of radio traffic to the prosecution of world war. Prior to World War II (WWII), the British Government’s deceptively-titled Code and Cypher School had taken over the mantle of Room 40, and the British Commonwealth (and German) intercept operators and cryptanalysts made ready to expand their task of deriving intelligence from radio transmissions. The coordination and control of convoys at sea would thus, as far as possible, be by means of visual signaling – signal flags, semaphore and Morse code by flashing light. The international code of signals, which employed flag hoists, had existed for many years for use between merchant and naval ships and with shore stations, and the yellow ‘Quarantine’ flag and the ‘Blue Peter’ were widely recognised, even amongst landsmen. But this means was insufficient for naval convoy work, much of which would take place in darkness.

As well, transmission of orders and instructions to ships in a convoy from the convoy commodore or escorting warships required a rather higher degree of skill and knowledge than the bridge staff of the average British merchant vessel possessed. Similarly, the personnel in many ships from Allied nations would have difficulties with the English language, thus adding to the Admiralty’s problems of devising a workable communications system. The solution, therefore, became obvious; put naval signalmen onboard selected merchant ships in a convoy so that these essential communications could be maintained and naval messages could be ‘translated’ into instructions clear to their host ships’ masters.

Regular and reserve naval signalmen could easily manage that responsibility but, as navies expanded rapidly under the impetus of war, there was an increasing demand for their services at sea in naval vessels. Furthermore, signalmen took a long time to train for their multiple responsibilities in warships, from message distribution to fleetwork and their mastery of the various modes of visual signaling. Demand quickly outstripped the modest supply of reservist signalmen, and large drafts of
new recruits swelled the establishments of signal schools. There was one other depressing factor in that equation: losses of both warships and merchant vessels in convoy invariably meant some losses of naval signalmen.

The Admiralty thought that the solution lay in the creation and training of a special cohort of signalmen specifically for posting to ships of convoys – ‘convoy signal ratings’, and in August 1940 a convoy signal section was established within the regular naval communications branch of the Royal Navy.¹ This was to be complemented by a leavening of senior and experienced sailors, with the bulk coming from direct entry recruits, who underwent an abbreviated training program before being deployed. Their syllabus was concerned with achieving sufficient levels of proficiency in the various modes of visual signaling, the international code of signals, an understanding of convoy organisation and operations, and the interpretation of convoy manoeuvring instructions.

In the early months of WWII, the RAN had encountered the same problem and was looking for a solution. The needs of convoys had, thus far, been met from the ranks of reservists. Eleven had undergone a convoy signals course at HMAS Cerberus – also known as Flinders Naval Depot (FND) or just ‘Flinders’– graduating on 4 January 1940, but without being designated as convoy signalmen.² Although incompletely trained in relation to general service, they had sufficient skills to meet the demands of convoy signalman duties. To these a few general service signalmen, usually of senior rank, had been added. Signalmen attached to merchant ships sailing for northern hemisphere destinations, such as those carrying troops and their equipment to the Mediterranean theatre, were absent from Australia for many months. For example, some members of the class of reserve signalmen who graduated from the first course joined the ships of the first troop convoy to the Middle East on 10 January and were not to return to Australia until September, by way of Port Said, Diego Suarez, Marseille, Brest, Liverpool, Halifax and Freetown. One of the latter stated:³

I was mobilised in Leeuwin [shore establishment in Fremantle] 2.9.39 and was in the same class [as Convoy Signalman George Anderson, RANR] in FND early’40, sailed to the UK in the same convoy, was in Pompey [Portsmouth] with him (and can prove it). In fact, we both missed the train from Glasgow to Euston in June ’40 (due to our attention being directed to two Scottish lassies instead of catching the train with the CYS [chief yeoman of signals] and the rest of the group).⁴

Effectively they were lost to the RAN for extended periods, which exacerbated the shortages already being confronted. As the Captain Superintendent of Training put it in November 1940, in proposing the adoption of the Admiralty scheme:
A large number of semi-trained reserve signalmen are at present serving in convoys who could be relieved by convoy signalmen and then would be available to relieve the acute shortage of active service and reserve signal ratings. There is at present no indication as to how many signalmen will be required for convoy duty in the future and if a pool of convoy signalmen were carried this would relieve the signal branch from the necessity of providing these ratings at short notice.\textsuperscript{5}

Despite support from the Naval Staff for the proposal, the Second Naval Member of the Australian Commonwealth Naval Board, responsible for personnel matters, remained unconvinced of the need and convoy requirements continued to be met from the ranks of general service signalmen. There matters stood until after the Japanese assault of December 1941, which made it very clear that convoying was to assume a much higher profile in naval operations on the Australia Station. By that stage there were 64 regular and reserve signalmen serving in what was termed the ‘convoy pool’. The convoy signalmen proposal was resurrected on 16 January 1942, and on 23 February the Naval Board approved it. Commonwealth Navy Order 69/1942 of 10 March promulgated the decision and laid down the regulations. Recruits would find themselves at sea as ordinary signalmen (C) within 12 weeks of entry, 4 of which would be spent in recruit training. There was a promotion avenue through to yeoman of signals (C) and regular and reserve signalmen already serving in the convoy pool would be allowed to transfer into the new convoy signal section. The scheme would meet anticipated convoy communications needs, and enable the RAN to claim back nearly 40 much needed signalmen to fill naval billets in ships and shore establishments.

The first class of convoy signalmen was entered on 2 March 1942. Some of the 30 young men who assembled at Flinders Naval Depot were barely 17 years old. They did four weeks intensive general naval and fitness training before commencing eight weeks of communications instruction, during which they were told that they were being trained to fill billets in merchant ships on the Murmansk and Atlantic convoy routes. Because of the huge losses of ships and men on these voyages, some of their petty officer instructors were, apparently, heard by recruits to remark to their peers that it was likely that their students would ‘all be dead in six months’.\textsuperscript{6}

Postings to the UK might have been higher authority’s intention at some stage, but before their training had been completed, Australian shipping on the east coast was under Japanese submarine attack. The month of May saw attacks and sinkings, and the midget submarine attack on Sydney Harbour took place on 31 May/1 June. The convoy system was imposed on the Australian east coast on 4 June and, as a result, only one of the graduates in this class of convoy signalmen was to see Murmansk. However, although two had been withdrawn during training, the remaining 28 all passed their course with flying colours, averaging 97.6 per cent against a pass mark of 75. Those over the age of 18 were rated ordinary signalmen, at the princely salary of six shillings per day. Those under 18 were classed as boy signalmen and paid only three shillings and sixpence a day.
Under the convoy system adopted in Australia, the assembly and sailing of convoys, and the provision of escorts for them, was the responsibility of naval-officers-in-charge of ports. The new signalmen (C) were posted to convoy pools under the command of these officers for deployment as required. Many went first to port war signal stations to gain practical signaling experience, but others joined the first Australian coastal convoys on or about 8 June 1942. Two sailed from the steel port of Newcastle bound for Melbourne on the day after a Japanese submarine’s attack on the port:

Sunday night about 1.15am was awoken by shells passing overhead. Later it was learned they were fired from the Japanese submarine I-24. She fired 24 shells, main targets being the power station and steelworks. The naval depot was situated near the power station and the shells from I-24 passed close overhead on their way to the target ...

Knowing we were to sail the next day we were rather apprehensive as to where the submarine may now be lurking. We were pleasantly surprised to see the newly commissioned destroyer HMAS Arunta and corvette HMAS Kalgoorlie as escorts for the convoy.¹

That convoy got through unscathed, but June-August was a bad time for Australian coastal shipping, with the vital iron ore carriers suffering losses heavy enough to threaten the crippling of the steel industry so necessary for the war effort. It was also the time when the support of Allied forces fighting in Papua and New Guinea depended almost entirely on shipping, and the new signalmen (C) were also fully engaged in this theatre of operations. Some were lucky in being posted to the staff of the convoy commodore, where they operated in company with other convoy signalmen and, sometimes, learned their trade under the watchful eye of a more experienced senior sailor:

Many of these convoys had the senior master as commodore and frequently his signal staff consisted of only 3 signalmen with the senior rating in charge. Usually the remaining ships were without naval signalmen. Occasionally a commodore of a slow convoy would be fortunate to have a yeoman or leading signalman in charge of his signal staff with three signalmen working three watches − 4 hours on, 8 hours off. ²

However, for others their first sea posting meant being dropped into the midst of the merchant service, without senior supervisors, and left to find their own feet:

As young whipper-snappers, we had to establish our credentials with the merchant marine officers who must have viewed us with doubts and, at times, grave concern. In those days it must have been apparent that we were lacking in experience, even unsure of ourselves, and yet
we were the ones who would have to relay the messages which could affect the safety of thousands of tons of shipping and millions of tons of vital cargo and, most importantly, the lives of all onboard.

The test of their skill – and their ability to gain the confidence of the host ship’s officers – came on sailing, when the efforts to get the convoy properly organised and formed up involved a large volume of signal traffic. Errors or delays always held the potential for confusion or, worse, collision between ships laden with ammunition, fuel or troops, or with vital war materials such as iron ore and coal. Then, when the convoy was settled on its journey, a watch had to be kept for signals from the convoy commodore or the escorts regarding changes to the passage plan which had been issued to masters at the pre-sailing conference. As a result of this, convoy signalmen in some ships spent most of their time at sea on or near the bridge.

At dawn they would be on hand to check that the convoy had kept its formation through the night and to be prepared to send or receive instructions and admonitions if not. Then, when the convoy’s position had been confirmed with morning star sights, and the commander of the escort had applied any additional intelligence received to his passage intentions, daily instructions regarding times for course and speed changes, details of any ships joining or leaving, changes in the escort and any expected overflights by maritime patrol aircraft would be signalled. Then the rest of their daylight hours of duty would be spent watching and waiting for anything else that may occur:

The vivid memory I have ... was the first signal I received at sea ... ships were spread out over the ocean and this in itself was something I had never experienced before. I remember standing in awe watching them and wondering what I had to do. Well, I didn’t have long to wait. Through the morning gloom there suddenly appeared a destroyer belting along at speed ... and as I watched, I realised the light that was flashing from her bridge was directed at us. With shaking hands and fast-beating heart I read the simple message: ‘What ship’?

This I straightway and dutifully relayed to the captain and the officer of the watch, and waited for their response. It was right there and then that I learned my first lesson in initiative, and after a discreet time, I asked, ‘What will I send back, sir?’ After all, this is what I had been instructed to do in our training at Flinders ... ‘What the hell d’ya think ya should send. Don’t ya know what bloody ship yer on?’ came the gruff and angry response. Somewhat chastened, I crept away thinking, ‘Cranky bastard; why couldn’t he have simply said Anhui?’ And so I wandered off, picked up my Aldis lamp and sent off my very first fair dinkum signal at sea! One word ‘Anhui’!
There were two other major issues for the neophyte signalmen. The first was learning how to be sailors; the second was determining their berthing and messing arrangements. This was for all of them their first extended period at sea, and the spectre of sea-sickness loomed large. For those assigned to troop ships it was an especially vexing problem: it would simply not have done for them to fall foul of the malady that too quickly and obviously afflicted their khaki-clad brethren:

Poor souls. Little did they know that we were the rawest of rookies, and like them we were about to embark on our very first voyage. And, all the time at the back of our minds were thoughts of how demeaning it was going to be if they were to see us perking our hearts up over the side. What a bold front we adopted, we who were supposed to know the answers! No, we just couldn’t give any indication that we were just as inexperienced as they were, that we had no idea where we were going, and we certainly didn’t know how to deal with that dreaded ‘malaise’ sea sickness!

The berthing and messing arrangements depended entirely on the master and his officers. Those with some appreciation of the importance of the convoy signalmen in the chain of command took more care that their guests were properly accommodated and fed. It was not uncommon in those ships for the young sailors to be assigned cabin space in the bridge superstructure and to eat with the ship’s officers. In other ships which carried two or more signalmen they generally shared their own cabin so that their watchkeeping routine did not disturb others. However, not all ships were as welcoming:

When I arrived onboard Admiral Chase I was given a cool reception, and this soon gave way to a premonition that this was not going to be a good trip. I was peremptorily told that there was no accommodation available and that the only space where I could sleep was the forward hold. My heart sank. The forward hold? This meant slinging my hammock and sleeping with the cargo, whatever it was, right up in the bows of the ship. My previous experience on other ships, if accommodation had been a problem, was that something reasonable would be found, even at times being allowed to sleep on or near the bridge.

Overarching these concerns of major importance to young men, were two others – the weather and the enemy. Both were present in full measure. Southern Australian waters are notoriously rough, and this was a trial for ships unable to manoeuvre freely for a more comfortable passage for their cargo and their crews, while the generally calmer waters of the Coral Sea change their character completely during the cyclone season. The enemy was ever-present. From Brisbane south to Gabo Island, Japanese submarines waged sporadic war on convoys, sinking or damaging more than thirty ships. This is a small fraction of the numbers lost to the Germans in the Battle of the Atlantic, but each loss in the South-West Pacific was almost
irreplaceable – the theatre was a long way down the priority list in allied war strategy. From Townsville north, convoys faced attack from Japanese submarines, aircraft and, occasionally, surface forces. Until sunk by HMAS Arunta (I) in August 1942, the Japanese submarine RO-33 had attacked and sunk several merchant ships in the Arafura Sea/Torres Strait area.

The evidence of Japanese determination to hinder Allied reinforcement of Papua and New Guinea was plain for all to see. Shipping into Port Moresby had to manoeuvre around the burnt out hulk of MV Macdhui, bombed and set on fire in close vicinity to the main wharf. The harbourmaster was most concerned that all shipping was clear of the wharf before the daily Japanese air raids lest they become a casualty alongside and block all access to it completely. In Milne Bay, the wreck of MV Anshun shelled and sunk by a Japanese cruiser, fortuitously, lay a little more than a ship’s beam off the wharf, thus enabling cargo to be offloaded on both sides simultaneously. Merchant ships were poorly armed to beat off any enemy attack, their deck guns only useful against minor surface targets and small arms largely ineffective against aircraft.13

In the early months of 1943 when the Japanese and the Allies were contesting control of the eastern end of Papua, Operation LILLIPUT was launched to transport men and their supplies and equipment into the area. The principal transports were Dutch ships escorted by Australian corvettes and destroyers. In 39 stages, over 3000 troops and 40,000 tons of cargo was landed for the loss of two transports and damage to several others and their escorts. A further operation to move 3000 US troops into the Buna-Gona area in February-March 1943 was achieved using three of the surviving Dutch ships and their corvette escorts, this time without loss:

Cargo almost always included aviation fuel or petrol in 44 gallon drums and often bombs and ammunition for the air force. Had we been hit we would have made a great bonfire. This nearly happened once when we went into Buna with just such a cargo. While the troops were disembarking there was an air attack and we could see the American Lightnings engaging the Jap planes. The Lightnings generally carried a spare belly tank of fuel and as one flew over us it released this tank, which looked just like a bomb. Luckily it hit the water about 40 feet from the ship but it gave us all a fright as, being full of petrol vapour, it could have started a fire which could have been very dangerous with our cargo.14

One of the stalwarts of the trooping runs to New Guinea was MV Tarooma, a former Bass Strait ferry, in which several of the convoy signalmen served. She made 38 round trips carrying troops forward and returning with wounded and, sometimes, Japanese prisoners of war. Of about 4000 tons displacement she was relatively fast at 18 knots – faster than a corvette - and so often sailed
independently of convoys, or with the sloop HMAS Swan (II) or a destroyer as escort. But, somewhat top heavy and of shallow draft, she was a very bad ship in a seaway, with a reputation so evil that troops embarked sometimes became seasick before she had even left harbour:

Many was the time when soldiers would come to us and tell us we were ‘bloody heroes’ doing the job we were doing. ‘Get us off this bloody tub!’ they’d say. ‘Buggered if we know how you can stand this sort of life.’ these were just some of the typical comments from blokes who were about to face the dangers and tribulations of jungle warfare: the unseen enemy, the malaria and other diseases, the tropical ulcers, the deprivation of food and shelter ... and so on.\(^\text{15}\)

In fact, it should be recorded that conditions onboard were not so far removed from those suffered by the soldiers. The troop accommodation stank and the whole ship was verminous. The heat, pounding of the sea and high tropical humidity made for uncomfortable berths, and led to the contamination of the ship’s fresh water tanks. Skin disease was not uncommon. For the two young convoy signalmen embarked, life was often a succession of watch-on watch-off days, a duty cycle that was extended whenever Tarooma was designated convoy commodore, for which a leading signalman should have been provided but was not. Even this routine was punctuated by the exigencies of action stations when the ship was under threat of attack by aircraft, or their escort made a sonar detection.

It is pleasing to note that the work of their young signalmen guests was recognised and sometimes reported upon by the masters of the host ships. There is little doubt that they had proven themselves capable of the duties for which they had been trained, and more, but despite recommendation for promotion, this never came. The convoy signalmen in merchant ships were rarely working under the oversight of more senior naval personnel, whose approval was required for the promotion process to be initiated. Time saw them promoted to the rank of signalman, but they progressed no further.\(^\text{16}\)

This was a disappointment, especially for the reservists of the first course. Several of these successfully undertook the courses held in Cerberus for promotion to convoy leading signalman and convoy yeoman of signals in 1942 and 1943. A few gained their ‘hooks’ but, despite their extensive experience of convoy operations around the world over three years of warfare, only one was promoted to yeoman. The small numbers in the branch and the progress of the war went against them. As the fighting moved away from Australian shores the needs for convoys were much diminished; by June 1943, the Japanese submarine campaign against the east coast convoys petered out. Convoying was discontinued south of Newcastle from November 1943 and south of Townsville in February 1944.
The convoy signalmen not required for convoys to New Guinea and beyond were found other employment, many going into general service billets ashore, manning Port War Signal Stations or signals offices in shore establishments. Some departed for overseas destinations in the European theatre for long periods, while others, generally of the reservist course, found themselves in ships of the fleet. Given their lack of training vis-à-vis the latter, this must have come as some surprise.

Mid-November 1944 on loan to HMAS *Fremantle*, engaged in several submarine hunts and general patrol work. To me this was a big change; instead of being on a ship being hunted, now I was the one doing the hunting, with all the equipment to deal with any situation which might arise.17

However, often their warships were not those employed on front line duties, such as HMAS *Malanda*, a Hayman Island ferry employed patrolling Darwin harbour.18 Many also gravitated into the naval control of shipping organisation, serving on staffs in Port Moresby, Madang and Hollandia.19
A group was gathered in Darwin towards the end of 1943 in preparation for a planned assault on the island of Timor by the Australian 9th Division – the famous ‘Rats of Tobruk’. However, the operation was cancelled, and the convoy signalmen were employed in escorted convoys of small ships working across the Arafura Sea to Thursday Island, which had frequently been subjected to air attacks from New Guinea and New Britain. They also participated in operations to probe Japanese defences in West Papua, and to establish Allied garrisons on islands near Timor, which continued into early 1945.

However, one of the big employers of RAN convoy signalmen at the latter stages of the war was the fleet train of the British Pacific Fleet (BPF). By war’s end this had grown to a force of 125 vessels, including commissioned ships, Royal Fleet Auxiliaries (RFA) and merchant ships on Admiralty charter. The fleet train was certainly a mixed bag and very different from its American counterpart, which comprised naval ships manned by US Navy personnel. Based in Sydney, the BPF had a forward support base at Manus Island, and from thence ships were deployed to support the fighting ships operating under American command off Okinawa and the Japanese home islands. The Royal Navy was short of signalmen and 16 Australian sailors were posted in to fill some of the gaps. After a few weeks at the RN depot at Warwick Farm in Sydney, three were posted to the fleet tanker RFA Carelia. Others served in the RF Auxiliaries Eaglesdale, Serpol, Stagpool, Slesvig, Kola and Wave Governor; the warships HM Ships Lothian and Montclare; carriers HM Ships Formidable, Reaper and Striker; the cruiser HMS Black Prince; and the frigate HMS Quilliam.

Carelia was part of the forward logistic support group, her cargo being replenished by ships from support bases, and then transferred to the fleet by underway replenishment. Consequently, she spent long periods at sea on duty fuelling all the ships of the British task force, especially the destroyers and smaller ships. By war’s end, the ship had spent more than 80 days continuously at sea. Conditions in a ship designed for European weather but operating in the tropics were unsatisfactory and steadily deteriorated, especially with the ship kept at high states of readiness for enemy attack. Accommodation was overcrowded, and the replenishment work never-ending. As a result, the workload of the three Australian signalmen was also high. However, they did it well; the commander of the logistics support group sent a farewell signal to Carelia addressed to the convoy signalmen saying, ‘You all three, have done extremely well and this has not passed unnoticed’.20

But service in Carelia was to have a special reward, as she was detailed as a member of the British fleet to enter Tokyo Bay to witness the Japanese surrender. This was a token force only, as the shortage of fuel would only permit a small part of the BPF to be on hand to witness this historic occasion. Space was also an issue; on 2 September 1945, over 200 Allied ships were squeezed into the bay.
The Japanese surrender did not bring to a close the work of the RAN nor of the convoy signalmen. Australia had been assigned the responsibility for disarming, taking the surrender of, and repatriating Japanese garrisons in the eastern Netherlands East Indies, New Britain and South Pacific islands, and this task was to continue until 1948. Convoy signalmen were deployed to a variety of RAN ships to support these tasks. In June 1945, two were posted to Madang to join the troops of the Australian 11th Division, which had been tasked with recovering Nauru and Ocean Island from their Japanese occupiers, one forming a part of the contingent for each island. The concern of all was the degree of acceptance of the Emperor’s order to surrender and the degree of cooperation to be expected from the Japanese garrisons:

Some 5-600 Japanese in full naval uniform (summer rig) formed up along the jetty [at Ocean Island] and adjacent area; on arrival we marched between them. As our party numbered only 120 we were relieved when we were safely past them. The Japanese force were in good physical condition, in good health and much larger than the average ... Brigadier J.R. Stevenson officially received the surrender from Lieut. Commander Suzuki on 1 October 1945. After about four days all Japanese were embarked on River Burdekin for transport to Rabaul and prison camp.21

So frequently did the convoy signalmen change ships, that their naval service records never reflected what they had done and where they had been. This was borne out by the refusal of veterans’ benefits to one demobilised sailor because his service record simply showed a succession of convoy pool depots in Australia, which was unacceptable as evidence that he had ever been anywhere near the enemy. This prompted the RAN to retain the convoy signals yeoman in the service for the express purpose of attempting to set the records straight. His was a job well done, but such was the diversity of work undertaken by the men of the convoy signal section that a number of omissions and inaccuracies in the list he had prepared were found much later on. Veterans make the claim that each of them sailed in as many as 40 or 50 ships, and that - all told - they plied their trade in over a thousand vessels.

By the end of the war they had seen service in all theatres of operations and, remarkably, suffered no casualties, although one had had his ship sunk under him and one manned a machine gun in fighting off an attack by a surfaced Japanese submarine. One was embarked in HMAS Warrnambool (I) when she sank in 1947 after hitting a mine in a field she was sweeping in the Great Barrier Reef, but he survived that also. When they were demobilised their stories and experiences went with them, for these were never officially recorded. It was not until 1997, when one of their number initiated contact with Navy Office to establish the origins and concepts of the convoy signals branch, that many of the files on which this account
is based came to light. Fortunately, that initiative also triggered a serious effort to record experiences before it was too late, and I am grateful for the comments and contributions made to this chapter by survivors.

However, in keeping with the proudest traditions of the RAN, no effort was ever made to analyse their experiences or to assess the benefits of their service to the navy’s war effort. What did these Australian sailors, most mere teenagers straight from shore, achieve? Apart from their role in releasing general service signalmen for other service, the convoy signalmen contributed indispensable work in keeping the convoy system operating. Small cogs in a big machine, it is at least arguable that without them the moving parts would have come to a halt. In his foreword to Convoy Signalman Bill Walshe’s book, *My Little War*, Admiral Tony Horton summed up their service as follows:

> Certainly the convoy signalmen played a pivotal role in the operation of the convoy system and, in turn the fleet logistics train. And those two operations were fundamental to the Allies ability to conduct war at sea and on land, and to survive. Like many other ‘unsung heroes’ the convoy signalmen did the job with professionalism and pride.

This is a good point at which to close the account but, in consonance with the theme of this book, it is also the appropriate time to ask the question of what are the plans for ensuring reliable communications between modern merchant ships – the vast majority of which are foreign-owned and sail under flags of convenience – and their warship escorts in any future conflict when convoys are formed? From whence would the 21st-century convoy signalmen come, and what communications medium would they be trained to employ?

**Notes**

1. Admiralty Fleet Order 3296/40 – Convoy Signal Section – Entry and Advancement of Ratings.
6. British and Allied merchant ship losses in 1940 almost reached 4 million tons and reached 4.3 million tons in 1941 after Hitler invaded the Soviet Union.  
13. There were exceptions that prove the rule. In November 1942, two Japanese merchant cruisers encountered and engaged a convoy comprising one Indian Navy corvette and a Dutch tanker *Ondina* armed with one 4-inch gun. While the first attacked the corvette, the second headed for *Ondina*, which managed to hit the Japanese and set her on fire. Further hits caused a huge fire as a result of which the cruiser sank. Although shelled and torpedoed by the first raider, *Ondina* made port safely. GH Gill, *The Royal Australian Navy, 1942-1945*, Canberra, Australian War Memorial, 1968, pp. 193-197.
16. In fact, promotion to leading signalman (C) required a completion of a course, to which none of the class of 1942 were ever posted. [CNO 104/1945]
17. Bartlett manuscript.
19. Alcorn letter.
21. Bartlett manuscript.
The story of the aircraft carrier is usually told in terms of numbers of aircraft and quality of aircraft rather than the ways in which the aircraft were operated. Arguably, the latter was always the key to real capability and in no area was this more true than in the control of fighter aircraft. Without some means of directing fighters efficiently and effectively on to the increasingly fast aircraft threatening the fleets of the late 1930s and 1940s, the role of the fighter would have become, indeed was becoming, very dubious. No matter what its aerodynamic performance, no fighter acting without direction could have done much against the contemporary air threat. Instead, the fighter controller, enabled by electronic sensors and communications got the measure of the threat and converted the carrier from a vulnerable platform to one that could fight and win against any air force, carrier or land-based.

The Royal Navy has often been criticised for backwardness in the fighter development of the Fleet Air Arm (FAA) for which it paid, but a cash-strapped service with only a limited front line (even in the projections of rearmament) had to make sure every airframe counted. The UK had been converted into a continental power by the advent of the aeroplane, and command of the air over Britain seemed as important as command of the sea around it. The Royal Air Force (RAF) formed as an independent service in 1918 for this very reason, had priority in aircraft and later in radar and the techniques for its use. It would take a long time for the Royal Navy to catch up.

In these circumstances, the Admiralty’s pre-war desire for multi-purpose aircraft and its suspicion of single seat fighters becomes much more explicable. By 1938, fighters were intended primarily as anti-spotter systems and, hence, low performance aircraft would do, notably the projected (and perhaps thankfully never built) three seat spotter fighter. Despite pressure from the Air Ministry for a reversion to higher performance single seat fighters, that got some response in the reluctantly accepted Sea Gladiator, the optimal Naval Staff fighter concepts were the Skua dive bomber and its successor, the Fulmar fighter reconnaissance aircraft, both basically two seat ‘bomber’ airframes. These could do other things than just shoot down the odd low performance spotter or shadower. Ships, including carriers, the Naval Staff and Fleet commanders argued, required both armour and anti-aircraft (AA) guns as passive and active AA weapons against modern bombers. Indeed, the Home Fleet
thought in 1938 that modern gunfire made the attack of the now better defended fleets ‘uneconomical’. The doctrine for carriers under air attack was for aircraft to be stowed as the ship protected itself with guns, and in the case of the new build ships, armoured hangars. In this context it was not surprising that some British carriers carried no fighters at all in 1939.

In the Pacific navies, the greater funding allowed by the lack of a strategic air threat and therefore the need for an independent strategic air force allowed both the US and Japanese navies to maintain a greater emphasis on fighters. Both retained single seaters, but even the most capable air defences made up of such aircraft could be penetrated when not only the only sensor, but the only means of communication was the ‘mark one eyeball’. Japanese defeat at Midway becomes much more explicable when one considers the nature of Japanese fighter control, or rather the lack of it.

Combat air patrols were flown over the fleet at three heights while all in the carriers’ screen scanned the horizon for targets. When Allied aircraft were spotted, the escorts made smoke to attract the fighters’ attention and fired their guns to indicate the direction of the raid. The fighters then visually acquired the targets. The Japanese Zero fighters had unreliable radios only usable on a single frequency and these were considered a waste of weight and were therefore usually removed to increase performance. Such a defence could be easily wrong footed in terms of height, but more importantly, direction. Thus, the American Dauntless dive bombers had their decisive opportunity at Midway. The attack was only ‘acquired’ by the Japanese as the bombers went into their dives.²

**The Royal Navy Experience**

By mid-1942, both the British and the Americans were much better, although a lot had still to be done to develop direction technique. Significantly, the first British naval radar, the Type 79 air warning set, was fitted in a battleship and a cruiser but not carriers. It was the responsibility of the communications branch. When a major air attack was made on the Home Fleet in September 1939, the battleship HMS *Rodney*’s detection was not used to scramble the carrier HMS *Ark Royal*’s fighters and the form of communication, flag signalling in conditions of radio silence, prevented information being passed on low flying targets, like the Dornier that surprised and actually bombed *Ark Royal*.³ By the Spring of the following year the need to fight *Fliegerkorps X* off Norway led to *Ark Royal*’s Air Signals Officer, FAA Observer Lieutenant Commander Charles Coke, to use radar sighting reports from the cruiser HMS *Sheffield* or the AA cruiser HMS *Curlew*, sent to the carrier by signal flags, or wireless telegraphy if the fleet’s position was known to be compromised. Coke,
sat in the corner of the bridge wireless office with a telegraphist beside him writing down incoming reports which Coke plotted on a Bigsworth board – a portable plotting board used by observers in the air – before himself passing messages by W/T [wireless telegraphy] to the fighters.

Coke first used the informative method, signalling the Skua observer the enemy’s position so he could plot a course to intercept on board. It was soon found however, that the British cruisers could track the fleet’s own Skuas as well as the Luftwaffe attackers. This allowed Coke to use the directive method, signalling the observer the course at which he should command the pilot to fly so that the fighter could be directly ‘vectored’ onto the target. There was as yet no direct voice communication between carrier and pilot. The observer used a speaking tube to tell the Skua’s pilot the information on where to fly, obtained either from the observer’s own calculations or, if the ‘directive’ method was being used, by Morse straight from Coke. Even in directive mode the system was slow, taking four minutes from initial detection to instructing the pilot, and ‘the radar could give only the approximate position and rarely an indication of height’. It also put a great deal of pressure on Coke, ‘who hardly left the bridge wireless office during the 24 hours of daylight off Norway in May and June 1940’. Although in no way could Ark Royal seriously contest command of the air off a hostile shore, some successes were nevertheless achieved. It was a start.

Ark Royal took Coke and his system to Gibraltar with Force ‘H’, commanded by Admiral Somerville who had done much for radar development at the Admiralty. The Type 79 in Sheffield provided Coke with his radar information, still transmitted by flag signal, and Somerville also kept an air plot based on this information on a circular blackboard on the bridge of his flagship, the battlecruiser HMS Renown. The carrier communicated in Morse with the observers and, using a single letter code system devised by Coke to speed things up, directed its Skuas and Fulmars with some success against the high flying Italian bombers first encountered and acquired at ranges of 70-100 miles. As the air threat deteriorated in early 1941, Ark Royal obtained a proper air direction plot and effective high frequency radio telephone equipment to communicate with her Fulmars. RAF procedures seem to have been adopted and an RAF officer was carried to give advice. Given the strategic priority given to strategic air defence, the junior Service’s techniques of fighter control were much more advanced at this time than the navy’s. Coke returned to Britain in May 1941 and campaigned for a fighter direction school to train a cadre of RN fighter directors. He was then given the task of setting it up at Royal Naval Air Station Yeovilton. Before doing so, Coke spent a week at RAF Fighter Command’s Controller’s Training Unit. Thus was joint communication between services used fruitfully to develop the Navy’s fighter direction techniques.
The first of the new armoured hangar carriers, HMS *Illustrious*, commissioned in April 1940 and, being a new ship, was fitted with a Type 79 radar. This was originally intended to allow her to call in and strike down her aircraft when under attack, but in mid-1940, alternative possibilities were on offer. Indeed, this combination of carrier and radar has been described as ‘the most important step taken by this new device since it was introduced into the Navy.’

While running trials off Bermuda, *Illustrious* used the informative method to control her Skuas. Reequipped with Fulmars, she sailed to the Mediterranean via Gibraltar where there was useful discussion between *Illustrious*’s Commander Operations, George Beale, and Coke of *Ark Royal* whose techniques were adopted. Such personal contacts were crucial in the early development of Allied fighter control as will be emphasised again later. When *Illustrious* was passed along the Mediterranean to join Admiral AB Cunningham’s Mediterranean Fleet, Cunningham remarked that the combination of radar and *Illustrious*’ Fulmars ‘placed an entirely different complexion on the air bombing menace compared with what had previously been experienced’.

When *Illustrious* arrived, the fleet’s emission control policy meant that the radar was switched off almost all the time. It was only to be used when an hourly one minute sweep had found targets. Moreover, no W/T messages were made to fighters until the threat had closed to 20 miles. A new balance between communications security and operational effectiveness had to be struck.

Beale acted as fighter direction officer (FDO). He sat in front of a ‘spider’s web’ plot receiving information from the radar office by telephone. As the available radio telephone equipment ‘proved unsatisfactory’ and the fighters were two seaters
anyway, Morse telegraphy continued to be used as the basic means of communication with the Fulmars.\textsuperscript{11} Beale trained other officers in interception technique and these controllers enabled \textit{Illustrious} to establish ‘something close to air supremacy in the Eastern Mediterranean, which she was able to maintain until the Luftwaffe arrived in Sicily at the end of the year’.\textsuperscript{12}

The Stukas of \textit{Fliegerkorps X} were too much for Beale and his system. The Type 279, as it now was, provided effective early warning, but the limited number of available Fulmars were occupied with Italian torpedo bombers and the carrier was heavily damaged despite her armour and guns. \textit{Ad hoc} defence against a later attack was provided by the 279-equipped modernised battleship HMS \textit{Valiant}, controlling Fulmars that had landed at Malta and were still within range. \textit{Illustrious}’ new sister HMS \textit{Formidable} was sent to replace her, and on arrival at Alexandria through the Suez Canal in March 1942, Beale briefed her Commander Operations, Philip Yorke, on fighter direction. Thus was the ‘torch handed on’, a second time, by personal contact.

No amount of fighter direction technique could substitute completely for adequate numbers of fighters, and \textit{Formidable} suffered the same fate as \textit{Illustrious} when she virtually ran out of serviceable Fulmars. It is interesting in this regard that that \textit{Ark Royal}, which carried 24 fighters compared to the armoured carriers’ 12-15, was never damaged by air attack in the Mediterranean. The fourth armoured hangar carrier, HMS \textit{Indomitable}, had extra hangar space to solve this problem, but she was not ready to take up her assigned position with the ill fated HM Ships \textit{Prince of Wales} and \textit{Repulse} at Singapore in December 1941. Contrary to popular belief, her grounding in November while on trials in was not the reason why she was not there, her trials program did not allow her to be there in time.\textsuperscript{13} It is interesting to speculate how her 21 radar-directed Fulmars and Sea Hurricanes would have coped with the Japanese attacks.

The year 1941 had seen fighter direction put on a proper basis in the Royal Navy with the opening of Coke’s Fighter Direction Centre at \textit{Yeovilton}. The first course began in July. Setting up the Centre had not been easy. Perhaps inevitably, it was hard to obtain sufficient priority for this novel specialisation and Coke had to exploit his good relations with the RAF to ‘scrounge’ a radar set from Boscombe Down. Insufficient aircraft were made available for training the directors and the remarkable expedient of using metronome-equipped Walls ice cream vending tricycles resorted to. Coke and his staff designed and fabricated all the other equipment required. Official attitudes soon became more supportive as the fleet was crying out for properly qualified FDOs, and Coke was given first choice of Royal Navy Volunteer Reserve officers coming out of the training establishment HMS \textit{King Alfred}. These bright young men from civilian backgrounds that required quick thinking and decision making were ideal for the new work. As Coke remembered, ‘The fourth course included a university lecturer, a future Olympic gold medallist in dinghy sailing, the headmaster of a public school, an actor and a doctor.’\textsuperscript{14}
A mock up of a fighter direction position was produced at Yeovilton to give FDOs some idea of the facilities they might expect at sea. At this stage, as AT Fleming, Coke’s successor at Yeovilton, remembered:

The FDO used to work on a 30-inch plotting diagram in the chart house, assisted by a plotting rating and a radio operator. The chaos which ensued when hostile aircraft were detected and the Admiral, Captain, Commander (Flying) and not least the (N) officer all wanted a look-see can well be imagined.\(^{15}\)

What was required was a space in the island of the carrier into which the functions of a large RAF Fighter Command Operations Room could be ‘compressed’.\(^{16}\) A glass display was devised that could have information fed to it on one side via fluorescent grease pencil and be read on the other by the FDO. An order was issued that ‘full facilities for fighter direction’ were to be fitted but no staff requirement was issued. Although Yeovilton produced a pamphlet that set out standard codes and procedures, there was still much scope for local initiative. The fortuitous coming together in December 1941 of Illustrious, Formidable and Indomitable at Norfolk Navy Yard for repairs allowed their FDOs to compare notes. As Coke remembered, ‘a comparison of their fighter direction arrangements revealed a considerable variety of method but many of the better ideas of each were standardised’.\(^{17}\)

All three ships were fitted with proper fighter direction spaces. As Coke recalled:

Commanding officers, torpedo officers, radar officers, signal officers and ships artisans all lent a hand ... Admiral’s sea cabins were hurriedly transformed into Fighter Direction Rooms with sufficient space for two officers and a rating to work: visits to New York provided more efficient high frequency R/T transmitters, inter office loud speakers (intercoms) and much else that was new in HM ships.\(^{18}\)

The R/T equipment made the effective operation of single seat fighters much easier. Fighter direction could not have made up for the gross disparity in aircraft numbers if the Eastern Fleet with Indomitable (12 Fulmars and 9 Sea Hurricanes) and Formidable (18 Martlets) had met the Japanese Kido Butai in April 1942. After the Japanese withdrawal, however, Illustrious joined them and,

Numerous exercises in the co-ordinated defence of a fleet by two or more carriers were carried out and much learned of fighter direction ... Experience soon showed that the facilities which had been based on single carrier operations in the Mediterranean were inadequate.\(^{19}\)

Filter, as well as intercept plots were required and FDO facilities were modified accordingly in the three Indian Ocean carriers. HMS Victorious had an arrangement based on RAF practice fitted in Britain. As Fleming remembered:
In the absence of Staff requirements at that time, improvements were largely the result of private enterprise, the enthusiasm and co-operation of ship’s staff, and the good-will of commanding officers.  

*Illustrious* modified her FDO arrangements while in Colombo. She also acquired from an RAF radar station a plan position indicator (PPI) display for her new radar, the Type 281. Originally designed for surface targets, this set was twice the wavelength of the 279. It provided greater precision and better general performance. It was less good at high altitudes than its predecessor but, unlike the 279 which it replaced in the fleet carriers, it was effective against low fliers. The Admiralty, considering that its wavelength was still too wide for a PPI and that it would be saturated with echoes, retained the older A-scan display, but *Illustrious*’ local initiative proved that, a fair interpretation could be made. Intercept officers reading their own PPI could obtain a better and quicker appreciation of a situation than from a plot from the ordinary (A-) scan. More plots could be told from a PPI and more raids plotted and intercepted.

*Illustrious* was not available when the RN’s carrier fighter direction techniques received a major test, the Operation PEDESTAL convoy of August 1942. *Victorious* and *Indomitable* supported the convoy in the Western Mediterranean along with HM Ships *Eagle* and *Furious* (with no FDO arrangements). Between them, the carriers had 72 fighters, all but 18 single seat Sea Hurricanes and Martlets. The two modern fleet carriers, each with a 12-hour stint, ran the battle. Coke, in *Victorious*, acted as fleet direction officer, communications being provided by an aircraft radio set on the flag deck of each carrier connected to the fighter direction rooms. Unfortunately, the beams of the 281 radars were too broad and the control systems soon became saturated. Enemy aircraft went undetected and fighters were lost by controllers. The system generally held up, however, until dusk on 12 August when 100 enemy aircraft overwhelmed the exhausted fighters, reduced 50 per cent in numbers by attrition (*Eagle* had been sunk by a submarine). *Indomitable* was heavily damaged. The carriers had shot down around 30 Axis aircraft for the loss of 13 in the air.

The lessons learned were that better communications, plotting and display systems were needed to cope with saturation. Height finding also remained a major requirement, as did the detection of low flying aircraft. The importance of a fleet direction officer was vindicated. Based on this experience, improved and enlarged direction room layouts were devised by the Admiralty’s Directorate of Naval Air Warfare and Training and prototype installations put into *Formidable* and *Victorious*. These reflected RAF practice combined with experience at sea. A senior FDO was responsible for the entire organisation. A main air display plot was maintained by an officer and some ratings entirely absorbed in plotting and filtering. There were two intercept positions with officers carrying out interceptions. The two fleet carriers had these installations in time for Operation TORCH, and at the end of 1942
Victorious took its fighter direction organisation to the United States to work up for her period supporting the US Pacific Fleet that had been reduced to one operational carrier by the attrition of the Solomons campaign.

The US Navy Experience

Victorious found that the US Navy had gone through a rather similar fighter direction learning curve to the British, over a roughly similar timescale. A noted above, the US Navy had not faced the inter-war problems of continental strategic diversion and aircraft shortage. Indeed, in 1939, it increased the numbers of fighters in its carriers, hoping high performance scout/dive bombers could provide warning. A surprise air raid against a concentration of vulnerable carriers was considered to be inevitably ‘fatal’. Attack was therefore by far the best form of defence.

This began to change with the advent of radar. USS Yorktown received one of the six prototype 1.5-metre CXAM early warning radar sets in 1940 followed by US Ships Enterprise, Lexington and Saratoga with CXAM-1. USS Hornet was completed with the smaller SC in October 1941. The early carrier battles led to useful lessons. The Battle of the Coral Sea demonstrated that the first fighter direction location, a ‘Radar Plot’ in a corner of Air Plot was, woefully inadequate to enable complete use to be made of all the information which the combined Radars of own and other ships are capable of furnishing, or even to use with full effectiveness information which can be furnished by the vessel’s own Radar.

Radar Plot, Yorktown recommended, should become a complete unit with enough room to allow the Fighter Director and his plotting and communications assistants to do their jobs without mutual interference. The position should ‘be so isolated as to be relatively free from spectator interference and from noise interference from other activities’. Radar Plot should have its own very high frequency (VHF) communications circuit with other radar equipped vessels and fighter directors as well as High Frequency communications with all aircraft circuits and effective intercoms to important stations aboard. It should be next to Air Plot and have the means for ‘physical, conversational communications’ with it. There should be plotting facilities for two simultaneous Radar Plots, a Search Plot and a Fighter Director/Tracking Plot. There should also be ‘sufficient blackboard and extra chartboard space to allow a complete picture to be maintained of the situation of our own aircraft and of the general and immediate tactical situation’. The fundamental point was made: ‘It must be recognised that the importance of Radar Plot in carriers is comparable to that of the plotting room in battleships.’ Fighter control/direction was indeed as important and basic as fire control systems in gun armed ships.
Another important lesson was provided when *Lexington*’s radar was put out of action. This ‘might have been disastrous’ if *Yorktown* had not been able to take over. Although fighter direction by other units was possible, or the use of other units’ radar information by the carrier, ‘neither of these alternate systems can be as effective as Fighter Direction from a carrier utilising its own radar information’.²⁷ Carriers should therefore be fitted with a second radar.

There was no time to fit *Yorktown* with either a proper fighter direction room or another radar before she was sunk at Midway. Over the next few months however, the surviving carriers in the Pacific were fitted with improved arrangements comparable to those in British ships. US Navy officers such as Jack Griffin and Hank Rowe had already been sent to Britain to learn about RAF techniques of fighter control, ‘because the British were the world’s leading experts on radar-guided fighter direction’.²⁸ A Fighter Direction School had been set up in San Diego, later moved to Hawaii. Based on the Coral Sea recommendations, separate Radar Plots were established in the islands of the carriers. These contained a plotting table manned by a direction officer and two junior FDOs from a pool of six. The two juniors maintained a plot from radar information communicated from A scan information through sound powered telephones from a compartment next door. Radar Plot also contained three radios and their operators each on a separate frequency for the three kinds of aircraft in the carrier air group, fighters, dive/scout bombers and torpedo aircraft. A fourth radio was the VHF inter-ship radio.

At the battle of the Eastern Solomons in August 1942, *Enterprise* ran the anti-air battle as she had the better team. Her senior FDO, Lieutenant Commander Ham Dow, was an experienced pilot who had done well at Midway and was considered the best FDO in the fleet. He was assisted by Lieutenant Hank Rowe who was at sea to observe action experience. HF communications with the fighters proved highly unsatisfactory with background noise interfering with clear information transfer. There was confusion as escort fighters were tuned to bomber frequencies. Also, the single frequency fighter circuit became overloaded with simultaneous transmission interference and chatter. Effectively the pilots jammed themselves and ‘the fighter direction system fell apart when the communications link was utterly overwhelmed at the start of the defensive fighter attacks’.²⁹ *Enterprise* was hit and damaged. August 1942 was a month of hard lessons in fighter direction for both the Royal and US navies.

At Santa Cruz in October, things were little better. *Hornet* had an improved radar fit with a salvaged CXAM antenna adding range to her SC transmitter (effectively creating the SK used by US carriers for the rest of the war), but more importantly Dow had been transferred away to South Pacific Fleet Staff. His replacement was Commander Jack Griffin, director of the Hawaii Fighter Direction School and with experience of the RAF, but not recent fleet actions. He had been given a pierhead jump to *Enterprise* to replace Dow and glean lessons for doctrine development. It
is probably fair to say that Griffin’s performance had more to do with doctrinal immaturity than personal deficiencies, but there were too many tactical errors. Radar information from different ships was not properly integrated, fighters were held back too close to the carriers and kept too low. ‘So, for all the intelligent application of technology and theory the fighter defence system broke down in Task Force 61 as completely as it had on August 24.’ Hornet was sunk, although Japanese air losses were heavy.

USS Hornet during the Battle of Santa Cruz, October 1942. (NHC 80-G-33947)

The loss of Hornet led to the British sending Victorious to reinforce the Americans in the Pacific. This led to mutual exchanges of views and hard won experience to mutual benefit. The evolution of mature fighter direction arrangements in both fleets was the result. British sources claim that Victorious’ prototype layout with which she was fitted for TORCH was quickly adopted as a pattern throughout the US Navy. Significantly, she operated as fighter carrier when in company with Saratoga. The latter could run up her aircraft engines below decks to deliver deck load strikes; the former had better control facilities for her increased load of 30 Wildcats. Her strike Avengers could operate from the American ship as required.
The Aircraft Carrier Fighter Control Revolution

The System is Perfected

VHF, first adopted by the Americans, was soon standard for RN fighter direction nets. The VHF frequencies were less subject to jamming or detection and the sets were multi-channel. Indomitable was comprehensively modernised in 1943 with further improved fighter direction arrangements first mocked up at the fighter direction school at its new larger home at Speckington Manor near Yeovilton. Her fighter directors had four HF transmitters and four VHF. The development of single antenna British radars also allowed the fitting of two air warning sets, Types 281B and 79B. These complemented each other in terms of height cover and reliability. The Admiralty finally relented on PPI displays for fighter controllers and these were now fitted for 281B information so they could be used directly by intercept officers in the Fighter Direction Room. The ‘skiatron’ was also developed, a large projection screen with a 24-inch ‘spider’s web’ upon which echoes were projected. This greatly simplified ‘the immediate and direct plotting of radar targets and of tracks and vectors, without the room having to be darkened. It was first fitted in Indomitable in June and used during the invasion of Sicily. The requirement for low altitude radar was dramatically demonstrated when Indomitable was torpedoed by low flying aircraft at night.

Indomitable was duly fitted at Norfolk, Virginia, with the American SG 10cm wavelength surface search radar that was very effective against such threats. Another problem, accurate heightfinding, was neatly solved by the fitting of the American SM-1 fighter direction set of similar wavelength. This used triaxial stabilisation and conical scanning to obtain accurate height information out to about 50 miles. SM-1 could also achieve similar ranges against low flying aircraft, and having this sensor made Indomitable the most capable fighter carrier in the fleet. She was used as flagship of the carriers of the British Pacific Fleet (BPF) with Commander EDG Lewin as Fleet FDO. Victorious had SG fitted at Liverpool but had to make do the British Type 277 10cm set for low air warning and heightfinding. Type 277 was also fitted to the new fleet carriers, HM Ships Indefatigable and Implacable, as well as Illustrious and Formidable, but proved something of a disappointment in both roles, especially the latter. All the BPF carriers had effective fighter direction rooms with PPI displays and skiatron.

The US system also matured after its fertilisation by the British. VHF was quickly adopted with four sets with four channels each. By 1945, the number of channels per set had increased to ten. In accordance with Yorktown’s recommendations, back-up radar was fitted. Enterprise received an SC-2 in late 1942, and this became the standard back-up set to the SK. In March 1943, the SM height finder appeared and soon became standard. SG was also fitted for close range detection within 5 miles. The layout of Radar Plot was also improved with seven men as the standard
staff. The Americans also seem to have eventually adopted the British practice of a dedicated radar-reporting channel. The means of conducting a fleet wide battle with a hierarchy of FDOs was also highly developed.

Fighter Direction techniques were honed and promulgated at the Fighter Direction Schools at Hawaii and at St Simon’s Island, Georgia, which produced the requisite officers. It was found that the demands of managing a three-dimensional environment and taking rapid decisions were best fulfilled by those who had earned at least $30,000 in three years. Lawyers, bankers and stockbrokers were recruited, as well as teachers and journalists, valued for their communications skill. In June 1944, when it sailed to cover the landings in the Marianas, the Fleet Fighter Director of Task Force (TF) 58 was Lieutenant Joseph R Eggert, a stockbroker who had been in the Essex class carrier Lexington since her commissioning in early 1943. He had been senior FDO for four months. Each of the four carrier task groups had its own controller.

Nothing demonstrated the revolution that had been wrought in fighter control better than the Battle of the Philippine Sea. Eggert and his colleagues directed TF 58’s Hellcats literally to shoot the Japanese carrier air arm out of the sky. The nightmare of a massed attack on carriers had turned into a pleasant dream, with the carrier fighters once more demonstrating the advantages of the defensive form of war. The fighter control revolution had re-vindicated Clausewitz and Corbett.33

HMS Formidable hit by a Kamikaze.
The Anglo-American carrier forces were able to defeat land-based air power and operate off the coast of Japan with effectiveness, although the Kamikazes did stress the system somewhat and several carriers were hit. The two navies’ radar fits proved complementary and radar information was shared. Skills were equal on both sides and of a high level. As Vice Admiral PL Vian, the British carrier group commander, remembered:

In the Aircraft Direction Room Lewin gave an astonishing performance. On his head would be a pair of earphones, each phone listening to a different frequency. By means of a throat microphone, he could communicate with his opposite numbers in the American groups. In front of him was a radar screen. With this equipment he directed our aircraft in the air with confidence and the utmost skill.34

In March 1945, the US Fleet HQ in Washington had ordered that Radar Plot be absorbed into the carrier’s Combat Information Center:

A space containing radar equipment, plotting devices and communications, internal and external) equipment manned by specifically trained personnel and charged with keeping the commanding officer and higher commands embarked informed of the location, identity and movement of friendly and/or enemy aircraft and surface ships within the area. Other principal functions which may be assigned are: (1) target indication, (2) control of aircraft in the area, both offensive and defensive, (3) control of small craft in the area, and (4) location of ship in close proximity to land (amphibious landings, shore bombardments etc).35

Radar was now established as the main sensor in above surface naval warfare. Assets were no longer directed primarily by eye. Communications were now primarily electronic. The fighter control revolution had become but a part of a wider transformation. Modern naval warfare had been born.

Conclusion

Without the fighter control revolution, the aircraft carrier might well not have fulfilled its promise as the new capital ship. Its vulnerability to air attack would have posed serious problems, to the extent perhaps of compromising its dominance. With fighter control, however, the aircraft carrier could take on enemy air forces, both carrier and land-based and defeat them. The pioneer fighter controllers rapidly established new skills in maritime warfare expertise based on the merging of information from electronic sensors with orders electronically communicated. Both technologies came out of signals organisations. The pioneer FDOs also gained from communicating and sharing ideas among themselves. There can, therefore, be no better example than this fighter control revolution of the impact of communications on maritime warfare.
Notes

1. See the Royal Navy Staff History, *BR 176 (53): Naval Aviation*, 1, Naval Library, Portsmouth. It is also available at the National Archives, Kew at ADM234/383. See also N Friedman, *British Carrier Aviation*, Annapolis, Naval Institute Press, 1988. The story will be further documented in the author’s forthcoming collection of documents being prepared for the Naval Records Society, *The Fleet Air Arm 1919-1939*.


8. This like all Type 79s, except the first two fitted in HM Ships *Rodney* and *Sheffield*, was modified with a surface gunnery ranging mode as Type 279 by the end of the year. The surface capability of the 279 was very useful at the Battle of Matapan. See Howse, *Radar at Sea*, pp. 40-41, 76.


11. Howse, *Radar at Sea*, p. 64.


13. Information kindly provided by Commander David Hobbs.


32. The lack of this had been noted by *Victorious*; see Friedman, *British Carrier Aviation*, p. 212, footnote 31.


35. CIC Manual, *Radar Bulletin No 6*, 7 July 1945, p. 1, <http://www.history.navy.mil/library/onlinr/cicmanual.htm>. This document seems to indicate that the general adoption of the CIC in all major units of the fleet was the March order. Other sources, for example, Tillman and Dickson use ‘CIC’ for fighter control facilities in US ships before that date but this is probably retrospective.
Early in December 1942, three RAN ships were engaged in an operation near Betano, on the east coast of what was then known as Portuguese Timor. The purpose of the operation was twofold:

- To land Netherlands East Indies (NEI) troops.
- To return to their base at Darwin in the Northern Territory with Portuguese civilians whose lives were thought to be at risk should they remain any longer on Timor.

The three ships involved in the operation were the two corvettes, HMA Ships *Castlemaine* and *Armidale* (I), under the command of Lieutenant Commander PJ Sullivan, RANR(S), and Lieutenant Commander DH Richards, RANR(S), respectively; and a Northern Territory patrol vessel, HMAS *Kuru*, commanded by Lieutenant JA Grant, RANR(S). The two Australian-built corvettes displaced 900 tons, were 55m in length, had a top speed of around 15 knots and carried a crew of 5 officers and 75-85 men. *Kuru*, a much smaller ship, was 22m long, displaced 55 tonnes and had a top speed of around 9-10 knots. Her role would be to provide a shuttle service between the shore and the two corvettes.

On the afternoon of 1 December, while operating alone, *Armidale* was attacked by a force of Japanese dive-bombers, torpedo bombers and fighters. Hit by two torpedoes; she was reported to have sunk in just four minutes, with the eventual loss of 100 of the 146 men onboard. Two large groups of men, NEI soldiers in a Carley float and RAN personnel cast adrift on a makeshift raft, were not rescued.

The *Armidale* saga is viewed as one of the most heroic episodes in the annals of the RAN and has become synonymous with the selfless heroism of Ordinary Seaman Teddy Sheean, an 18-year-old Tasmanian who, to quote from Richards’ Report of Proceedings, ‘although wounded, remained at his post at the after Oerlikon and was responsible for bringing down one enemy bomber. He continued firing until he was killed at his gun’. Many observers believe Sheean should have been awarded a posthumous Victoria Cross for this action - not the posthumous Mention in Despatches his gallantry was later accorded - but in recent years his gallantry and self-sacrifice have been commemorated and honoured by his name being given to the fifth of the RAN’s six *Collins* class submarines.

Also, in a relatively little-known action, *Kuru*’s Grant demonstrated masterly seamanship in successfully evading approximately 200 bombs dropped by 44 bombers over a period of almost seven hours. There was also well-deserved praise.
for the stoic endurance of 46 of Armidale’s crew who, cast adrift in two open boats for several days, endured terrible hardships before being rescued. In December 2002, on the 60th anniversary of Armidale’s loss, Defence announced a new class of patrol boat would enter service with the RAN. Known as the Armidale class, the crew’s gallant service was finally acknowledged.

Over the last dozen or so years, the author has corresponded and spoken to survivors and former crew members of Armidale and Kuru. All were highly critical of the man who had overall command and control of Operation HAMBURGER, Commodore CJ Pope, RAN, Naval Officer in Charge (NOIC) Darwin. However, based on information made available to the Board of Inquiry convened immediately following Armidale’s loss, a recent analysis of the command, control, communication and information aspects of the operation has shown that where errors occurred, they were not necessarily all one-sided.

Rather, the evidence suggests that the seeds of the Armidale tragedy were sown at the planning stage of the operation. The senior officers involved should have clearly understood that when transmitting ‘enemy reports’, it was absolutely essential for these reports to be sent in an agreed, common and unambiguous format. That these basic rules were not followed on the afternoon Armidale was sunk, when coupled with Pope’s apparent oversight in not bringing various omissions in these reports to the attention of the officers under his command, would ultimately exact a terrible cost from the men serving in Armidale.

HMAS Armidale at Port Moresby.
To apportion blame all these years later for the causes of Armidale’s loss – and what followed – is rather a pointless exercise. From the standpoint of the accuracy and operational relevance of the ‘enemy reports’ being transmitted to NOIC Darwin from the three ships in Operation HAMBURGER, far better to understand what went wrong. How could this information have been made more relevant? Just how was it interpreted? How was it finally assessed?

**Background**

Prior to the strike by carrier-based aircraft on Darwin of 19 February 1942, Japan’s intelligence sources presumed there could be a large build-up of Allied naval and air forces under way in the north of Australia. Such was not the case. Nonetheless, the Japanese took the military situation seriously enough to ensure that whatever strength the Allied forces possessed, they should not be able to interfere with the Japanese advance through the major islands of the NEI. The best way to achieve this and protect the flanks of this advance was to invade and occupy Timor.

Thus, a day after the bombing of Darwin, Japanese forces invaded Timor, landing simultaneously at Keoepang (Netherlands Timor) to the south of the island and at Dili (Portuguese Timor) to the north. The 2/40th Infantry Battalion - the small Australian garrison in the south - found itself confronted by a force of some 23,000 men. Quickly overwhelmed, the battalion was forced to surrender. However, to the north, the odds were marginally better. There, only 6000 Japanese landed initially and the 670 men, the remnants of Sparrow Force, were able to fight and hold out for a far longer period. The 2/2nd Independent Company, together with 200 other NEI Army personnel, headed for the mountainous regions and jungle of the island, the better to conduct guerrilla warfare operations against the Japanese - precisely the type of operation for which the 2/2nd had been trained. Initially, supplies necessary for the conduct of these operations were airlifted in by RAAF Hudsons, but later, small ships based at Darwin took over this vital task.

These Darwin-Timor runs went under the code name Operation HAMBURGER and the vessel most frequently used was the small patrol boat, *Kuru*, then commanded by Lieutenant J Joel, RANVR. In late May, she had made the first of a number of trips to Timor, and in July a former Department of Trade and Customs vessel, HMAS *Vigilant*, under Sub-Lieutenant HA Bennett, RANR joined the 375-mile (600km) run. By the beginning of September, *Kuru* had made six trips to the Timor coast, and *Vigilant* three.¹ On 12 September, a corvette, HMAS *Kalgoorlie*, commanded by Lieutenant Commander HA Litchfield, RANR, was employed for the first time.

The hit-and-run tactics of the 2/2nd had great nuisance value, but the remnants of Sparrow Force could not be expected to hold out indefinitely behind enemy lines. In June 1942, another Independent Company, the 2/4th, stationed at Darwin, was designated to relieve the 2/2nd by mid-September. The scale of this potentially hazardous operation (it was intended to move 400 personnel and their equipment
into Timor and a fortnight later bring out 600 men and their equipment) required a
ship, larger and faster than a corvette. The destroyer HMAS Voyager (I), commanded
by Lieutenant Commander RC Robison, RAN, and which had seen service in the
Mediterranean during most of 1941 and been based at Fremantle since May 1942,
was accordingly selected for the task.\(^2\)

On 22 September, Voyager departed Darwin with 15 tonnes of supplies, sundry
landing equipment and 250 officers and men of the 2/4th, arriving off Betano in
the early evening of 23 September. The only spot available for Voyager to disembark
the men and unload her cargo lay between two reefs, along a stretch of coastline
whose topographical features scarcely qualified it to be known as a bay, let alone a
harbour. To make matters worse, Robison had little in the way of navigational aids,
save oral advice and a rough sketch plan of the area from Sub-Lieutenant Bennett,
who had anchored Vigilant there previously. Having carefully inched into position
between the reefs, Voyager ran aground while seeking to avoid disembarking
troops who were in small boats uncomfortably close to her port propeller.\(^3\) Voyager
was stuck fast, and all efforts to re-float her were unsuccessful. She was spotted
the following day by a Japanese reconnaissance aircraft, her predicament leaving
Robison with no alternative but to order his crew to set about her systematic
destruction. Albeit unwittingly, he was considerably aided and abetted later in
the day when the Japanese bombed her with a mix of high explosive, incendiary
and anti-personnel bombs. In a hastily organised rescue mission, the corvettes
HMA Ships Kalgoorlie and Warrnambool (I), the latter commanded by Lieutenant
Commander SJ Barron, RANR(S), were ordered to rescue Voyager’s stranded crew
and return them to Darwin. This rescue operation was successfully concluded
around midday, 27 September.

By early October, the problem and the means of how best to bring out the 360
men of the 2/2nd from Timor was still no closer to being resolved. NOIC Darwin
had estimated five corvettes would be required for the task, yet in Darwin there
were only two corvettes immediately available: Warrnambool and Kalgoorlie.
Castlemaine was due to arrive on 5 October and Armidale was also pencilled-in
to be arriving on 7 November. However, as is inevitably the case where
strategically important war zones have priority over lesser war zones, resources
allocated for Timor operations were always going to be problematical and liable
to change without notice.

Despite these obstacles, Darwin-Timor runs continued and on 5 November,
Castlemaine paid her first visit to the Timor coast, while on 18 November, Kuru made
her penultimate run to Betano where she again landed supplies. To guard against
the possibility of the Betano area being unsuitable when the time came to return
the 2/2nd to Darwin, Kuru also took the precaution of inspecting the coastline for
alternative embarkation points.
The Operation

On 24 November, Allied Forces Headquarters finally gave their approval to a plan for the evacuation of the 2/2nd, together with some 100 Portuguese women and children. This operation would involve three ships: Castlemaine, Armidale and Kuru.

The plan called for the operation to be accomplished in two stages. Since Kuru’s top speed was not much more than half that of the corvettes, she would sail independently from Darwin on 28 November, one day ahead of Castlemaine and Armidale, arriving at Betano during the early evening of 30 November. Castlemaine and Armidale would rendezvous with her two hours later. Kuru would ferry Armidale’s complement of NEI soldiers (approximately 50) to the shore and on the return trip, convey 176 Australian Army personnel and the Portuguese civilians to one or both of the corvettes. In a repeat operation, the remainder of the 2/2nd would be picked up on the night of 4-5 December.

Up until this latest operation, (excluding the special circumstances pertinent to the ill-fated operation, involving Voyager), the likes of Kuru, Vigilant, Kalgoorlie, Warrnambool and Castlemaine had successfully completed 11 operations to Timor without encountering any opposition from either air or sea. However, the two corvettes were spotted by a Japanese reconnaissance aircraft only a few hours sailing time out of Darwin on 29 November, and when Castlemaine issued a series of in clear ‘enemy reports’ during the daylight hours of 30 November, these proved to be but the harbinger of more difficult times ahead.4

While still some 110nm from landfall, Castlemaine reported:

0945/30 One aircraft ... height 5000ft. Position 10° 22’ S, 127° 34’ East.
0958/30 Attack still in progress
1029/30 Attack ceased

Once detected, Castlemaine reported at 1050/30, ‘Consider prospects (for) operation doubtful’. Pope was unmoved at Sullivan’s assessment at 1132/30 signaling, ‘Risk must be accepted’, and in the same signal ordering Castlemaine and Armidale to detour from their intended course. Later, Castlemaine reported:

1255/30 Am being attacked. [This was a false alarm]
1302/30 Cancel my 1255.
1402/30 Am being bombed.
1432/30 Attack still on. Four enemy aircraft 7000ft.
1445/30 Attack ceased.

Pope requested Castlemaine to send her position at 1343/30 but Sullivan did not comply until 1455/30 when the attack was over.

The final enemy report Castlemaine issued was:
1831/30 Am being attacked by enemy fighter.
1855/30 Nine aircraft, height 5000ft.
2000/30 Attack ceased.

The change of course ordered at 1132/30 had failed to shake-off the shadowers, and Sullivan’s doubts on continuing with the operation had appeared to be confirmed when the two corvettes had been attacked twice more before nightfall. The corvettes may have come through unscathed, but the combined effect of course changes and air attacks had compromised their rendezvous time with Kuru. When landfall was finally made at 0200/1 - many hours after their intended arrival of two hours after sunset - there was no sign of Kuru. Neither was there any response from the personnel they were intending to embark.

When Kuru arrived off Betano at 2000/30, there was some initial confusion about the correct pick-up point. The consequent delay meant embarkation of (now) 77 Portuguese women and children did not commence until 2345/30. At 0150/1, still not knowing the whereabouts of the two corvettes, nor the reasons for their failure to make the rendezvous, Grant felt obliged to return to Darwin, steering a pre-arranged course of 164° away from Betano. The corvettes, for their part, left the Betano area at 0330, following the same course. At 0549/1, Pope instructed Castlemaine: ‘You may be required to repeat operation tonight.’ On receiving this instruction, Sullivan, as senior officer, would have reasoned that, strictly speaking, it was Castlemaine’s responsibility to follow Kuru back to Timor. This could only be achieved by a double transfer; the civilians on board Kuru to Armidale, and the soldiers on board Armidale to Castlemaine. This was a risky process given an already-alerted enemy might put in an unwanted appearance at any moment and in the circumstances could not be justified. Instead, once the corvettes met up with Kuru, the civilians would be transferred to Castlemaine, and Armidale would follow Kuru back to Betano.

Castlemaine and Armidale eventually located Kuru at approximately 0740/1, some 55nm from Betano. At 0840, Sullivan signaled Pope confirming the transfer of refugees from Kuru to Castlemaine was now complete. He further recommended Armidale and Kuru should return ‘to complete troop operation’. This, Pope approved at 0950/1.

Prior to receiving Pope’s reply, Castlemaine and Armidale had resumed their course of 164° away from Betano, Castlemaine reporting another enemy attack:

0930/1 Single enemy aircraft, low level bombing. Position 10° 14’ S, 126° 02’ E, Course 164°, 12 knots.

At 1100/1, Castlemaine and Armidale parted company, Castlemaine returning to Darwin, Armidale steering a course of 28° back towards the Timor coast. After reporting her position at 1115/1 as:

10° 45’ S, 126° 08’ E, Course 028°, 12 knots.
Armidale issued the following sequence of enemy reports:

1254/1 Enemy aircraft bombing at 10° 35' S, 126° 16' E.
1337/1 Attack ceased. Large formations of enemy being used.\(^7\)

In his later written report, Richards reported the 1254/1 attack was by five dive bombers, but this crucial information was not included in his enemy report – a significant omission as events were later to prove. Of the five, two were later claimed as damaged, while the other three do not appear to have pressed home their attack.\(^8\) Nonetheless, with dive-bombing regarded as a far more serious threat to shipping than bombing from altitude, Richards should have notified Pope of the presence of dive-bombers. Such a report should at least have served to put Pope on notice about seriously re-considering the wisdom of continuing with the operation:

1430/1 9 enemy aircraft bombing at 10° 16' S, 126° 28'E.
1458/1 9 bombers, 4 fighters.

In the final attack, one bomb was recorded as a ‘near miss’, but Armidale was hit by two of three torpedoes, and she sank within four minutes. Many lives were lost, principally the NEI soldiers who were billeted close to where the first torpedo struck. Parts of the torpedo also struck the radio room, giving her wireless telegraphy operator no chance to inform Naval HQ in Darwin. The other torpedo hit home on the port side between the boiler room and the engine room. Having no option but to ‘abandon ship’, men were machine-gunned in the water by Zero fighters.

As the Armidale tragedy was unfolding, the situation for Kuru was no less perilous, Grant successfully managing to evade a succession of attacks throughout the afternoon and early evening. He issued a series of enemy reports:

1228/1 10 aircraft at 5000ft. Position 10° 15' S, 126° 45' E, 9 knots.
1235/1 Being attacked.
1309/1 Being attacked. Position: 10° 15' S, 126° 45' E, Course 327° 10 knots.
1445/1 Being attacked. Unable to continue operation on schedule owing to bombing. Returning to Darwin.
1551/1 Being attacked. Position: 10° S, 127° E. Course 135°, 9 knots.
1826/1 9 aircraft ... height 5000ft. Am being attacked.
1842/1 Being attacked. Position: 10° 40'S, 127° 04' E, Course 140°, 10 knots.\(^9\)

A major difference between the enemy reports from the corvettes and those of Kuru was that there was no indication from Kuru when attacks had ceased. This oversight may have been unintended, nonetheless the consequences of this omission for two groups of Armidale survivors had dire consequences. Had Kuru signaled ‘attack ceased’, Armidale should have stood out as the only ship not to have closed an enemy report in this manner following attacks by more than one aircraft.
The author discussed this omission with one of *Kuru*’s crew and he was adamant that attacks were continuous and thus there was neither the time nor the opportunity to transmit this vital signal. But with time intervals between successive attacks of 34, 96, 66 and 155 minutes respectively, there should have been the opportunity except for possibly the time interval between the first and second attacks – to signal when attacks had ceased. On the other hand, it was Pope’s responsibility to be awake to any omissions and ensure that all ship commanding officers kept him as fully informed as possible.

At 1445/1, the severity of attacks on his ship convinced Grant there was no alternative other than to return to Darwin. As her two reported positions at 1551/1 and 1842/1 show, *Kuru* was intent on following a south-easterly course – a course most likely begun at 1445/1.

At 1631/1, some 90 minutes after *Armidale* had sunk, Pope, in ordering *Armidale* and *Kuru* to continue with the operation, signaled, ‘Air attack is to be accepted as ordinary, routine secondary warfare’.

In enemy reports received by Pope from the three ships, threats had been classified only as ‘bombers’, ‘fighters’ or ‘enemy aircraft’, and at one time or another, all ships had reported there were nine aircraft present. The number; nine, is of some significance. Based on what had been observed a number of times in the region (for example, the attack on an Australian/US convoy from Darwin to Koepang on 17 February 1942, and the bombing of Darwin, 19 February 1942), Pope would have surmised that the final attack on *Castlemaine* on 30 November was by nine bombers, flying straight and level and in arrowhead formation (in this form of attack, at a given signal from the flight leader, all aircraft dropped their bombs simultaneously). Not generally regarded as a particularly effective way to attack ships, Pope’s mindset with respect to the nature of the threat would have gone a long way to explaining why he still wanted to continue with the operation as late as 1631/1.

At 2005/1, RAAF Hudsons reported two Japanese cruisers were in the general vicinity of where *Armidale* and *Kuru* would be heading. On receipt of this news, Pope did not hesitate to call the operation off. However, *Armidale*’s ‘radio silence’ was interpreted as a sign she was still observing covert operational procedures.

For the next two days, Pope’s conviction that *Armidale* could survive level bombing attacks only compounded his difficulties and, more importantly, the difficulties of those men who had survived. The penny had still to drop that *Armidale* might possibly have been sunk and her ‘radio silence’ was no proof she was still proceeding with the mission. Any lurking doubts Pope may have held about his earlier assessment of the situation were not resolved until 0230/3 – some 7.5 hours after he had ordered *Armidale* to break radio silence and report her position, course and speed, and some 36 hours after she had slipped below the waters of the Timor Sea. At 1136/3 Pope finally aired his misgivings about *Armidale*’s safety to the Naval Board, adding that a search for survivors had now begun. But the first of two groups of *Armidale* survivors
in open boats was not located by Darwin-based RAAF Lockheed Hudson bombers of Nos 2 and 13 Squadrons until 1000/5. *Kalgoorlie* was ordered to pick them up and this she did at 2330/6.

From this rescue, a clearer but by no means complete picture began to emerge of the circumstances of the three groups of survivors who were in desperate need of rescue. Prompted by information received from the survivors, Pope radioed the Naval Board and Commander South-West Pacific at 1050/7, requesting an RAAF PBY-5 Catalina flying boat from No. 11 Squadron to join the search. Even so, with the Catalina squadron stationed at Cairns in northern Queensland, over 1000 miles away, this meant that the Catalina’s ETA at Darwin would not be until around dawn of 8 December. Just over four hours later, at 1507/7, news was received that three RAAF Hudsons had located about 40 personnel marooned on a raft some 29nm from where *Armidale* was presumed to have sunk.

Quite why Pope allowed the search to go into its fifth day before requesting the Catalina - and then only after the first group of survivors had been found - defies all logical explanation. In all essential aspects of search and rescue, the Catalina was a far superior aircraft to the Hudson. With its endurance about double that of the Hudson and an ability to loiter at 120kts for long periods ‘on task’ the Catalina was the ideal aircraft for such missions. But by far its greatest advantage lay in its ability to alight on the sea once personnel had been located. Thus a week after *Armidale* was lost, a plane best-suited for search-and-rescue search, began searching in the vicinity of the corvette’s last-known position. What then transpired in the Catalina’s first search is described in the official report provided by the Naval Board to the Prime Minister on 11 January 1943:

> At 1556 on the 8th December the Catalina sighted the rafts 40 miles N.E. of the position of the sinking, and later the same day sighted the whaler 150 miles N.W. of Darwin. Owing to the rough state of the sea the Catalina was unable to alight to offer assistance either to the rafts or the whaler.10

The Catalina, A24-25, later reported:

> Sighted raft made of timber lashed with four large drums overcrowded with 17 men, all apparently in fair condition but had little clothing. Dropped food, water, blankets, life preservers, sun helmet and whiskey and aircraft marine distress signal.11

The remnants of the whaler in which a further 29 survivors were literally holding onto life by a thread were subsequently picked up by *Kalgoorlie* at 1700/9. Despite the most intensive efforts by both air and sea assets, the remaining 48 men, were never sighted again. While there are various theories as to what may have subsequently befallen their makeshift raft and carley float, their fate remains unknown. The Catalina that located the raft tragically suffered a similar fate; disappearing without trace while on an anti-submarine patrol off Cairns on 28 February 1943.12
On 10 December, the Netherlands destroyer, *Tjerk Hiddes*, was despatched to Timor from Darwin to evacuate members of the 2/2nd, NEI military and Portuguese civilians, in total some 392 personnel. Between 10 and 19 December, *Tjerk Hiddes* made three trips and a total of some 950 personnel were rescued without incident. Finally, on 10 January 1943, the remnants of ‘Lancer Force’, some 282 personnel, along with a small number of civilians reached Darwin, having been picked up by the destroyer, HMAS *Arunta* (I), at Quicras, some distance up the coast from Betano.

**The Board of Inquiry**

In calling for a Board of Inquiry into *Armidale*’s loss, Pope requested that ‘a number of points should be cleared up if it is possible to do so’. Some of these points were fairly basic; for example, what was the time and location of sinking, were surface craft involved, and were the enemy aware she had been sunk? The last of seven issues raised concerned ‘any description of enemy formations and methods of attack which might be useful for future guidance’. By 14 December, when Pope submitted the Board of Inquiry’s report to the Naval Board, these items, including the all-important seventh, had been relegated to ‘minor points’. The Board of Inquiry did not investigate whether failures to accurately describe enemy formations and methods of attack in ‘enemy reports’ had influenced the course of the operation. Instead, the following were now considered to be ‘the principal matters at issue in connection with the loss of the ship and the operation as a whole:

- Whether the level of risk associated with the operation which had led to *Armidale* being sunk was justified or not?
- Had the ship been well handled and well fought to the last by her Commanding Officer?
- Was his [Pope’s] own action, in continuing with the operation in the face of known risks, correct?^14

All relevant wireless transmissions, enemy reports and reported ship positions during 30 November/1 December together with reports written after the event were available to the Board of Inquiry. A cursory inspection of the material by those conducting the Inquiry should have been sufficient to show-up many deficiencies and/or pointers in the contents of a number of ‘enemy reports’; deficiencies which, had they been queried at the time the ‘enemy reports’ were received, might well have influenced or changed the course of events on 1 December:

- *Castlemaine*’s 1432/30 and 1855/30 enemy reports specified the number of threats (but not type) and their height. Pope would have assumed, correctly, that the standard Japanese technique for bombing ships from altitude was being applied. *Castlemaine*’s 0930/1 signal of a ‘single aircraft–low level bombing’ was later referred to in Sullivan’s report as possibly a ‘torpedo bomber’ which ‘had a fixed undercarriage
and hovered just outside gun range’. It later transpired that the aircraft was part of a larger force (number not recorded) that was bombing Armidale and Castlermaine at this time.\textsuperscript{15}

- **Armidale**’s first enemy report at 1254/1 made no mention of aircraft type (dive-bombers) nor provided any indication of their height (hardly necessary in a dive-bombing attack, admittedly). Armidale’s 'attack ceased' signal at 1337/1 was not repeated following later attacks, an omission at the time not regarded as overly suspicious.

- **Kuru**’s oversight in not transmitting ‘attack ceased’ signals during the afternoon of 1 December, unwittingly aggravated Armidale’s difficulties. Target type was not given and target numbers and height were only given in the first (1228/1) and last (1826/1) attacks. Once again, Kuru’s enemy reports would only have served to confirm Pope’s belief that aircraft flying straight and level were bombing the ships.

- Of Kuru’s reported positions for 1 December, only that at 1842/1 made any sense in relation to her known performance. While these errors, of themselves, were not that important in the context of what happened that afternoon, her reported course of 140° at 1842/1 and 135° at 1551/1, would, if extrapolated back to 1445/1, put Kuru far closer to Armidale when she sank, than was thought to be the case at the time of the Inquiry.

Pope as much conceded that the use of torpedo bombers in the attack on Armidale had caught everyone off guard. In his report to the naval board of 14 December, Pope wrote:

> I naturally hoped that these small, manoeuvrable and [as against low-level attacks within Oerlikon range] fairly well armed vessels would escape serious damage. Unfortunately this was not the case and Armidale was finally sunk by a heavy and well-coordinated attack which included torpedo bombers, a new factor in these waters, without which the ships would probably have escaped serious damage. This is also the view of the [commanding officer] Armidale, expressed to me verbally.\textsuperscript{16}

This single paragraph reveals much of Pope’s mindset on why he had seen no reason to curtail the operation. His original ‘risk must be accepted’ signal in response to Sullivan’s concerns about air attacks on Castlermaine and Armidale was obviously based on previous experience of Japanese air attacks in the area, and what he perceived to be the degree of risk a particular threat type posed to the ships. The two Japanese cruisers which were supposedly close to where Armidale and Kuru were due to make landfall constituted an unacceptable risk; not so high-level bombing.
At the same time, Pope appeared to be downplaying the role of dive bombers in the attack. Torpedo bombers had not been used in the carrier-based strike on Darwin of 19 February, or in any other attacks on Darwin since that time. Given all this, perhaps it was unreasonable to anticipate the Japanese would resort to torpedo bomber attacks on such relatively unimportant targets as corvettes, but why he felt Armidale would have ‘escaped serious damage’ from dive bombers is a little more difficult to explain away.

The vulnerability of ships to mass dive bomber attacks had been amply demonstrated in a number of previous actions: the Luftwaffe against warships in both the Norwegian and Mediterranean campaigns; and the Imperial Japanese Navy naval air arm in the Indian Ocean in early April 1942 where in two separate attacks, the anti-aircraft defences of two cruisers, HM Ships Dorsetshire and Cornwall and the aircraft carrier, HMS Hermes, together with her escorting destroyer, HMAS Vampire (I), had been quickly swamped. The US Navy’s successes against the four carriers in the Battle of Midway in June 1942 had been an emphatic demonstration to the world’s navies, of the dive bomber’s capability against large warships.

Pope’s faith in the ability of small ships to survive dive bombing attacks may have had something to do with what had happened in the Darwin air raid, where, apart from the loss of the destroyer, USS Peary, dive bombing had not resulted in any of the smaller warships present (HMA Ships, Swan (II), Warrego (II), Warrnambool, Deloraine or Katoomba) taking a direct hit. However, if the eyewitness account of Swan’s commanding officer, Lieutenant Commander AJ Travis, RAN, is anything to go by, the capability of small ships against dive bombers was not strictly put to the test in the Darwin air raid. Travis claimed dive-bombers had attacked at relatively shallow angles, with a consequent loss in bomb aiming accuracy. In the Indian Ocean off (then) Ceylon, the Flower class corvette, HMS Hollyhock - a ship comparable in size and maneuverability to Australian corvettes - had been sunk by nine Japanese dive-bombers, with the loss of 53 lives.

As Kuru’s Report of Proceedings later revealed, Sullivan’s 1445/1 signal had covered an attack by bombers and fighters, the numerical strength of the force matching closely that engaged against Armidale at that time, viz:

At 1440 nine others arrived with five two-seater fighters evidently waiting to come down on a direct hit and pick us off. The method of attack was the same as before, but had split up into three at first attack, and of course my moves were the same.

It is not absolutely clear whether the ‘nine others’ Grant referred to were high level bombers or dive bombers, also, were the ‘five two-seater fighters’ in fact ‘Val’ dive bombers? If it were the same force which accounted for Armidale, then they would most probably have been dive bombers. Whatever, this was the attack which finally convinced Grant that Kuru could no longer continue with the operation. Hence his unequivocal signal. Kuru was returning to Darwin.
Reconstruction

On 1 December, there were eight positions transmitted by Castlemaine, Armidale and Kuru - all included in Pope’s initial report to the Naval Board of 3 December 1942 (See Figure 22.1).

Castlemaine’s position at 0930 bears 162° 38’ from the geographic location of Betano (9° 11’S, 125° 42’E) which ties in with the pre-arranged order to depart the Timor coast on a course of 164°, while those transmitted by Armidale are consistent with her later change of course from 164° to 28°.

Figure 22.1: Recorded positions of HMAS Castlemaine, Kuru and Armidale, 1 December 1942

Taking as the base point Castlemaine’s position at 0930/1 – or about the same time Kuru separated from the two corvettes – Kuru would have averaged just over 7 knots to reach her reported position at 1842/1. However, to reach her reported position at 1228/1, she would have to have covered around 42nm in almost three hours, an average speed close to 14 knots. Similarly, while it was possible for Kuru to have got from her 1309/1 position to her 1551/1 position – a distance of 21.1nm in just under three hours – she would, most
likely, have been setting a course of 135° for much of that time. Also, the distance (40.2nm) between her reported positions at 1551/1 and 1842/1 again equates to an average speed of close to 14 knots. As with the earlier point-to-point average, such a speed was well beyond her capabilities. Also, except for her 1842/1 position, there appears to have been a ‘rounding off’ to the nearest quarter a degree applied to the other positions reported – probably enforced by her being under attack at these times.

The conclusion has to be that Kuru’s 1228/1, 1309/1, 1551/1 positions were seriously in error, raising the possibility; that if Kuru were steering in a south-easterly direction from 1445/1 onwards, then she may have been far closer to Armidale at the time she sank than the naval board were to credit her in the postwar period. If that were so, could Kuru have rescued Armidale survivors?

Such speculation is best answered in the following terms:

• there is no record of anyone from either ship having sighted the other during the time of the mid-afternoon attack, and while they may have been close, the likelihood was that Armidale was just outside Kuru’s visual horizon

• in 2003, the author discussed the issue with Kuru’s radio operator and his response was that he ‘could only report to Darwin, there was no radio contact available between Kuru and Armidale’.

So the likelihood is that, while Kuru was close to Armidale, she was never close enough to be able to render assistance.

Turning to the issue of ‘air search’, the sole reference to this aspect of the operation by the Board of Inquiry is contained in Pope’s 14 December report to the Naval Board, where he wrote:

An intensive air search over many days has been carried out for the raft which was sighted by a Hudson on Monday, 7 December and by the Catalina on the following day, but has not been seen since, although the search has been continued daily.  

And:

As an indication of the intensity of the search carried out, it has been calculated that the aircraft made 43 sorties and flew rather more than 40,000 miles over a total period of 300 flying hours.

Pope also queried whether ‘his action in continuing in the face of known risks ... [was] correct’, and sought to justify his actions by drawing comparisons between his operation and those in the Mediterranean theatre:
We took many naval risks and incurred great losses in supporting the garrisons at Tobruk and Malta and passing convoys to Russia under incessant air attack. I consider the operation though on a much smaller scale, as a similar operation comparable in importance and accepted all risks. The position of Lancer Force, heavily outnumbered on the island by about 10 to 1, and of the refugees was precarious and the operation urgent.\textsuperscript{22}

The issue of whether Pope’s actions were correct or not was addressed in the initial report prepared by the Naval Board for the Prime Minister, John Curtin. It was concluded: ‘the carrying out of the operation with the forces available was a justifiable war risk’.\textsuperscript{23} However, when finally submitted to the Prime Minister on 11 January 1943, all reference to NOIC Darwin’s actions or whether the operation was a ‘justifiable war risk’ had been removed from the report.

But just how credible were Pope’s initial arguments anyway? Had Armidale been sunk \textit{en route} to Betano on 30 November, her loss could have been regarded as part of the fortunes of war and his comparison might have had some substance. However, success depended on Operation HAMBURGER remaining covert. Armidale had been sunk in broad daylight through being ordered to ‘go round again’ in the face of a now-alerted enemy – a practice generally regarded in military circles as a definite ‘no-no’. In such circumstances, persisting with the operation could hardly be classed as a justifiable war risk.

As his 1445/1 signal showed, Grant in Kuru had obviously summed up the situation and was intent on returning to Darwin. Essentially, this meant that if Kuru were out of the operation, then there was not much point in Armidale continuing either. Kuru would presumably have received Pope’s 1631/1 ‘routine secondary warfare’ signal which had also included the following: ‘Armidale be prepared to begin operation without assistance from Kuru’. Grant might well have interpreted this as Pope’s implied acceptance of his, (now) almost two-hours-old decision to return to Darwin. Yet later, Pope reported to the Naval Board with respect to his 1631/1 signal: ‘As it seemed unlikely that Kuru would be on time, I told Armidale to be prepared to begin the operation without the assistance of Kuru’.\textsuperscript{24} This puts a somewhat different slant on things. Grant had made clear his intention to return to Darwin, yet Pope was expecting Kuru to turn around again and make for Betano in response to his 1631/1 order. But Grant was not about to do any such thing. Some 44 bombers and 200 bombs later, Kuru reached relative safety in the early evening of 2 December and arrived in Darwin at 1805/3.\textsuperscript{25}

Grant did not face a court martial for having disregarded Pope’s 1631/1 order to return to Betano. Indeed, at the time he received high praise from both Pope and the Naval Board for having ‘handled his ship under intensive and frequent attacks in the most masterly manner.’\textsuperscript{26} But that said, Grant was not about to be recommended for a gallantry award either.
Second Board of Inquiry - Refused

Post-war, the father of a sailor who had perished on the raft requested a fresh Board of Inquiry to investigate various issues associated with *Armidale*’s loss. Some of the criticisms he made were quite unfounded – clearly, he was still distraught at what he considered to be the needless loss of his son. Nonetheless his concerns were taken up by his Federal MP, Kim Beazley Sr. He raised two issues having the potential to severely embarrass Navy: *Armidale*’s so-called ‘radio silence’ and the delay in initiating the search for survivors.

In respect of ‘radio silence’ the naval board wrote to Mr Beazley:

> Had *Armidale* survived the air attack and been in the process of evading a possible impending one, there would have been an understandable reluctance on *Armidale*’s part to break wireless silence and thus give away her position. The fact that *Armidale*’s wireless was not again heard, was by no means evidence that the ship had been sunk.\(^{27}\)

Having survived an attack, both *Castlemaine* and *Armidale*, had broken radio silence to send ‘attack ceased’. Had *Kuru* done likewise, or had Pope reminded her to do so, or had Pope remembered that *Armidale* had sent this signal previously, then *Armidale*’s silence should have served to put Pope on notice that all might not be well with the corvette.

With respect to search delays, the Naval Board wrote, ‘on 1st, 2nd and 3rd December, aircraft specially detailed to search for HMAS *Armidale* or her survivors were despatched.’\(^{28}\)

This response was misleading, disingenuous and an act of pure obfuscation on the board’s part. On the first two of these days, aircraft (presumably Beaufighters) were flying missions in support of *Armidale*, which did not necessarily involve locating her. Search operations for *Armidale* survivors by Hudsons did not begin until December 3. The issue of why the Catalina was not requested until 7 December was not addressed.

Another issue raised was: why didn’t *Kuru* go to *Armidale*’s assistance?

The board’s response was that *Kuru* was 30-40 miles from *Armidale*, which suggests that while someone had ‘joined the dots’ based on *Kuru*’s reported positions produced at the first Board of Inquiry, no one had bothered to check the average speeds required to achieve these positions.\(^{29}\) Further, a quarter of a century later, a plot purporting to show the movements of the three ships on 1 December 1942 was published in Volume 2 of the RAN’s Official History (see Figure 22.2). This plot contains serious errors. *Kuru* is shown positioned south of *Armidale* in the morning and early afternoon, but heading in a north-easterly direction prior to finally heading due east. This is contrary to her known 0900/1 and reported 1842/1 positions, where she was to *Armidale*’s north in the morning and early afternoon, and heading south-east by the early evening.
The board refused Beazley’s request for another inquiry – an inquiry which, had it been held, would inevitably have focussed on various shortcomings in the transmission of information and the command and control aspects of Operation HAMBURGER. The inclusion of just four words ‘dive bombers’ and ‘attack ceased’ in certain ‘enemy reports’ may well have caused Pope to have some concerns about the future viability and safety of the operation. That ‘enemy reports’ were not challenged as to their content at critical stages in the operation, ultimately sealed the fate of many Armidale personnel who might otherwise have had every chance of being rescued. To paraphrase Benjamin Franklin, these words became the ‘nail’ that ultimately led to the ‘rider’ being lost.

Yet, despite all the delays in initiating and executing the search operation, on the afternoon of 8 December the hopes and spirits for would-be rescuers and raft survivors alike must have soared at the prospect that finally, many lives were about to be spared. Having existed so precariously and for so long, just how those poor souls must have felt when they were finally located can scarcely be imagined. That these desperately unlucky men were not rescued has to be regarded as one of Australia’s greatest maritime tragedies.
Notes

2. Gill, *The RAN in World War II*, p. 176-182
4. National Archives of Australia, MP 1185/8, 2026/9/336
6. National Archives of Australia, MP 1185/8, 2026/9/336
7. National Archives of Australia, MP 1185/8, 2026/9/336
8. Walker, *HMAS Armidale*, p. 166
9. National Archives of Australia, MP 1185/8, 2026/9/336
10. National Archives of Australia, MP 1185/8, 2026/9/336
11. National Archives of Australia, MP 1185/8, 2026/9/336
18. <www.hmshollyhock.co.uk>.
27. National Archives of Australia, MP 151/1, 429/201/943
28. National Archives of Australia, MP 151/1, 429/201/943
29. National Archives of Australia, MP 151/1, 429/201/943.
23. Communications, C2 Entropy and Maritime Operations

Alexander Kalloniatis

Secret. Immediate. Convoy is to scatter.

Admiralty to PQ-17, 4 July 1942.

Whatever subsequent historians were to make of them, the effect of the Admiralty’s signals on events in the Barents Sea was quite irreversible.

D Irving, The Destruction of Convoy PQ-17.

There is no other general measure for the irreversibility of a process than the amount of increase in entropy.

Max Planck, 1905.

Irreversibility, Dynamics and Maritime Engagements

The notion of irreversibility is pivotal in both physics and military operations, and it is the intent of this paper to formalise the connection between the two. In physics, irreversibility rears its head in systems of myriad parts for which an external observer is ill-placed to track every microscopic event, despite the applicability of deterministic laws. The best that can be managed is a coarse-grained view of the system evolution. Information is lost in the process and the observer is unable to wind back the clock on the system, or to act upon the system to restore it to some initial or previously existing state. In military operations, irreversibility is invariably a human tragedy for at least one side, such as the seamen of convoy PQ-17 whose circumstances and fate will be discussed below. Irreversibility means that changes occur in the military configuration, either by ill-conceived deliberate order, the action of the enemy or plain accident. This triggers an inexorable slippery-slide into the destruction of lives and military assets, and the complete and unavoidable defeat of a military force.

The concept that will connect these two disparate worlds is that of entropy, loosely to be thought of as the state of disorder of a system, though this definition will be tightened later. From the world of physics, this paper will draw on concepts from the fields of statistical mechanics and thermodynamics. These concepts will be applied in the military domain, specifically the maritime environment, to the nervous system of any military force: its command and control (C2) system. It is this formal structure that determines the operational lines of communication by which the maritime force is enabled to achieve its mission.
At face value, the domains of the laws of physics and of military affairs appear divergent. Yet statistical mechanics, a field of physics, is concerned with systems of multiple, possibly heterogeneous entities in a certain physical environment that can occupy distinguishable states, which are organised according to some predefined structure and finally which undergo some dynamic process. The elements are all there for the mapping onto a mathematically formal system of a maritime force with its C2 arrangements. The impediment would appear to be the core of a C2 system: the human factor. Thus this chapter will take some care in explaining how the formalism of statistical mechanics – described qualitatively – can deal with the uncertainty involved with this element. The outcome will be the concept of C2 entropy, a quantity describing the ‘disorder’ of a military force including both the physical properties of its elements and the C2 arrangements through which the nodes communicate and orient themselves. Specifically:

- C2 Entropy depends on both the ‘physical’ (position, velocity) and ‘virtual’ (informational, communicational, relational) properties of both nodes and links of a military force
- C2 Entropy increases in time during the course of a military operation
- C2 Entropy impedes the control a commander may exert on the subordinate system
- C2 Entropy however can be exchanged between nodes and links offering opportunities for partial control in either the physical or virtual disposition of force elements.

These hypotheses lead to the following recommendation for a ‘good’ C2 system: C2 links must be maintained in a state of ‘latency’ as available but sparingly used degrees of freedom until the event of crises.

The concept will be analysed through the study of two historical maritime operations where an existing naval communication network was used in a variety of ways: from absence of use, in the case of the British Admiralty control of convoy PQ-17 which was all but annihilated en route to Russia by German forces over the period 4-10 July 1942, to one of overuse, as in the case of the British Grand Fleet at the Battle of Jutland which confronted the German High Sea Fleet (HSF) from 31 May-1 June 1916. A brief glimpse at the German perspective of this battle will also offer an intermediate picture where physical and virtual degrees of freedom are used in tandem to achieve at least a beneficial tactical outcome. The paper will conclude with some general comments on the implications of C2 Entropy for maritime operations in the brave new world of Network Centric Warfare (NCW).
Entropy, Command and Control - PQ-17

This ill-fated World War II (WWII) convoy, conducted to provide the Soviet Union with armaments and general supplies, sailed from Iceland to Murmansk on 3 July 1942.\textsuperscript{2} The convoy itself consisted of some 36 merchant ships and an escort of corvettes and destroyers led by Commander Jack Broome. A Cruiser Squadron led by Rear Admiral Louis HK Hamilton was intended as backup defence. The main covering force, in turn commanded by Rear Admiral John C Tovey, and including a fleet aircraft carrier, was scouting to the north-west but would only cover the convoy as far as the line of longitude extending from North Cape, the northernmost tip of Norway. The whole operation was commanded from the British Admiralty in the United Kingdom by the First Sea Lord, Admiral Sir Dudley Pound. The defence of the convoy was complicated by a second strategic aim: to lure the German battleship Tirpitz out of the safety of the Norwegian fiords into open conflict with the main covering force and thus destroy her.

An initial attack on the convoy by German torpedo bombers at 2030 on 4 July 1942, combined with uncertainty over whether Tirpitz and her escorts had left their berths, caused the Admiralty to fear the worst. At 2136, the Admiralty ordered that the cruisers should separate from the convoy to join the main covering force – for battle with Tirpitz – and that the convoy should scatter. Hamilton, believing that a greatly superior enemy was about to appear over the horizon, in turn gave the order that the destroyers under his command should detach from the convoy and likewise join with the Cruiser Squadron.

Tirpitz, having joined up with the heavy cruisers Hipper and Scheer at Altenfiord, was indeed heading out to sea, and this movement had been detected and reported to the Admiralty. But the Germans also picked up these Allied signals and, unwilling to accept the risk of engagement, immediately ordered the Tirpitz squadron back to Norwegian waters. The combined effect of coordinated U-boat attacks and aircraft launching from Norwegian airfields was instead deemed sufficient to devastate the convoy. Without sufficient escort or mutual support, the merchant ships were picked off piecemeal. Only 11 merchant ships survived.

The order to scatter was not pulled out of left-field, but was built in as one of the options in the Admiralty’s orders for control. There was, however, no thought given to how the convoy might be reassembled if required, nor to whom legal authority for the lives of the merchantmen should devolve once the Admiralty had decided to abandon responsibility.\textsuperscript{3} Finally, circumstances were compounded by the divided purpose of the Cruiser Squadron – to protect the convoy and join the main covering force for an engagement with the German capital ships. The thought that such an engagement was close at hand triggered Hamilton’s decision to strip the convoy of naval protection. It was subsequently impossible to return the destroyers to the scattered convoy because of their limited fuel capacity.
and lack of intelligence on the location of the oil-tanker, which had in fact been destroyed. The slide of PQ-17 into disaster after the order to scatter was given seems irreversible. Is this a sign of high entropy?

**Defining the system**

We begin with the notion of a system of interacting entities, each of which can exist in a distinguishable state. Dynamical variables - degrees of freedom that vary with time - are assigned to each entity, the measurement of which renders the state of the entity quantifiable. An elegant framework for combining the measurements of states of the various entities into an overall system state is a state-space: a multidimensional space whose components are the variables for each system entity. A particular assignment of numerical values to each variable for each entity gives a point in state-space (see Figure 23.1).

![Figure 23.1: Properties of State Space](image)

In the context of PQ-17, we may choose our system in a number of ways as there are many interesting systems and subsystems. Let us choose as the system the merchant ships and the three naval forces operating in the battlespace, all of which were under the Admiralty’s military, legal or at least moral responsibility. Including the threatening German elements in the system is also permissible, as control of Allied elements was predicated on their movements. What are the appropriate variables or degrees of freedom? For a traditional military force, be it maritime or otherwise, the aim is invariably to coordinate force elements in space and time in order to achieve effects. Thus there is no escaping the basic physical variables of the position and velocities of each of these ships.
A system may be closed or open, according to its degree of interaction with the environment. How open the system is depends also on the degree of interaction with the observer. In our case, the observer will be one seeking to influence the system evolution, namely to control, undermine or destroy the system. Open systems are generally a challenge in statistical mechanics. However, one can either include enough of the environment (to the extent that it can be partitioned) into the system definition and/or determine a section of the system history in which the system is approximately closed, where the role of the environment is minimal and the observer is not intervening. In applying this approach to military systems finding such a section, if possible, requires care.

To the extent that PQ-17 spent most of its time other than in actual contact with the enemy, the system is closed if the system history is taken from the time of the scatter at 2220 on 4 July until the first attacks by U-boats at 0340 on 5 July; arguably the evolution of the system over this time sealed the scattering convoy’s fate. Using as evidence the sighting by German air reconnaissance at 0030 on 5 July, ‘convoy extended over 25 miles’; by the time of the first attacks the convoy was already extended over a distance of some 60 miles.

The system observer, command and control

According to the Pigeau-McCann definitions:

Command is the creative expression of human will necessary to accomplish the mission; control is the structures and processes devised by command to enable it to manage risk. C2 is the establishment of common intent to achieve coordinated action.  

However, for reasons which will become apparent, the nuance on C2 adopted in the ADF is also useful: ‘C2 is the system empowering designated persons to exercise lawful authority and direction over assigned forces’. Thus, the commander – especially at the operational level – is first an observer who must determine the state of their subordinate assigned forces before seeking to assert control. Indeed, the prevalence of the doctrine of mission command – whereby a superior directs what is to be achieved but leaves the subordinate to determine how it is to be achieved – ensures that the commander is interacting with the subordinate system only intermittently. Mission command, in other words, involves an aggregating and punctuated, rather than a micro-managed and continuous approach to the control of force elements.

Returning to PQ-17, an approximate closed system can be located from the time of the order given to scatter and the initial attrition by the enemy – though attrition is also conceptually not a problem if interpreted simply as immobilisation of the respective system element. The observer shall be taken to be the British Admiralty as the ultimately responsible legal authority over the convoy – in the spirit of the ADF definition of C2. Indeed, this is valid to the degree that communications
between the Admiralty and the merchant ships did not occur after they had been separated from their military escorts. Admiral Pound had enquired about whether the merchant ships had one time pads—simple encryption systems—before giving the order, indicating a preparedness to undertake some rudimentary operational communication. A C2 system, arguably, continued to exist.

The observer is armed with a particular means of categorising, aggregating and measuring the state of the system entities. First, the types of variables to be used at the aggregate level may differ from those at a more microscopic level of description. A ‘macrostate’ is a unique system state specified by the values of variables relevant to the aggregate level. A ‘microstate’ is a unique system state specified by the values of variables relevant to the microscopic level, namely relevant to the system constituents. Different microstates may be consistent with a single macrostate.

The Admiralty was less concerned even prior to the order to scatter with the specific spatial formation of the merchant ships within convoy PQ-17—this was the responsibility of the commander of the escorts. Many possible arrangements of the merchant ships were consistent with the data the Admiralty may have been using to characterise the state of the convoy: its aggregate position and bearing thus defined the macrostate. However, within this macrostate datum perhaps the most useful microstate information would have been the distribution of one time pads with a view to a later reassembly in the event the convoy had to scatter.

Some mathematical formalism is unavoidable at this point: let $E$ specify the macrostate, and let $i$ specify a particular microstate consistent with $E$. This will be necessary to define entropy.

**The many faces of uncertainty**

Uncertainty is inherent in the divergence between the actual microscopic system state and the ability of the observer to determine that state through the lens of macrostates.

A first source of uncertainty is from aggregation. Measurements of a variable are categorised using discrete ‘bins’ of a certain size. An associated probability distribution governs the assignment of measured values to bins subject to the refinement of the gradations and the overall physical constraints on the system. We can speak of a probability that the microstate $i$ occurs within the macrostate $E$ and represent this as $p(i \mid E)$. In terms of the system state-space, this uncertainty is seen in the inability of an observer to determine the system microstate to an idealised mathematical point. Rather, the system state is localised within a finite sized region of state-space, the macrostate encompassing a spread of microstates. The density of this region is the probability $p(i \mid E)$. 
A second driver for uncertainty is the lack of knowledge of all the relevant external and even internal influences on system entities. This type of uncertainty is called ‘noise’. The closest physical example is the property of dust particles suspended in fluid, so-called ‘Brownian motion’: these are observed to move abruptly as a result of myriads of collisions with genuine microscopic fluid molecules. A useful analytic description of the dust particles involves Newton’s laws of motion given the known macroscopic forces on the system plus a noise term to incorporate the indeterminably myriad microscopic influences on the particles. Clearly the greatest source of noise in a C2 system – with this definition – is the human participant: no model, be it that of a mathematician, military analyst or commander, can quantify or even track on a continuous basis the detailed cognitive state of a human. The machinery of statistical mechanics is indeed capable of handling both sources of uncertainty in the framework of stochastic differential equations of motion for the evolution in time of the system state or associated probability distribution. The reader will be spared such details here.

We now define entropy. This term is popularly used interchangeably with the word ‘disorder’ a looseness of expression entrenched in the popular literature that is impossible to reverse. Let us give instead a more precise statement of what disorder is for this analysis. Disorder is the degree of uniformity in the probability distribution associated with the states of system entities. Turning to a mathematical definition – the only maths we will indulge in here - the (average) entropy is given by the formula based on the natural logarithm, ln,

\[ H = -\sum_{E=1}^{N} p(i \mid E) \ln p(i \mid E) \]

To gain some insight, consider how entropy is minimised and maximised given that the individual probabilities are positive numbers and that the sum of all probabilities is one. If all microstates are consistent with only one macrostate, say that specified by \( E = 1 \), then \( p(i \mid 1) = 1 \) with the rest zero: entropy would vanish since \( \ln 1 = 0 \). At the other extreme lies equilibrium: if there was an equal likelihood that a microstate could belong to any one of \( N \) macrostates then \( p(i \mid E) = 1/N \) and each term in the sum would contribute equally so that entropy \( H = -\ln 1/N = \ln N > 0 \). Seen at the aggregate level, a system does not change when in equilibrium even though quite rapid changes of microstate may be taking place. Between these two poles sits relatively lower entropy for distributions, which are unevenly spread. The more uniform the spread, the higher the entropy. Maximum entropy represents the case of equilibrium: maximum spread in the probability distribution. Correspondingly, maximum entropy means an observer has the least chance of correctly picking the actual microstate within a given macrostate by a random selection. This helps one appreciate the importance of entropy for C2 where the commander-as-system-observer must influence the
system in order to realise their intent: the key contingent for asserting appropriate control on the system is that one can determine the system state in the first place. Maximum entropy gives the least opportunity for control.

The significance of entropy in physics lies in its role in the Second Law of Thermodynamics, which can be stated: as a closed system in equilibrium evolves in time, its entropy cannot decrease. This is the source of irreversibility of changes in physical statistical systems. The conditions in which a system can be closed and at equilibrium have often meant that the significance of the Second Law is dismissed for real world human systems. Openness of a system has been addressed. The obsession with equilibrium comes from a failure to distinguish two quite different fields of physics which both use the term entropy. Thermodynamics, out of which the Second Law originates, is concerned purely with the macroscopic – namely aggregate – behaviour of systems without reference to their microscopic or constituent structure. Statistical Mechanics is concerned with the statistical properties of the microscopic systems and how they contribute to the aggregate behaviour. Whereas thermodynamics initially considers systems only in equilibrium, statistical mechanics has the capacity to study systems evolving towards equilibrium.

There is a statistical mechanical version of the Second Law of Thermodynamics that is related to Boltzmann’s ‘H-theorem’, and arises from the stochastic dynamical equations for statistical systems. It is in this formalism – not thermodynamics - that C2 Entropy will take flesh. The import of Boltzmann’s theory is that systems out of equilibrium also evolve by increasing entropy, essentially due to ‘mixing’ during many-state to many-state transitions at each step of time evolution. This can be alternately expressed by saying: if a system has available to it certain freedom of action then under dynamical evolution it will exercise that freedom. In state space, whereas initially a system may be prepared (say, by a commander) in a narrow region, as it evolves the region in which the system can be localised expands and distorts corresponding to the exercising of more and more of its degrees of freedom. These effects are illustrated in Figure 23.1. We propose that this is the underlying cause of the heuristic Parkinson’s Law, derived in the human domain, which states: work expands so as to fill the available time for its completion.9 Ironically, this law was first formulated based on observations of an organisation integral to the maritime engagements studied in this paper: the British Admiralty.

There is an extremely important outcome, beyond irreversibility. Initially a statistical system has latent degrees of freedom. With the progress of time, the system equilibrates its available degrees of freedom subject to constraints. We shall return to this point.
Entropy of convoy PQ-17

We can now complete our qualitative analysis of the entropy of PQ-17.

At the initial time of the selected system history the entropy was low as a consequence of the clear ‘order of battle’ of convoy PQ-17: anti-submarine trawlers at the four corners of its outer screen, a next layer of screening destroyers, interspersed at key points by corvettes, then the columns of merchant ships, the trailing mine-sweepers and Allied submarines. The Admiralty, by knowing the position of the aggregate convoy in a report from the escort commander was able to determine more refined coordinates of each vessel if it so required: the particular microstate corresponding to the macrostate could be determined with confidence without requesting each vessel to report its position. The probability distributions were sharply defined. Thus, microscopic control if required – by the issue of orders for movements of particular units to specific places – was viable.

After the order to scatter, with the progress of time, the probability distribution of positions and speeds rapidly smeared as ships spread across the Barents Sea. Initial bearings, if sought from the military commanders prior to the departure of the destroyers, may have aided in constraining the shape of the distorting probability distribution, but only for a time as the certainty of attack from marauding U-boats would have made such initial information useless. Indeed, many of the merchant ships, fitted only with a magnetic compass, were incapable even of determining their own position at such high latitudes. Thus, over the course of several days the probability had completely equalised that an individual unit was at any grid square of specific size in the region defined by the boundaries of latitude 25 and 40 degrees East, the Arctic ice and the Russian coast (see Figure 23.2). First, for reasons that have nothing to do with the violence overtaking the human participants in these events, this is consistent with disorder. Though this jars against our sense of the human suffering endured by the victims of U-boat and aeroplane attacks, this is also equilibrium in the strict statistical sense.

Entropy – as observed from the Admiralty – was high and increasing. Contrast this with the narrow spatial and velocity distribution required to arrange available elements into a defensible fighting force (as was attempted locally by some units which had managed to reach Matochkin Strait, a narrow strip of water leading from the Barents to the Kara Sea, dividing Novaya Zemlaya in two), again a configuration of low entropy. Entropy increase meant irreversible degradation of the convoy as a defensible organisation because the system could no longer be reliably controlled. The means apparently were available: the one-time pads meant operational information could be – but was not – exchanged between the Admiralty and elements of the convoy. As mentioned, the destroyers could not be returned to the convoy because of their fuel limitations and lack of knowledge of the state of the oiler. This lack of information alone spreads the probability distribution associated with the convoy configuration and therefore increases the spatial entropy.
We shall not try to play armchair strategists by attempting to construct a ‘what if’ scenario to save the scattered convoy. However, if such a plan exists communications and C2 are surely pivotal. ‘Military withdrawal is all C2’,is a motto used by operators for engagements on dry land – see for example the withdrawal of the ANZACs from Gallipoli. We argue it applies no less to the maritime environment. C2 is the key means by which a spatially disordered military force is re-organised, be it for withdrawal or renewed combat. C2 is the element that prevents spatial disorder being a one-way track for a military force. If through C2 a force may reverse its descent into spatial disorder, where then is the use of entropy? 

The answer we propose is that the dynamical specification of the system – in terms of the physical state of its components – is incomplete and must incorporate the C2 arrangements, namely the structure and dynamical properties of the links between C2 nodes. We seek to confirm that spatial reorganisation can be achieved – a reversible process – while having C2 Entropy increasing – an irreversible process - by internal exchange of disorder from the physical state of nodes to the virtual state of links. 

It is tempting to conclude now that PQ-17 was beyond salvation by the Admiralty because it had a high C2 Entropy thoroughly concentrated in the spatial behaviour of its nodes and because it failed to or was unwilling to use its C2 degrees of freedom. Because we cannot turn back the clock on PQ-17, we must seek a different maritime operation to confirm our hypothesis. In doing so, we will discover also whether ‘using’ C2 degrees of freedom only means ‘communicating’.

Figure 23.2: Probability Distribution After the Order for Convoy PQ-17 to Disperse

Where is the oiler Aldersdale? What is her state?
C2 Entropy and the Battle of Jutland

The Battle of Jutland saw the Royal Navy’s Grand Fleet, under Admiral Sir John Jellicoe, confront the HSF, under Vice-Admiral Reinhard Scheer. It took place in the North Sea off the coast of Denmark over some 15 hours from 1600 on 31 May to effectively the dawn of 1 June 1916.

The main German strategy was to try to lure and destroy parts of the British fleet while avoiding a full engagement with the Grand Fleet. The confident British on the other hand, sought to confront the entire German fleet. The capacity of only being able to engage during daylight complicated the strategy. Scouting formations were vital as the ‘bait’ for both sides. That of the British consisted of two groups. Vice Admiral David Beatty led the Battle Cruiser Fleet (BCF) of lightly-armoured, fast battlecruisers. Rear Admiral Hugh Evan-Thomas, RN, commanded a subordinate group of fast well-armoured Queen Elizabeth class battleships of the 5th Battle Squadron (BS). The Germans had the First Scouting Group of Rear Admiral Franz Hipper. From the British perspective, the fast and heavily armoured 5thBS should be the ‘sharp end’ of the BCF, whose aim was to tie down the HSF long enough so that Jellicoe could reach the battle with his slower but heavily armoured battleships and give time for combat during daylight hours.

From a C2 perspective, it is relevant that the British employed an elaborate signals-driven fleet manoeuvring through flag, semaphore, Morse and wireless. Mission Command – arguably a guiding principle under Nelson at the Battle of Trafalgar – had been long absent as a doctrinal principle since the death in 1893 of its champion in the Victorian era, Sir George Tryon.

On the afternoon of 31 May, the BCF made contact with Hipper’s scouts. At a critical juncture, orders were given at 1648 from Beatty’s flagship using flag signals to the 5thBS to turn ‘in succession’ in the face of heavy bombardment from the Germans. A delay in implementation of the order brought each of the 5thBS battleships under direct fire, killing or maiming hundreds of Englishmen and jeopardising wholesale the pride of the Royal Navy. This delay was arguably caused by the flags being left close up at the yardarms for longer than necessary: execution of a flag order was meant to take place when flags were hauled down. Eventually the 5thBS moved into formation with the BCF, which collectively fired on the combined German fleet, inexorably drawing it in a ‘run to the north’ towards Jellicoe’s Grand Fleet. As the two British fleets converged, orders were given at 1810 via flag signals for the fleet to prepare for battle:

The column nearest south-east-by-east is to alter course in succession to that point of the compass, the remaining columns altering course leading ships together, the rest in succession so as to form astern of that column, maintaining speed of the fleet.
The full deployment of the entire Grand Fleet into the single line-of-battle took 20 minutes, with masterful manoeuvring, not a little chaos and barely hours of daylight left. Jellicoe thereby achieved the much desired ‘crossing the T’ of the enemy, offering him maximum opportunity to fire on any single element of the HSF with minimal risk of return fire. In the meantime the enemy had turned away. However, as if driven by a death-wish, Scheer subsequently turned back into the Grand Fleet and had his ‘T’ crossed again, now from the north-west. Another German order to reverse course was given finally and night overtook the fleets.

During the night Jellicoe made an erroneous guess at the direction in which Scheer would seek to escape. Nevertheless, the German fleet drifted through the rear of the British with ships colliding and exchanging fire. Remarkably, none of this information was transmitted to the commander. By dawn, Jellicoe realised the HSF had escaped. Despite heavy mutual losses (the majority of them British), the ‘new Trafalgar’ had slipped from Britain’s grasp.

C2 Entropy – British perspective

Many aspects of this engagement make it amenable to statistical mechanical analysis. The isolation of the fleets from other external influences means the boundaries are clear. If one wished to focus purely on the British fleets, the HSF can be regarded as part of the (rapidly changing and reactive) environment. In this first part, the observer will be taken to be Jellicoe. The system nodes are the ships themselves, a mixture of battleships, battlecruisers, cruisers, destroyers and ‘fast battleships’ with different speeds, lethality, strength and C2 functions. A key question is: was there equilibrium? Certainly not in any spatial properties; for the impressiveness of numbers of British ships deploying at 1810, by thermodynamic standards the distribution of ship positions and velocities was quite narrow: ‘24 dreadnoughts in a compact line of just 6 miles in length, and with all main gunnery arcs bearing towards the enemy’.

The marked difference between Jutland and PQ-17 is the role of communications: C2 links were active during the entirety of the daylight phase of operations off Jutland to a rate of a flag-signal every 67 seconds, though combat occupied barely a few hours. This C2 activity enabled the parade-ground precision of ship movements through the majority of the operation. Yet, though not the unmitigated disaster that was PQ-17, at Jutland the communications hardly enabled a British tactical victory (strategic victory though it was). What is missing from our analysis and how does it relate to entropy?
The answer lies in the nature of a rapid and high volume of communications traffic. Regardless of the precise systematisation of link-variables, the important element to recognise is the probabilistic nature inherent in an observer identifying C2-link states. The ‘mistakes’ at any one of the critical junctures in the Battle of Jutland reduce to a single node making a judgement about the state of a communication link elsewhere in the system (as observed by that node):

- Evan-Thomas’ faith in Beatty’s flag order to turn in succession in the early stages despite the bombardment from Hipper.
- Ship captains at the rear of the Grand Fleet during the night sequence in assuming someone else had communicated the presence of the enemy to Jellicoe.
- The British Admiralty in assuming that Scheer’s intention to escape to Horn’s Reef during the night had been detected and communicated to Jellicoe through his own internal C2 network, even though they had intercepted German communications to this effect.
- Ultimately Jellicoe in assuming that if the enemy was being sighted, his C2 network would enable him to be informed of it.

One way of formalising this – albeit quite simplistic – is as follows. We assign a discrete variable \( X[i, j] \) to any C2 link between nodes \( i \) and \( j \):

- \( X[i, j] = 1 \): information to transmit, transmission takes place
- \( X[i, j] = 0 \): no information to transmit, no transmission takes place
- \( X[i, j] = -1 \): information to transmit, no transmission takes place.

All values are required to specify dynamical states of C2 links at Jutland. Random snapshots over the course of the events at Jutland would yield a probability distribution associated with the evolution of these variables. While profuse communication - manoeuvring orders and intelligence – had been exchanged over the course of the day, by the night phase of the battle if a piece of information existed there was a good chance that someone able to communicate it would not communicate it. The probability distribution had evolved from being peaked around \( X[i, j] = 0 \) or \( 1 \) to covering the whole space of values \( 1, 0 \) and \(-1\): the onset of equilibrium in these degrees of freedom (see Figure 23.3). With its high degree of spatial order throughout the entire operation – it could not be otherwise in the navy of that era – the C2 Entropy of the Grand Fleet can be argued to have been increasingly distributed into C2 links. Jellicoe’s system was equilibrating.
Contrast: the German about-turns at Jutland

Further insight can be gained by taking the German perspective, particularly that of Scheer having his ‘T’ crossed twice by the full might of the British Grand Fleet. Scheer’s order – communicated by wireless radio on both occasions was ‘CINC to General: ‘Turn together 16 points to starboard.’”

The sequence was to begin with the rear-most ship, cascading forward with each ship putting over its helm as the vessel astern had begun her turn. On the first occasion for this, at 1835, Scheer’s HSF was drawn out in a long untidy line. The pre-Dreadnoughts at the rear should have begun the turn but were lagging due to distortion in the line-of-battle. The commander of the rearmost Dreadnought, *Westfalen* – further ahead in the line – took the initiative and began the turn. Torpedo boats sped to the head of the line laying a smokescreen to hide the new direction of the fleet from the British. When at 1839 Scheer ordered ‘Course-West’, ships automatically aligned themselves with *Westfalen*. On the second occasion, at 1918, the about-turn of the dreadnoughts was preceded by attacking battlecruisers driven by ‘Battlecruisers - At the enemy’ at 1913, and was succeeded by the launch of torpedoes after the order at 1921 ‘Torpedo Boats to attack’. This had the desired effect of forcing Jellicoe to briefly turn his fleet away giving the HSF the room to escape into the evening gloom.
Evident is a blend of, clumsy coordination of force elements achieved by succinct orders, local initiative and training – and, therefore, less explicit communication. On both occasions, the time scale for avoiding annihilation was that of minutes. The HSF’s extensive use of wireless, the traffic of which was often picked up by the Admiralty though handled poorly, had not impoverished the personal initiative of its commanders. The spirit of Moltke’s Auftragstaktik – mission command – was alive and well on land and at sea.

At the level of entropy, we have – at least at this qualitative level – system activity distributed between its spatial and its communication degrees of freedom. The evolution of the HSF from its state of ordered deployment into battle, into ‘controlled chaos’ and finally back into orderly escape is matched by compensatory and moderate communication and intuitively determined inter-ship coordination. C2 Entropy was channelled between physical and virtual degrees of freedom while equilibrium was avoided because of communication discipline. It is tempting to conclude Scheer managed to deploy his degrees of freedom effectively, without inordinately increasing in entropy, in the space where he maintained capacity. Correspondingly, the appropriate level of control could be exercised by Scheer to achieve tactical victory – giving the British a bloody nose while affecting an escape. It is not the aim of this analysis to show why, nevertheless, this outcome was a strategic failure for the German navy.

**C2 Entropy Principles**

We arrive at this summary of the concept of C2 Entropy:

- A C2 system consists of two classes of entities, nodes and links, whose states can change with time.
- C2 links can exist without explicit communication taking place.

The input of information from the outside, through the dissemination of plans, through training or promulgation of military doctrine corresponds to the preparation of the system so that C2 links, through prior distribution of information, are created or reinforced but in a latent state. Moreover, C2 links are exercised as degrees of freedom through operational communication.

During this process, disorder is absorbed in these degrees of freedom permitting order or coordination in the configuration or other properties of C2 nodes. The dangerous regime for a C2 organisation is when C2 links, with the passage of time and the continued exercise of operational information exchange undergo equilibration (see Figure 23.4).
Implications for Future Maritime C2

The study in this chapter of two maritime engagements has yielded a concept that illuminates the transition between order and disorder in both physical and virtual properties of a naval force. This work requires both deeper quantitative analysis and extension to other maritime operations – such as those of the Pacific Theatre of WWII (Japanese fleet withdrawals from two separate naval battles near Guadalcanal suggest interesting C2 Entropy phenomena), littoral and amphibious operations. However, in focusing on ‘Naval Networks’ we are obliged to cast an eye to the future. Perhaps the days of formation fleet-to-fleet battles like Trafalgar, Jutland or Guadalcanal are over: blue-water naval effects are now to be delivered more-and-more by coordination through virtual, not physical, space. NCW, if it ever acquires an operationally useful definition, can only amplify this domination of virtual space. The aim of the following is to highlight the dimensions of the problems posed by NCW and to pose challenges, the resolution of which will allow network enablement to be viable for a future maritime force.

The network

The problem posed by NCW is well recognised, including by its authors: information overload. For C2 Entropy the problem manifests as a network enabled force being an uncontrollable, bloated (in state-space) equilibrated entity at maximum entropy. The intent of NCW is that situational awareness be enhanced for all, enabling self-synchronisation. Thus, the network exists not solely for the commander but for
every node. Every node becomes a prospective ‘controller’ of the system. However, a democratised and maximised C2 Entropy implies that no-one can be a controller of the system. The intention here is not to be a Luddite nor anti-democratic with respect to network enablement but to pose the challenge:

How can a modern network of naval platforms be structured with an appropriate diversity and hierarchy of degrees of freedom so that C2 Entropy can be manipulated for positive benefit?

Latency

Andrew Gordon, in his masterful work on the Battle of Jutland, highlights in all but name the value of latency. Through the framework of C2 Entropy, latency comes into its own. In order to avoid a spread in the probability distribution an observer associates with certain aspects of the system-state, degrees of freedom must not only be diverse but used sparingly. Message traffic in the 1990-91 Gulf War was observed to undergo ‘priority creep’ as mission criticality approached. This phenomenon is nothing other than equilibration. Worse still, a networked enabled force may foolishly be operating at full bandwidth capacity before deploying into an area of operations and find, when push-comes-to-shove, that it has no room left to move in state-space. Often the sole means of ensuring latency has been through commanders demanding the exercise of discipline in the conduct of communications ‘chatter’. In the high capacity bandwidth/disk-space/processing world of NCW personal restraint may be insufficient. The challenge can be formulated as:

How can latency of degrees of freedom be hardwired into any network enabled system allowing it to ‘grow’ in state-space in a controlled fashion as it impinges on the mission critical period?

Doctrine, training and mission command

The previous two points have spoken largely to the technology side of the NCW equation. Wisely, the ADF’s NCW Roadmap 2007 does not overlook the human element, summarised in the phrase ‘professional mastery’. Again, Gordon in his work on Jutland beats us to the punch in positing an inverse relation between robust doctrine and the need for signalling. In our context, doctrine and training play a double role in minimising C2 Entropy through system evolution. At face value, a well-trained military force guided by robust doctrine mitigates the uncertainty (read ‘probability distribution’) a commander may associate with the system-micro-state in carrying out aggregate-level control. This limits overall the amount of entropy that may be attributed to the system a priori. More importantly, good doctrine and training enable coordination between C2 nodes without explicit or detailed communication along C2 links: they cultivate latency in the system. It is mission command that enables a subordinate to take the initiative – to use doctrine and training – in fulfilling a mission in the absence of detailed control. However, mission
command has a quantitative dimension associated with it in implying a (possibly
time varying) framework of aggregating the C2 system, the environment and the
decision landscape within which devolution of control is specified. The impact of
mission command on C2 Entropy measure and system evolution is thus both direct
and complex. Like latency, it is part of the system hard-wiring. The final challenge
is then how can mission command be flexibly hard-wired into a C2 system such that
C2 Entropy growth is managed appropriately?

These challenges clearly aggregate together many more. The cyber-genie cannot be
put back in the bottle – irreversibility again, and perhaps even from entropy. The
genie must be ridden – through solid research – to make future naval networks
serve the humans at their core.

Notes
1. The author thanks Brian Hanlon, Tony Dekker and David Schmidtchen for constructive discussions
   as well as the encouragement and offer of resources from David Stevens and the Sea Power Centre
   - Australia.
2. The reference to this engagement used in this paper is that of D Irving, *The Destruction of Convoy
   consider reformation as an option. See p. 14.
   Spring, 2001, p. 53
6. Irving, *The Destruction of Convoy PQ-17*, p. 93. Note that Irving refers to ‘one ship pads’ but it seems
   clear from the context that he is referring to the well-known cryptographic device.
7. For example, the use of noise for modelling human factors in tactical combat systems. See L Ingber,
   ‘Statistical Mechanics of Combat and Extensions’, in C Jones (ed), *Toward a Science of Command,
   Control & Communications*, American Institute of Aeronautics and Astronautics, Washington DC,
   1993, pp. 117-149.
8. Three words are used interchangeably in the popular literature but which need to be cleanly
   distinguished: disorder, noise and chaos. However, they have quite a different character. Disorder
   is uniformity of probability distribution. Noise means abrupt changes in behaviour due to unknown
   influences. Chaos – not used in this paper – means sensitivity to initial conditions.
10. Private comment to author by Dr David Schmidtchen; and J Bentley, ‘Champion of ANZAC: General
    Sir Brudenell White, the First Australian Imperial Force and the Emergence of Australian Military
    Times have been converted to Greenwich Summer Time for consistency with previous time data.
13. Proper comparison of the ‘complexity’ of British vs German orders should be seen in the contrast between the above-quoted deployment order from Jellicoe with Scheer’s analogous directive to form his seven columns into a line-of-battle at 1644: ‘Follow leading ship. Alter course. Leading ships of division together; rest in succession to N’. This deserves a more careful analysis than is possible here.


24. Misdirection Amidst the ‘Fog of Relief’: Problems with Communications Interoperability in Operation UNIFIED ASSISTANCE

Bruce Elleman

Following the 26 December 2004 earthquake and the devastating tsunamis it created throughout Southeast Asia, the US military responded massively with ships, helicopters, and aeroplanes. Communications were to be a key element underlying the success of this operation. In northern Indonesia, one of the worst hit areas, the combined forces of over a dozen nations, the United Nations (UN), and over a hundred independent organisations soon formed a ‘collective’, as versus a formal ‘coalition’. Essential communications included interaction among local governments, representatives from USAID, the UN, and numerous non-governmental organisations (NGOs), as well as extensive ship-to-ship and ship-to-shore communications.

The highest level of communications was government-to-government, and included the US military’s links with the Indonesian government as well as among the various nations cooperating to provide aid. The US Embassy in Jakarta helped to pave the way for US forces, and liaison officers provided the crucial link between civilian and military hierarchies. When UN representatives, NGOs, and outside media organisations arrived on the scene, public affairs officers (PAOs) played a similarly important role in providing reporters unhampered access to the scene of the disaster.

Communications between various militaries was vital, since a total of 18 nations sent either military or naval forces, or both, to the region. Within 24 hours of the disaster, US Government officials working for Admiral Thomas B Fargo, Commander of US Pacific Command (PACOM) ‘contacted ambassadors and senior military leaders in affected countries’ so that a proper response could be planned. Soon after the tsunami Admiral Walter Doran, head of Pacific Fleet, called Admiral Arun Prakash, the Chief of Naval Operations of the Indian Navy, and the two former classmates decided where each navy would concentrate their efforts.

US embassies in the region also included defense attaché offices, which were rapidly overwhelmed with requests from the local governments. Since their relatively small offices could not handle the demand, additional military representatives were assigned to these duties. To assist their efforts, PACOM also created ‘a dedicated, round-the-clock Support Element Cell to act as the single point of contact for PACOM, the country teams, and partner nation militaries’.
Among the American naval forces, ship-to-ship communications were complicated by the need to switch from a classified to an unclassified communication network, and bandwidth allocation remained a concern throughout the operation. However, communications from the ship-to-shore and then between different shore parties on land proved time and time again to be the ‘biggest challenge’. In fact, communications from ship-to-shore and on land proved to be more complicated than it really needed to be, since unlike NGOs who had mobile phones, the US military usually had no choice but to use more cumbersome ultra high frequency (UHF) and very high frequency (VHF) equipment.\(^5\)

The post-tsunami humanitarian response in Southeast Asia was unprecedented, not only in the size and duration of the operation, but in the large number of nations participating in the effort. Reliable communications was an essential component of the operation’s success. This chapter will discuss not only the notable communication successes, but also communications interoperability shortcomings, and will make recommendations for how future ‘collectives’ might be better organised.

**Multinational and Media Communications Challenges**

The widespread destruction caused by the Southeast Asian earthquake and tsunamis impacted over a dozen countries, with well over 130,000 deaths in Indonesia alone. On 28 December 2004, PACOM Commander Admiral Thomas Fargo set up Joint Task Force (JTF) 536 under the command of Lieutenant General Robert R Blackman, Jr, US Marine Corps. JTF 536’s mission was to assist some of the most hard-hit countries, including Thailand, Sri Lanka and Indonesia. General Blackman early-on warned that reliable communications would be key to success. He even compared the ‘fog of relief’ to the ‘fog of war’ and emphasised ‘strong communication among all parties’ as the best possible solution.\(^6\)

Based in Utapao, Thailand, JTF 536 began delivering aid on 30 December 2004, only four days after the disaster. However, it soon became clear that Aceh province, in northern Indonesia, needed greater multinational assistance. On 3 January 2005, the task force was changed to Combined Support Force (CSF) 536 to better reflect the multinational nature of the relief operation. Australian and Singaporean forces had already reached Aceh province, but were soon joined by relief workers from the US, Japan, Malaysia, France, Russia, and China.

The number of countries and variety of equipment involved in the relief mission was to present a number of communications challenges. According to Ralph A Cossa, President of the Pacific Forum Center for Strategic and International Studies in Honolulu, country-to-country communications worked well during the crisis because of the foresight of the pacific nations:

> The relief operations also demonstrated the merits of the Pacific Command’s Asia Pacific Area Network (APAN). The APAN mission is to share unclassified information electronically in order to
facilitate regional understanding, build confidence among Asia-Pacific neighbours and enhance security cooperation. APAN was used extensively by Britain, Canada, Australia and the affected Asian nations while coordinating relief efforts.\textsuperscript{7}

Within the region, US Embassies became the focus of communications, but the comparatively small number of US military representatives ‘were quickly inundated with requests for assistance from the host nations’. Additional US personnel were quickly assigned to augment these capabilities. They arrived within days of the disaster and helped to assimilate information from the host nations and NGOs, and combine them with official reports from USAID and the UN. As Rear Admiral David Dorsett later concluded, ‘boots on the ground early in a humanitarian crisis are critical to developing situation awareness’.\textsuperscript{8}

Communications among representatives from the US lead organisation, USAID, the UN, and the many supporting NGOs proved essential to the relief effort. The creation of ‘Spark Teams’ helped establish communications among the various US shore parties and with other aid organisations. Spark Teams became a ‘clearinghouse for information,’ and they also ‘helped to overcome collaboration difficulties posed by differences in hardware, software, and bandwidth capabilities between military and civilian participants’.\textsuperscript{9} Promoting systems integration was particularly important, since this helped to rectify what was generally described as a chaotic first few days:

International aid workers, military personnel from several countries, volunteers, government workers, and grieving families are all trying to bring relief to an area where the full magnitude of the disaster is still unfolding.\textsuperscript{10}

Equally important was assisting the international media. Additional PAOs were quickly assigned to help, and US military personnel took responsibility for the transmission of media reports, using official satellite communications channels, over the internet, and via e-mail. For example, as soon as it arrived off Aceh province on 1 January 2005, the aircraft carrier USS Abraham Lincoln also served as an important base of operations for international film crews and newsmen, including 60 Minutes. Sending out images of the disaster was given top priority. To assist in filing video reports, they even received permission to use the classified Secret Internet Protocol Router Network (SIPRNET):

Fast file transfer was done over SIPRNET as that was least restricted for usage for those with the right clearance. Expensive equipment, not normally used so regularly, but a new way of getting video out the door.\textsuperscript{11}

Since most of the ships were able to receive satellite TV, and so could watch the media reports on television within minutes of seeing the reports being filmed, this provided an immediate and very real sense of accomplishment among the ships’
crews and shore parties. One officer even recalled the effect on morale of the first CNN reports, stating that it was a great boost to see this report on TV after the horrific sights and smells they had encountered during the first day of the operation.\textsuperscript{12}

Access to email also meant that crewmembers were constantly receiving new information from family and friends about the humanitarian relief mission, and could more easily voice their own views. Some US crewmembers were critical of what appeared to be too much assistance given to UN experts, NGOs, and reporters, with one blogging that they were ‘a travelling circus of so-called aid workers’ who wasted valuable helicopter time being ferried to shore and then back to their ‘guest bedrooms’.\textsuperscript{13} However, UN assessment teams provided a better understanding of where scarce resources should be directed, while the media created a greater awareness among the public of the extent of the tsunami disaster, thus increasing private donations to assist the refugees. US military’s communications capabilities proved vital in both of these areas.
Although the post-tsunami humanitarian relief operation was not arranged as a coalition effort, but as an informal ‘collection’, there was constant communication among the participant countries, the UN representatives, NGOs, and the press. Since all of the countries involved in the humanitarian operation were working toward the same goal there was relatively little friction that is normally encountered in the ‘fog and friction’ of war, but communications were constantly challenged by the ‘fog of relief’. In particular, reliable communications between different militaries proved to be a challenge.

Military-to-Military Communications

Communications between various militaries were particularly important, and General Blackman encouraged ‘his deputies to consult other nations regularly to avoid overlap’. It took several days for the official CSF headquarters at Utapao, Thailand, to acquire global communications, so that initially the advanced team were ‘walking into a black hole themselves’.14 During the first week of the operations, increasing the US military’s communications with other nation’s militaries remained a principal goal.

In addition to hooking up SIPRNET and Non-Classified Internet Protocol Router Network (NIPRNET) communications at Utapao, dozens of commercial mobile phones were purchased from local Thai companies: ‘Local Thai cellular phones are the convenient way to go’, argued Marine Colonel Medio Monti, who installed the communications system.15 In support of Utapao’s communications efforts, on 4 January 2005, the Australian built high-speed, shallow-draft, catamaran WestPac Express left Okinawa for Thailand carrying 630 tons of equipment, including communications gear. After a 2300-mile journey, WestPac Express arrived in Chuksamet, Thailand, on 10 January 2005.16 It disembarked 35 trucks, Hummers, and forklifts, as well as 30 pieces of communications equipment; it also was transporting 30 Marines with 7th Communications Battalion, III Marine Expeditionary Force Headquarters Group.17

Utapao was also responsible for constructing an internet website, which allowed other militaries to monitor the US military’s activities. By making this information available through the website, the planners at Utapao hoped to avoid ‘duplication and waste’.18 Due to unavoidable delays in getting the necessary equipment on-line, however, the Utapao headquarters could not establish full NIPRNET and SIPRNET connectivity until 6 January 2005. By contrast, US Navy ships like Abraham Lincoln already were up and running on most forms of communication when they arrived off Aceh province on 1 January (See Figure 24.1).

One particularly important problem was that US Navy ships were wired to work mainly on the classified SIPRNET system, not the unclassified NIPRNET, as CSF 536 in Utapao was initially set up to use. Throughout the humanitarian operation, CSF headquarters wanted to keep everything unclassified, so they could work easily
with other nations’ assets. But, *Abraham Lincoln* was required to use SIPRNET. This made communicating with Utapao more difficult, since most navy personnel were simply not used to working in a ‘predominantly unclassified environment, with 95 percent of the data used by the intelligence professionals ... being unclassified’.19 One US submariner ruefully commented how hard it was to go from a platform that was trying to be secret to one that was trying to transmit as much as possible.20

![Figure 24.1: Final CSF 536 C2 Capabilities](image)

As a result of this difference in communications equipment, during the first week of the humanitarian operation direct communications between the Naval Forward (NAVFOR) forces and Utapao was unreliable. It proved enormously time-consuming to downgrade material from the secret level to the unclassified level. As a result, much crucial information only appeared on the secret level, and hence CSF headquarters in Utapao was ‘cut out from all of this information’ and so were often operating ‘in the dark’. Although Utapao acquired SIPRNET on 6 January, the CSF still did not have very many SIPRNET accounts. The SIPRNET computers were kept in a separate building, and there were not many machines, so people did not monitor the classified machines 24/7.21

A second problem was that the communications were not set up properly for the type of multinational ‘collection’ that eventually developed. If there had been a formal coalition, the Japanese and Australians would have wanted to rely on the Combined Enterprise Regional Information Exchange System (CENTRIXS) to communicate.
But, in northern Indonesia nobody wanted to use it, since it was too difficult to operate and too many people did not have CENTRIXS terminals. By contrast, the Global War On Terror (GWOT) enclave might have been better for this type of mission, but it was set up under the auspices of GWOT and so could not be used for a humanitarian mission. What was needed instead was a general Humanitarian Assistance/Disaster Relief enclave for CENTRIXS, which would have made the operation look more like a coalition rather than a bunch of separate countries. According to Captain Brian Roby, USN, Chief of Staff, a ‘combined coordination cell’ was created instead to coordinate the participating countries, but that ‘connectivity was biggest challenge’.22

In the end, these differences did not really matter too much, since it was not really a coalition environment. Nevertheless, throughout the operation even simple communications between coalition partners remained a major problem. For example, in order to get a helicopter to deliver 10 tons of hospital equipment to a German field hospital near Teunam, about 80 miles southeast of Banda Aceh, Ina Bluemel, a German Red Cross worker, simply walked up to a US pilot ‘asking for a helicopter’. The pilot agreed, and delivered the supplies.23 This was the most typical form of coalition communications.

The At-Sea-Communications Structure

The main mission of CSF 536 was to get humanitarian supplies to those people who needed them the most. But, poor communications between at-sea components proved to be a major stumbling block. When *Abraham Lincoln* arrived off of Indonesia, it by default became the main US communications centre, which meant that it had to set up communications with Utapao and Honolulu, between all of the major naval platforms, as well as communications between the ship and the various away teams working in Aceh province. The early establishment of reliable communications proved to be particularly important, since much valuable time was saved and the humanitarian relief efforts could be carried out more efficiently.

*Abraham Lincoln*’s transit from Hong Kong to Indonesia, rather than to South Korea as originally planned, created certain communications problems. Because it was the middle of the Christmas-New Year’s vacation period, and so many people were on holiday, the required communication shift from the Pacific Ocean satellite network to the Indian Ocean network went particularly poorly. Much of the transit time between Hong Kong and Indonesia was spent getting the ship’s communications shifted to the Indian Ocean satellites. Once this took place, however, *Abraham Lincoln* was fully hooked up to the global satellite network.

The US contingent soon included six ships in the carrier strike group led by *Abraham Lincoln*, seven ships in the expeditionary strike group led by USS *Bonhomme Richard*, and eventually an additional 17 US Navy support ships; later, USS *Fort McHenry* and USS *Essex* joined the operation. There were extensive horizontal communications
and cross-talk between these ships, but each had its own zone so that there was relatively little coordination. According to one communications expert, due to ‘strike group’ centric-thinking there was insufficient integration among different US Navy assets in the theatre.24

This was in part due to the geography of northern Sumatra. Because Abraham Lincoln spent most of the time on the west coast of Aceh province, the high mountain chain running north-to-south blocked easy communications with the east side. To overcome this handicap, US ships were spread up and down along the coast of northern Indonesia to act as communications relays.25 On occasion, Abraham Lincoln also developed satellite communications (SATCOM) difficulties, especially when the satellite was directly overhead and the antennae would experience ‘black zones,’ that interfered with communications.26

To communicate from ship-to-ship, the top choice was often to use chat rooms, which used SIPRNET. No similar architecture was available on NIPRNET, which made it more difficult to communicate with foreign navies. The cost of using SIPRNET was high, and it would normally be ‘too expensive’ to be used as a chat server.27 Ideally, Utapao needed a similar cell so that it could use the same chat rooms as the ships. For several days, nobody from Utapao was even visiting the chat rooms. Some groups, including people on shore or on the hospital ship USNS Mercy, tried to use Webex. Unfortunately, this system was never used because it required a 3.1Mb applet download. Then, once it was downloaded it was, found that the chat room was password protected and the only person ... who knew the password was on leave, so they could never get in the room to use it.28

Surprisingly, global satellite communications turned out to be better and more reliable than regional communications. It took many days, and in some cases weeks, before all of the local problems were fixed, with CSG-Indonesia only gaining the full range of communications interoperability on 18 January, almost three weeks into the operation. In hindsight, it might have been preferable not to make Utapao the JTF and then CSF headquarters, but instead to coordinate early operations directly from Abraham Lincoln with a satellite communications link directly to PACOM in Honolulu, Hawaii. This probably would have had a positive impact on the speed of communications, thus increasing the ability of the sea-based platforms to conduct humanitarian operations.

**Difficulties with Ship-to-Shore Communications**

Upon their arrival off northern Indonesia, crew members from Abraham Lincoln had to first locate proper helicopter landing zones and set up communications. Establishing ship-to-shore communications was one of the most important elements during the first few days of relief effort. One of the greatest challenges for the crisis action teams on-board ship was to retain constant communications with the shore
teams working in Banda Aceh. Often, it was easiest to use e-mail to communicate, but due to a number of geographic and meteorological reasons some locations could ‘not receive data’. In addition, not only did the regular UHF and VHF radios have to be ‘in-tune with weather’ but even ‘rotor wash from helos [helicopters] would take down antennae’.29

During the first few days, the humanitarian relief effort depended on ship-to-shore communications. To coordinate the flow of supplies and control aircraft at landing zones, reliable communications between ship and shore personnel and shore personnel and aircraft were required. This often meant that each team needed one radio to communicate with the ship, another to communicate with helicopters, and a third set to communicate with other shore teams. According to Commander Williams there were ‘No comms first day. Handheld radios came second day so things worked much better’.31

To remedy this communications problem, Motorola walkie-talkies used by the munitions disposal teams as ‘expeditionary communications equipment’ proved to be especially useful, since they could function as ship-to-shore communicators. The explosive ordnance disposal (EOD) involvement with humanitarian missions had been ‘non-existent before this operation. Then they became invaluable to the missions’.32 In particular, Motorola commercial-off-the-shelf Walkie-Talkies were used for the shore parties, while to communicate with the air they had to use shorter range UHF and VHF radios, or longer range Iridium satellite phones. The Marines helped solve this communication problem, in part at least, by providing the necessary short-range equipment, but even so ship-to-shore communication remained difficult.33

Early in the mission in Aceh province, it was suggested that regular commercial mobile phones might provide the easiest solution; US relief workers were finding that regular mobile phones in Thailand were easy to use and reliable. A team was sent in to Aceh province to perform site surveys for mobile phone towers, but it was determined that it would have taken too long to get a new system operating.34 Meanwhile, the Nortel Company had promised free mobile phones to support relief operations, but the US Navy’s Judge Advocate General refused to accept them because it might appear to be a gift. Admiral Walt Doran later criticised the fact that US laws made it impossible to make use of Nortel’s generosity.35 Purchasing additional Iridium satellite phones was also considered a possibility, but they were expensive and could be difficult to use.

To resolve communication problems, every night there was a ‘hot wash’ chaired by Rear Admiral Doug Crowder, USN, Abraham Lincoln Strike Group Commander, or by Captain Matthew Klunder, the Deputy Carrier Air Group Commander. According to Captain Klunder, there were initially many delays in getting the work parties in place or back on the ship.36 To make it easier to keep track of who was working on-shore, all volunteers were put into a computer database, and the
database was then used to make assignments. In addition to keeping tabs on who was working on Indonesian territory, to make sure that nobody was left on-shore overnight, work assignments were switched around so ‘all aboard ship had an opportunity to participate’.  

In the end, most ship-to-shore communications were provided by UHF and VHF radios and satellite phones. Overall, satellite communications proved to be very good, and shore parties ‘couldn’t have managed without SATCOMs and portable communications equipment’. As AO1 Parra noted, ‘Satcoms was the mission. Control element for ship and coordination of flights from ships, tracking food, medevacs, staging area. Backpacks were used and batteries were backups’. Although Operation UNIFIED ASSISTANCE was a successful mission by any standard, certain changes in the vertical and horizontal communications structure would have eased a number of interoperability problems.

**Vertical and Horizontal Communications Problems**

Although the US humanitarian relief mission in northern Indonesia was a success, communications interoperability was a constant concern. At least at the beginning, structural problems interfered with rapid communications both vertically and horizontally. The most important problem was with the CSF 536 structure, which was headquartered in Utapao, Thailand, and which took its orders directly from PACOM in Honolulu. As one communications expert in *Abraham Lincoln* was quick to point out, ‘Not much value added by hundreds of people at PACOM, while only 40 people on the ground were doing all the real work. JTF structure might not be right’.

According to Sunoy Banerjee, a Center for Naval Analysis representative aboard *Abraham Lincoln*, as a result of these communications problems there was at times a serious disconnect between what PACOM and CSF thought was going on, and what was actually happening in-theatre. One prime example of this was the decision on what to do with *Bonhomme Richard* and her accompanying ships when she arrived in the area. *Abraham Lincoln* planners hoped to use *Bonhomme Richard* to set up a second sea-based logistical hub further south near Mulaboh. From there, she could use her helicopter force to take supplies and deliver them. This would have been a more efficient use of assets. However, the CSF headquarters disagreed and sent *Bonhomme Richard* to Medan instead, where it quickly overloaded the airport and virtually shut it down. Only a few days later was *Bonhomme Richard* finally redirected to Mulaboh.

This delay in allocating resources could have been avoided if the communications structure had been better. What they did not need was massive numbers of people up the chain telling them what to do. One solution would have been to eliminate unnecessary nodes and to ‘flatten’ the hierarchy. Reducing the vertical structure would have allowed *Abraham Lincoln* to communicate directly with PACOM: ‘E-mail
would have worked better if they could have sent it straight to PACOM, rather than through the CSF as intermediary. This slowed the information flow’.42

By contrast with the land base at Utapao, which had to build up its communications infrastructure over time, sea-basing presented a superior communications suite since *Abraham Lincoln* had unified communications, command, and control immediately upon arrival in theatre. Furthermore, everything was self-contained in one place. Bandwidth allocation was a concern, however, with NIPRNET bandwidth generally over-utilised and SIPRNET under-utilised. This created notable bottlenecks, such as accessing imagery from NIPR websites. A navy ‘lessons learned’ study published soon after the operation concluded that ‘transmission via multiple paths, as appropriate considering security classification, would have met the needs of both groups’.43

As for horizontal communications, it was surprising how long it took to get mobile communications into the theatre, and shore parties initially had difficulty coordinating with the ship, air assets, and other shore parties. Following the end of Operation UNIFIED ASSISTANCE, Combat Strike Groups were urged to establish an Expeditionary Communications capability independent of the embarked EOD detachment, as well as being willing to ‘purchase Iridium satellite telephones in sufficient quantity, based on the size and scope of the operation and other telecommunications assets available’.44

One proposed solution to these vertical and horizontal problems was to flatten the communications structure. A ‘Smart Staff’-style organisation,

> encompasses a shared representation and interactive use of planning information in a team environment, and consists of individual workplaces, generation and representation of ideas, and shared interactive large screen displays.45

If used, such a structure might have allowed for a better understanding of command and control at the staff level. As it was, there were hundreds of people working on organising the mission in other places, such as at CSF headquarters at Utapao and in Honolulu, while there were only a handful of people doing all of the real work on-site on *Abraham Lincoln*.

The one exception to this picture was that every NGO wanted a daily assessment, and the CSF staff in Utapao was responsible for putting together one team to do it for everyone. This information was made available on the Utapao web-server and could be downloaded by anyone, virtually anywhere. This website was one of the most positive developments that came out of the CSF over the month, since the diverse goals of the ‘collective’ could be better supported.
Conclusions

Throughout Operation UNIFIED ASSISTANCE, there were many communications successes, but a number of equally important failures. Successes included using mobile seabases, such as Abraham Lincoln, to help coordinate communications regulating the flow of humanitarian aid into Aceh province. According to Commander Dan Verheul, it was the Spark Teams in Aceh province that then helped organise distribution of the supplies and ‘to provide the energy to make things happen’. The combination of global and local communications made the humanitarian mission a success.

One enduring problem throughout the operation was that inherent differences between NAVFOR’s reliance on SIPRNET and the CSF 536’s decision to rely mainly on NIPRNET. Realising that this was a problem, Utapao acquired full access to SIPRNET on 6 January 2005, but even then it was sparsely utilised. More to the point, only on 15 January was CSG-Indonesia in Medan up and running on SIPRNET, while only on 18 January did CSG-Indonesia FWD in Banda Aceh for the first time acquire both SIPRNET and NIPRNET (See Figure 24.1). Almost by default, this meant that the US Navy ships off of northern Indonesia could often communicate more quickly and easily with PACOM than they could within the immediate region.

Another major problem with communications was bandwidth allocation. Much of the equipment was not designed to allow increasing bandwidth, so that far too much bandwidth was permanently allocated to equipment that went unused. For example, the US Navy allocated approximately half of all of the bandwidth for phones, but the average usage was low. It would have been much more useful if bandwidth could have been reallocated as needed: ‘Don’t need to buy more satellites, just need to allocate bandwidth where it is needed. Connectivity needs to be given top priority’.

Similar connectivity problems affected communications with the shore parties. What they needed were more mobile phones or Walkie-Talkies, which were unavailable except for a handful of Motorolas used by the explosive disposal units. As Crowder, was heard to lament:

We’ve got a bizillion dollars of satellite communications suite here in the strike group, but we are not so good with how to communicate from the ship, where the helicopters are, to the beach, where the supplies are, three miles away from each other.

Finally, the choice of Utapao as the operation headquarters was highly criticised by naval personnel on Abraham Lincoln. While keeping in touch with PACOM proved to be relatively easy, especially via the SATCOM email network, communications were more unreliable regionally, both in the vertical chain of command and horizontally between the different nodes of the command and control structure. In future humanitarian operations from the sea, it might prove more effective to sea-base the task force headquarters on a vessel, like Abraham Lincoln, which arrived in-theatre with the full array of communications interoperability.
Notes

3. Author’s interview with Admiral Walter Doran (retd), Arlington, 23 October 2006.
7. <usinfo.state.gov/gi/Archive/2005/Mar/05-433015.html>.
20. Naval Historical Center Oral Interviews, Aronson.
22. Naval Historical Center Oral Interviews, Captain Brian Roby, 20 February 2005.
24. Naval Historical Center Oral Interviews, Banerjee.
25. Naval Historical Center Oral Interviews, Aronson.
27. Naval Historical Center Oral Interviews, Jason Carter.
28. Naval Historical Center Oral Interviews, Banerjee.
30. Naval Historical Center Oral Interviews, AO1 Kevin Parra, 20 February 2005.
32. Naval Historical Center Oral Interviews, Carter.
34. Naval Historical Center Oral Interviews, Carter.
35. Author’s interview with Admiral Walter Doran (Ret.), Arlington, 23 October 2006.
38. Naval Historical Center Oral Interviews, Carter.
39. Naval Historical Center Oral Interviews, Parra.
40. Naval Historical Center Oral Interviews, Banerjee.
41. Naval Historical Center Oral Interviews, Banerjee.
42. Naval Historical Center Oral Interviews, Banerjee.
45. <stinet.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADP010687>.
47. Naval Historical Center Oral Interviews, Banerjee.
49. Naval Historical Center Oral Interviews, Aronson.
50. Author’s interview with Admiral Doran.
Richard Gimblett

There has been little exploration of the roots of Network Centric Warfare (NCW), and only slightly more attention has been directed to the role of allied navies in it, even though NCW springs from a body of allied tactical thought and procedures.¹ The Canadian naval experience with NCW presents a unique case study, in that because of its close operational association with the US Navy, the Royal Canadian Navy (RCN) has been deeply involved in the practical implementation of the concept virtually from the beginning.

This chapter begins by exploring the naval roots of NCW, from the dawn of the information age in the 1970s, when a multitude of new sensors threatened to overwhelm commanders with more information than they could process, and the range of those sensors and associated munitions expanded the scope of naval warfare to encompass literally oceanic breadths. To manage this level of complexity, allied naval staffs turned to three key capabilities:

1. Increasing use of computerised systems to process the inputs.

2. The Composite Warfare Commander concept to distribute warfare responsibilities downwards, flattening traditional notions of command.

3. Satellite communications that allowed real-time global communications at reliable data flow-rates.

The chapter then undertakes a case study in the experience of the RCN with the practical development of NCW to its present-day incarnation as network-enabled operations (NEOps). Through the 1980s, the RCN gained practical experience in each of the three capability domains described above, leading to an important Coalition command role in the 1990-91 Gulf War. Through the 1990s, this experience was broadened to include direct and privileged participation in networked operations as new Canadian frigates deployed to the Persian Gulf ‘integrated’ into US Navy carrier battle groups. This culminated in the wake of the Al Qaeda attacks of 11 September 2001, when the RCN quickly found itself charged with exercising command of other Coalition naval forces in the Arabian Sea theatre of operations, in which possession of networked capabilities was critical to success.
Determining the Roots of NCW

There has been little exploration of the roots of NCW for a variety of reasons that are interesting avenues of exploration in themselves, let alone for the implications they have for the way in which NCW has developed.

To begin, it has been difficult for outside observers with no security clearance to keep abreast of detailed tactical developments in recent decades, and naval officers themselves (as with all practitioners caught up in the rapid pace of the present day) have lost sight of the historicity of their profession. While it is simplistic to invoke the cliché that history repeats itself, historians are well aware of the cyclical nature of command at sea. A closely related second dimension stems from the impulse of proponents of NCW to project it as a radical new concept, contrary to which stands the fact that, although NCW is indeed revolutionary in its implications for military operations, it has been evolutionary in development. That evolutionary development has been partly due to the costs of implementation (it being prohibitive, for example, to refit entire fleets all at once, and as such most units throughout a fleet are in different stages of transition), and partly due to the differential timings of the various ‘defence cycles’.

Those defence cycles make up a third dimension to our exploration; in many ways they have always been with us, but the fact they have speeded up in recent decades makes them seem ‘new’ to the extent that one analyst has labelled ‘the interactive cycle problem’. The informatics technology cycle of roughly 3-5 years corresponds roughly with the operational employment cycle of 5-6 years for most officers (the Canadian system is held out as typical, being 2-3 years in an at-sea position, followed by 2-3 years ashore before returning to sea again). This makes it relatively simple for professionals to keep pace with the implementation of new systems, but against this runs the capital equipment procurement cycle that can be as long as 15-20 years for a major program purchase, rendering any such acquisition at least three ‘generations’ out of date at the point of entering service. The main point in the case of NCW, however, is that naval practitioners have taken in stride the progress of the past two decades (encompassing at least three informatics-operational employment cycles or generations) that seems revolutionary in its pace of implementation to outside observers thinking in terms of traditional generation cycles of 20-25 years.

A fourth dimension is the general acceptance of the notion that allied navies are unable to keep up to the US Navy, due to incompatible acquisition frameworks driven primarily by much more constrained defence budgets, but due also to Congress-imposed constraints on the sharing of US technology. Until recently, Canada has been the lone (and usually unremarked) exception to this latter constraint, due to the ‘very special relationship’ stemming from shared responsibility for the defence of North America (most visible in NORAD, although the Basic CANUS Defence Plan has had an equally important naval element, going back to its origin in 1940). National political differences over prosecution of the 2003 Gulf War have begun to
erode this unique Canadian access, with the US Congress becoming more willing to open it to the British and Australians who joined in Operation IRAQI FREEDOM.

Finally, returning to North America, it is not widely appreciated that our two navies have different levels of integration between the west and the east coasts, both within themselves and with each other. Within the US Navy, the division between 2nd Fleet based in Norfolk and 3rd Fleet in San Diego is especially acute, and to a certain extent this has driven the differentiation within the RCN between the west and the east coasts; whereas on the west coast the direct bi-national collaboration has been quite seamless for at least two decades, the requirement on the east coast to engage concurrently a range of allies within the NATO framework has led to development on the east coast of a diverging (and to some extent more operationally inhibited) doctrine. Robert Kaplan discusses this theme (with occasional indirect references to NCW) noting how it is far simpler for the US Pacific Command (PACOM) to engage regional partners in multiple bi-lateral arrangements, whereas Commander Second Fleet in Norfolk must seek consensus within NATO’s multilateral ‘warfare by committee.’ However, as will be seen below, the implications for NEOps are decidedly mixed.

**Technology and the Evolution of Naval Warfare**

The roots of NCW go back to the rapid evolution in naval warfare that began in the 1970s. A study in the mid-1980s, looking back at the historical process of ‘Technology and the Evolution of Naval Warfare’ since the 1850s, tracked the steadily increasing progress: from ‘high seas combat’ at a range of a mere three miles at the beginning of the 20th century; through the ‘integrated systems’ of long-range gunnery, destroyer torpedo boats and submarines culminating in World War I at a range of 6-10 miles; then to the dawn of ‘three-medium combat’ in the interwar years, incorporating torpedo planes with a range of 150 miles, but still based upon the line of battleships and attendant destroyer screens; through the demonstration of carrier-based air power from World War II (WWII) to the age in the 1980s of ‘air-delivered guided ordnance’ enveloping a range of 500 miles around the aircraft carrier. The author concluded that:

> We are probably now [1987] in the midst of the next major transition. It has already brought ocean area coverage in command, control, and communication, as well as intelligence, navigation, and meteorology information. The same transition will make it possible to conduct tactical reconnaissance over areas as large as the North Atlantic or Indian Oceans by the end of the decade. The culmination of this series of developments may well bring tactical integration of ocean areas. The major technological development that permitted these advances in capability is the earth-orbiting platform.

Indeed, technological advances to the 1980s were combining to fundamentally change classical notions of naval command and control (see Figure 25.1).
The Composite Warfare Commander Concept

Until the early 1980s, naval command at sea was being exercised much as it had been for the previous 400 years (Admiral Nelson’s famous ‘band of brothers’ notwithstanding), in a style defined by one theoretician as ‘command-by-direction’, whereby commanders attempt to direct all of their forces all of the time. To be sure, some changes had occurred, the most readily discernible being that the centre of naval power had shifted during WWII from the line of battleships to the aircraft carrier task force. A less obvious development was the nascent idea of what has come to be termed in allied doctrine as ‘command by negation’, resulting from the influences of improved technology (which demanded higher education levels of most ratings) and the consequent faster pace of action (which demanded a greater speed of reaction against a broader range of air, surface and sub-surface threats). Both combined to encourage the delegation of procedural decision-making responsibilities downward to lower tactical commanders or even onboard systems operators. This worked well within a ship, where the captain could easily exercise a veto function, having shifted his action station from the open bridge into the embryonic enclosed operations room. Within larger formations, however, the officer in tactical command (OTC) still firmly retained a somewhat rigid overall control.
A variety of factors came together in the late 1970s to force a re-thinking of this time-honoured system of naval command. The dawn of the ‘information age’ was precipitating the dramatic escalation in the pace of technological change, spawning the introduction of a multitude of new wide-area sensors (for example, Airborne Warning and Control Systems, satellites, Sound Surveillance System) that in turn threatened to overwhelm the OTC with more information than he and his staff could process. Simultaneously, the range of these new sensors in tandem with the reach of carrier aircraft equipped with guided munitions were expanding the scope of naval warfare to encompass literally oceanic breadths (that is, an area of responsibility measured in hundreds of thousands of square miles). From all of this came the US Navy’s new Maritime Strategy that envisioned the management of a global naval war against the Soviet Union. One present-day paper tracing the evolution of NCW points to this period as the defining moment when the US Navy began to recognise the ‘dramatic doctrinal evolution occurring in the Army’ in the development of Air-Land battle, to begin its own shift from platform-centric mass to manoeuvre warfare incorporating the predominant principles of initiative, speed, long range and precise firepower.

Managing this level of complexity was a challenge for the best of admirals, even with the capacity of a full staff embarked in the new specially designed command and control ships US Ships Blue Ridge and Mount Whitney (which entered service in 1970-71, assigned respectively to the Pacific and Atlantic commanders). The answer was the Composite Warfare Commander (CWC) concept. This concept essentially distributed responsibility and devolved appropriate authority downwards to competent subordinate commanders in each of the warfare areas (for example, anti-submarine warfare (ASW), anti-surface warfare (ASUW), anti-air warfare (AAW) and strike), under the watchful eye of the OTC who, having provided his overall commander’s intent, could use the range of modern communications at his disposal to monitor progress and exercise command by negation from his flagship. Although the splitting of warfare responsibilities amongst subordinate commanders had begun to take place over the years, the practice was inconsistent, and not always clearly defined. In the early 1980s, the US Navy sought to institute a more formalised procedure with clear delegation of command and recommended it to NATO as an ‘experimental tactic’. By the end of the decade the CWC concept had been formally integrated as doctrine into NATO’s primary Allied Tactical Publication, ATP-1. Through the years, various refinements were added, such as a series of operational tasking formatted messages by which the OTC and his subordinate commanders could promulgate standing instructions and any modifications to them in a familiar and easy-to-read style.

With only slight modification, the CWC concept has been established as the basic organizing concept for command of coalition naval warfare. The Multinational Maritime Operations Doctrine Manual provides a general description:
The grouping of units within a maritime Task Force will be based on the force’s assigned mission and threat. Protecting the force while conducting sea control and power projection missions normally requires the selective delegation of warfare functions (such as, ASW, AAW, [and] ASUW) from the [OTC] to a subordinate commander. This process is embodied in the [CWC] concept.

The CWC concept allows the Task Force Commander or OTC to delegate tactical command (TACOM) to a Composite Warfare Commander to conduct power projection operations, counter threats to the force, and conduct sea control operations. However, in practice, the OTC would normally retain the duties of CWC [see Figure 25.2]. Depending on the size and complexity of maritime operations, the CWC may subsequently delegate tactical control (TACON) of some or all of the warfare functions to subordinate commanders. When maritime operations involve more than one Task Force [TF], each TF will retain its own CWC structure. To minimise mutual interference, the MNFC [Multinational Force Commander] will need to identify how TF warfare and sustainment activities will be coordinated within the maritime battlespace (e.g., establish a geographic area of operations for each TF or assign one TF to coordinate all TF activities). During a joint campaign, command of power projection operations such as strike and amphibious operations would normally be retained by the CWC of the carrier or amphibious TF. Functional responsibilities can also be assigned for selected operations such as maritime interdiction ... or special operations ... A similar organization may be implemented for a multinational force. When directed by the MNFC, subordinate commanders will act as warfare or functional commanders within the multinational force.13

The CWC concept retained the appearance of classic command-by-direction in its hierarchical task organisation; however, in breaking down the previous rigid centralised control and allowing for subordinate warfare commanders’ intent, it conceptually shifted western command and control (C2) practices to something more closely resembling ‘command-by-influence’. This command style attempts to deal with uncertainty by moving decision thresholds to lower command levels, thereby allowing smaller units to carry out missions bounded by the concept of operations derived from the commander’s intent.14
The Canadian Naval Experience of Network Enabled Operations

This is an appropriate point to turn to the Canadian naval experience with NCW. As a NATO ally, the RCN quickly became familiar with the CWC concept, but regrettably was only able to employ it initially at a much lower level than intended, having lost its aircraft carrier in the late 1960s, and consequently being consigned to the close-in ASW screen around the main body (that normally being a function retained under the direct control of the OTC or the US Navy cruiser commanding the inner screen). However, the RCN did possess four modern DDH-280 *Iroquois* class destroyers, equipped with the latest computerised digital display command and control system, connected to the rest of the force by the revolutionary ship-to-ship-to-aircraft tactical datalink Link-11, and importantly embarking two large Sea King ASW helicopters that rationalised a 100-mile radius of operational control. The industrious Canadian staffs who found a new home in these ‘Sisters of the Space Age’ (as the DDH-280s were styled when commissioned in the early 1970s) pressed to be delegated the subordinate ASW commander duties, and for their reward quickly found themselves deluged with information, not unlike their senior American commanders, even within that area of specialization. A later commander of maritime command, Vice Admiral Lynn Mason, recalls that as captain of HMCS *Iroquois* in 1981-82, the volume of operational message traffic led him to assign a senior ship’s officer full-time to the task of filtering and digesting it into a manageable volume that he might absorb efficiently. The effort was magnified at the task group level, requiring the embarkation in the modest Canadian destroyers of additional officers and senior ratings (and the supporting communications systems) to form a staff roughly equivalent to that of a US Navy battle group to manage the information flow. With dogged determination, however, by the late 1980s Canadian task group commanders regularly were exercising the ASW commander function in major NATO exercises. By the time of the 1990-91 Gulf War, the level of staff expertise
had received general recognition, such that the Commander of the Canadian task group was the only non-US Navy officer assigned a subordinate warfare commander role in that conflict, as Commander of the Coalition Logistics Force. That same commander discerned that the prevailing conditions of the ad hoc structure of coalition warfare were far different from the obligations of a formal alliance, leading him to suggest a re-definition of C2 from ‘command and control’ instead to mean ‘cooperation and coordination.’

In the meantime, other developments had pushed the Canadian navy quite legitimately into the CWC role while also laying the groundwork for later participation in the network-enabled revolution. From the mid-1980s, several Canadian ships were equipped with towed array sonars, in anticipation of that being the primary underwater sensor of the new general purpose Canadian patrol frigates then under construction. With passive detection ranges often in the order of hundreds of miles, these ships were most effectively stationed well outside the inner screen. Such over-the-horizon ranges, in contrast to active sonar ranges measured in thousands of yards, quite literally broadened the perspective of Canadian naval commanders. In another sense, such ranges also were beyond the capacity of the line-of-sight UHF Link-11 datalink, and longer-range high frequencies (HFs) that could follow the earth’s curvature, because they proved unable to handle the flow-rates necessary for a reliable datalink (HF signals also were easily subject to enemy direction-finding and as such had to be avoided in most tactical situations). The obvious solution was acquisition of satellite communications (SATCOM) operating at UHF and higher frequencies (all line-of-sight into space and returned on a narrow undetectable ‘footprint’). Of the various NATO systems becoming available, Canada fatefully invested in the US Navy Fleet SATCOM, owing to the fact that our towed array-equipped ships were working closely with US Navy forces in the prosecution of strategic ASW against Soviet ballistic missile firing submarines. This new role was made possible, as discussed earlier, primarily through the unique high level Canadian access to American communications and command procedures, and indeed Canadian ships commonly came to be equipped with standard fits initially of the Joint Operational Tactical System digital display and eventually its web-based successor, Global Command and Control System, Maritime. In return, the unique Canadian role in facilitating command of Coalition naval forces in the Persian Gulf in 1990-91 validated the broader applications of this high level access onto the international scene, beyond the strict defence of North America, into the realm of coalition warfare. Where interaction with American naval forces had always been an accepted part of broader alliance duty for all navies within NATO, the RCN suddenly came to the realisation of a much deeper meaning: what would soon become known as ‘interoperability with the US Navy’ was appreciated to be a fundamental operating tenet, and within that, communications were a key element worth continued investment.
Therefore, by the early 1990s, two of the essential building blocks for NCW were in place: the routine assignment of separate warfare commanders for area air warfare, ASW and ASUW within the CWC concept had flattened traditional notions of command at sea; and the increasing use of fleet satellite communication satellites allowed real-time global communications at reliable data flow-rates. The RCN had enjoyed recent practical experience in both domains, and each in a fashion that solidified the unique relationship with the US Navy. Ironically, these two conditions came about at the same time that the geostrategic situation driving American C2 innovation changed fundamentally. In Canada, as with NATO more generally, there was an expectation that the collapse of the Soviet Union would lead to a ‘peace dividend’ in the form of reduced military budgets. In the United States, however, the disappearance of a ‘peer competitor’ did nothing to slow continued development of new information systems. The impetus now was coming from technology itself, as the computer revolution began to be felt at a more personal and hence immediate level in the early 1990s, with widespread access to the Internet and user-friendly web-based software functions.

The full implications of the computer revolution for command at sea were not truly appreciated anywhere in the early 1990s, let alone within the RCN. At a very basic level, the age of the Canadian ships available to deploy to the Persian Gulf had embarrassed the government into taking whatever steps were necessary to equip them properly; the resulting free flow of money (albeit still at relatively modest amounts, given only three ships were involved) witnessed the proliferation of personal computers acquired for use as word processors throughout the ships, leading in turn to a great leap in the computer-literacy of Canadian sailors. More prosaically, the early 1990s saw the virtual rebuilding (one might call it ‘the transformation’) of the Canadian fleet, with the introduction into service of the new-build Halifax class Canadian patrol frigates and the upgrading of the Iroquois class through the Tribal Update and Modernization Program (TRUMP). Both programs having been designed in the mid-1980s, computers were a major element in their equipment: for example, the basic platform machinery and combat systems of the CPF were run by a revolutionary (for the times) distributed network of what were essentially 14 Apple 512s (that is, 512kB times 14, or slightly more than 7MB of total memory, although over a third of that was lost due to the database management system employed); TRUMP accomplished roughly the same for the Iroquois class. The command and control systems within both these classes, being of such recent design origin, were the envy of many other navies.

Similar developments were occurring, naturally, in other navies as computers rapidly spread into wider use in the first half of the 1990s, especially in the US Navy. As access to the internet also became generally available, one of the first to recognise the operational C2 potential was PACOM based in Pearl Harbor, Hawaii, on whose associated staffs serve a number of Canadian naval officers. In particular, the Commander Task Force 12, the Pacific theatre ASW commander appreciated that a satellite-based classified military version of the internet could solve a number
of C2 problems he faced, as the ideal medium through which to coordinate the multiple inputs over the vast distances from the variety of units and assets under his command. A collaborative effort with the defence industry supplier, Orincon Corporation, produced the Web-Centric Anti-submarine warfare Net (WeCAN) as a "real-time theatre and tactical level information sharing capability for [under-sea warfare] collaborative planning and execution." WeCAN first became operational in 1996, and from its beginning as a network for email exchange and the sharing of common basic information posted to a centralised server, WeCAN immediately proved its worth, for example in allowing new units joining an ASW operation to pull down pertinent information from the net (typically in the form of pre-formatted messages), rather than the ASW commander having to re-transmit a large volume of messages; another function allowed units prosecuting a contact to post their acoustic and other sources of information for viewing and collaborative assessment by other units. Within the US Navy this eventually was imported to the developing Secret Internet Protocol Router Network (SIPRNET), a US Department of Defense managed system to allow the sharing of classified information among military personnel, with multiple levels of access) to allow access with the other branches of the US armed forces. Experiments were conducted with a lower-classified version known as Coalition Wide Area Network (COWAN) during Exercise RIMPAC 98 involving various 'Rim of the Pacific' nations in the summer of 1998, and this became the basis for a COWAN employed by naval forces gathered in the Arabian Sea for Operation ENDURING FREEDOM from the autumn of 2001. With the availability of additional soft- and hardware technology such as the establishment of ‘Chat Rooms,’ WeCAN / COWAN (see Figure 25.3) has quickly grown into Combined Enterprise Regional Information Exchange System (CENTRIXS), and a collaborative command decision-making tool, the latest version of which is known as ‘C@S2’ (Collaboration at Sea, Version 2).

Once again, the RCN was deeply involved with this process practically from its earliest days. In 1995, the Canadian Government decided to deploy a warship to the Persian Gulf to assist in the enforcement of United Nations sanctions against Iraq. The ship designated was one of the new frigates, the Esquimalt-based HMCS Calgary, to be part of a US Navy 3rd Fleet carrier battle group. In pre-deployment planning, it occurred to the various staffs that the modern weapons and communications systems of the frigate meant Calgary could effectively take the place of a US Navy ship, helping to relieve the manning pressures facing the American fleet as it downsized from the 600-ship Cold War navy. Such full ‘integration’ into the battle group was contingent upon complete communications ‘connectivity,’ but even the high level access enjoyed by the RCN with the US Navy was not sufficient to have yet allowed SIPRNET access. Recognising the benefit to both parties, the new Commander of Maritime Command, Vice-Admiral Lynn Mason met to resolve the issue with the Chief of Naval Operations, Admiral Mike Boorda. Boorda agreed to Mason’s proposal, and Calgary was fitted with all the required systems. The deployment proved to be a great success, becoming the model for a subsequent half-dozen similar deployments that took place before the fall of 2001 (roughly one a year, each for about a six-month period).
An important aspect of these communications fits (which included not only the specialised displays and computer software, but also the internal ship local area network (SHIPLAN) and external satellite components) was that they were obtained as ‘mission fits’, that is, specific acquisitions for each particular ship for the designated mission. It is Canadian practice that mission fits of most equipment is removed on completion of a deployment, typically for transfer to a ship proceeding on the next mission. In this instance, the US Navy had developed sufficient incremental improvements to the SIPRNET/COWAN system by the time of each subsequent mission that it was better value to obtain a completely new system each time rather than expend the additional removal and installation costs. At the same time, however, the original basic fit remained sufficiently useful that it could be brought up to date through an end-of-fiscal-year ‘minor requirements’ purchase. In this fashion, by the summer of 2001, nearly half of the frigate fleet was fitted with network-enabling technology, and a large number of crews were familiar with its use; importantly, it had all been accomplished at significantly lower cost and a much-abbreviated period than a formal capital acquisition program.

The fits and familiarity were not distributed evenly, however, because the majority of frigate integrations had been with Pacific Fleet battle groups, and only one ship from Canada’s Atlantic fleet had occasion to experience the complete communications interoperability with the US Navy, that being HMCS Charlottetown, attached to a 2nd Fleet Surface Action Group (commanded from a cruiser and therefore significant
also in operating at a lower communications level than an aircraft carrier battle group). Off-setting that to a limited extent was the fact that the east coast destroyers HMC Ships *Iroquois* and *Athabaskan* had been fitted with a much larger scale of equipment for the six months each had been employed as the flagship for Canadian command of the NATO Standing Naval Force Atlantic in 1999-2000, although again this was not to the high connectivity level of the west coast. An assessment of that command tour offers the following overview:

The most recent operations have demonstrated that information management is becoming a complex affair. The US Navy is leading the Revolution in Military Affairs ... at sea, and countries that wish to operate with the USN, in the littorals or elsewhere, must try to stay in step. This requires compatible high-speed and secure data links, use of the Internet for open source intelligence, internal ship and staff Local Area Networks (LANs), video teleconferencing between ships and formations, and other means of rapid and reliable communication. The Canadian Navy is well placed to conduct operations with the US and other Allied navies; however, a great deal of effort will be required to achieve Network-Centric Warfare (NCW), where all operational maritime units are ‘netted-in’ to the operational picture. NCW will likely lead to centralized control of sensors and weapons to optimize capabilities, thus making the waging of maritime warfare more efficient. Ultimately, this enhanced ‘connectivity’ will allow naval forces to ‘link in’ more completely with both land and air forces that are also operating in the littorals.²⁹

From this auspicious practical operational beginning, the involvement of the RCN soon came to include the theoretical development of NCW itself. Among those observing the increasing use of networked communications through the 1990s was Vice Admiral Arthur Cebrowski, the US Navy’s Director for Space, Information Warfare and Command and Control; in concert with a number of former colleagues elsewhere on the Pentagon’s Joint Staff, he began to develop his vision of NCW, first published in January 1998.³⁰ He was able to exploit his anticipated shift to the Naval War College to include NCW as one of the experimentation elements for that summer’s Global War Game, an annual modelling and simulation event that had begun in 1979 specifically to game the US Navy’s Maritime Strategy.³¹ Through the 1990s, the scenarios obviously had narrowed somewhat from global war with the Soviet Union, but attendance at the game had broadened to include the other close allies Australia, Canada and the United Kingdom (AUSCANUKUS, commonly referred to collectively as ‘four-eyes’). Normally the game was staged in-house at the war college, but to add realism to the 1998 experiment Cebrowski included a real-time satellite link with the 3rd Fleet carrier battle group preparing to deploy to
the Persian Gulf – including the integrated frigate HMCS *Ottawa* (IV). Such a level of activity, including Canadian and allied participation, continues to this day, leading to a fairly broad theoretical as well as practical familiarity with the concept.\(^{32}\)

In the wake of the Al Qaeda attacks on the United States on 11 September 2001, Canada deployed the east coast task group to support the global war on terrorism (widely known as Operation ENDURING FREEDOM, the initial Canadian contribution was called Operation APOLLO).\(^{33}\) The Canadian navy was the first major non-American force to arrive in-theatre, and quickly found itself charged with the significant undertaking of exercising command over other Coalition naval forces as they arrived in the Arabian Sea theatre of operations (four Canadian commodores served in succession over the 18-month period from November 2001 through June 2003). The appointment as Warfare Commander for the Arabian Sea theatre of operations, Commander Task Force 151 was arguably the first true exercise of operational-level command by a senior Canadian officer since WWII. It could not have been accomplished as successfully or as professionally as it transpired but for the employment of networked operations. A similar combined task force (CTF) - CTF 150 - operated in the Horn of Africa region commanded in rotation by continental European Union allies, but to nowhere near the same level of connectivity with the US Navy or consequent operational success.

Just as the Arabian Sea by now was a familiar theatre of operations for the RCN, the progressive engagement in network enabled operations over the past decade facilitated the maintenance of completely integrated communications connectivity with US Navy commanders, specifically Commander 5th Fleet in Bahrain and the others embarked at-sea in the carriers. To complete the C2 links, Canadian commanders at national headquarters in Ottawa and the command detachment at Central Command headquarters in Tampa, Florida, were outfitted with necessary equipment and channels, as was the detachment commander of the Aurora long-range maritime patrol aircraft at ‘Camp Mirage’ (the Canadian air base at an undisclosed location on the Arabian Peninsula). For those air force and army officers not yet familiar with this level of networked operations, it was eye-opening experience. The full range of network-enabled capabilities (and dizzying array of acronyms and systems – at least to the lay reader) is testament to the complexity of the range of information at the disposal of the modern naval commander (and required to be managed by him): the ‘secret’ level COWAN, with its cross-linked web pages, email and ‘Sametime Chat’ features; MCOIN III (the most recent web-based version of the Maritime Command Operational Information Network, a classified national wide area network similar to the American SIPRNET, with COWAN and now CENTRIXS residing on it); and the Link-16 and Link-11 tactical datalinks, as well as the Global Command and Control System to maintain the ‘recognised maritime picture’.
The global ranges involved, and the enormous bandwidth ‘pipeline’ needed to maintain the networks listed above, could only be assured by ready access to several SATCOM channels, which therefore also became the limiting factor. To extend the connectivity throughout the task force, the Canadian task group commanders pushed other coalition members to adopt COWAN. The US Navy was quite happy to allow firewalled access to lower levels of their classified networks, but even longstanding NATO members ended up declining to engage, mostly because of the costs to obtain the required technology and to rent the satellite channels. Those few that did join COWAN (such as the British and Australians) chose to attempt to do so on satellite channels rented for only short time blocks each day, but ultimately found that partial engagement operationally limiting, forcing them into discrete roles: the Royal Navy commander chose to maintain his task group as a separate entity, which allowed direct support to the US Navy, but reinforced Britain’s separation from the rest of the so-called ‘coalition of the willing’. When the US Navy delegated command of interception operations in the northern Persian Gulf area to the RAN, the Australian task group commanders found they had to embark in the US Navy Aegis destroyer assigned to his group to gain access to the communications and displays needed to perform the role. The Canadian commanders were not so constrained, but did appreciate the limitations of the forces under their command. However, the coalition forces also constituted the bulk of the forces assigned to the area, and to ensure their most effective operational employment, the Canadians pressed hard to gain their access to the vital information exchanges. Eventually a modest short-range network was established for the non-SATCOM fitted coalition members, through the mediums of HF Battle Force Email (BFEM) and Link-11 tactical datalink. But as one of them, Commodore Eric Lerhe, observed, ‘We never got BFEM to carry longer than 30-40 nautical miles, so calling it an “Arabian sea network” is a bit of a stretch.’

Although the maintenance of the networks described above were contingent upon the capability to perform the range of warfare activities, which defined CTF 151’s mission as a classic exercise of sea control, in fact they had little to do with the warfare exercise of power projection envisioned by the proponents of NCW. This distinction was underscored by the very the purpose of CTF 151, which was to facilitate the continued engagement in the war against terrorism of coalition members who disagreed with the American prosecution of the war against Iraq. As such, there was a clear separation of activities between the overt warfighting of Operation IRAQI FREEDOM and the picture compilation and maritime interdiction of the on-going Operation ENDURING FREEDOM. Nonetheless, the Canadian task group commanders saw the employment of NCW principles in the instantaneous worldwide communications and situational awareness to allow tactical actions based on blended inputs. As Lerhe again put it, ‘The Task Group Commander embarked in a Canadian destroyer enjoyed a level of command, control, communications and intelligence unmatched outside of a USN cruiser.’
By way of conclusion, one might observe that they put that level of access to even better effect, by working hard also at innovative and adaptive uses of other technology, such as to expand the technology net to include those outside of it. Indeed, the RCN has recognised its ‘force multiplier’ potential by acting in a ‘Gateway C4ISR’ capacity between the US Navy and less well-equipped coalition members. The challenge remains the ability to maintain the pace being set by the US Navy. As observed in a staff analysis by a senior Canadian naval officer:

Technological solutions are being developed to overcome these obstacles, however a restrictive information sharing culture in the US is proving to be as difficult as the technical one. Until these problems are resolved, the Canadian Navy’s necessary vision of seamless technological procedural interoperability with the US Navy will remain highly problematic.

This chapter has shown that, given our close operational association with the US Navy, the RCN has been deeply involved in the practical implementation of network-enabled capabilities virtually from the beginning. However, as a junior alliance (and more recently coalition) partner to the US Navy, the Canadian experience differs in some fundamental ways. These in turn highlight points of vulnerability in the US Navy approach, while offering useful thoughts on the way ahead. Where a number of naval analysts foresaw a major problem with NCW being the ability of coalition partners to keep pace with the US Navy, the practical experience of what might be called ‘the Canadian model’ is that there is a place for small navies in NCW.

Notes


9. An example of Airborne Warning and Control Systems or AWACS is the US Air Force’s E-3 Sentry, while a Sound Underwater Surveillance System or SOSUS, is an area network of listening devices on the ocean bottoms.


11. The description that follows is necessarily simplified in the interests of making the general principles accessible to lay readers. Naval professionals will know that the development was neither as smooth nor as effectively put into practise as might be inferred as suggested here.

12. The Composite Warfare Commander Concept was originally promulgated in AXP-5 (the secret allied compilation of experimental tactics) as EXTAC 740.


16. Previous tactical datalinks (also referred to as TADILs) had passed teletype messages that needed to be hand-plotted. Link-11 transmitted computer graphics to be automatically overlaid on the ship-generated radar display. The standard present-day TADIL is Link-16, which incorporates embedded ‘pages’ of amplifying information on each graphic symbol.

17. Author interview Vice Admiral Lynn Mason (Rtd), Halifax, 12 May 2005.


21. Background on the development of Joint Operational Tactical System through the follow-on system of Joint Maritime Command Information System) to the current Global Command and Control System, Maritime can be found at: www.fas.org/irp/program/core/jmcis.htm.

22. It is impressive just how little computing power is required to run the basic ship’s systems: the networks described in the text are still in service nearly two decades after initial design, with that for the Halifax class about to be updated as part of their mid-life upgrade (nothing similar is envisaged for the Iroquois class, as those 40-year-old vessels are to be withdrawn over the coming decade).


25. Mason interview.


28. Email correspondence Lieutenant Commander RWH McKillop (Rtd), 1 June 2005.


32. Author interview with Captain Ian Parker (Rtd), Ottawa, 31 May 2005.

33. For an overview of Operation APOLLO, with particular emphasis on the naval participation, see Richard Gimblett, Operation Apollo: The Golden Age of the Canadian Navy in the War Against Terrorism, Magic Light, Ottawa, 2004.


36. Email correspondence with Commodore Eric Lerhe (Rtd), 27 June 2005.

37. Author interview Commodore Eric Lerhe (Rtd), Halifax, 13 May 2005.


40. Carr, ‘Network Centric Coalitions: Plug, Pass, or Plug-in?; and Barbara A Geraghty, ‘Will Network-Centric Warfare be the Death Knell for Allied/Coalition Operations?’, unpublished US Naval War College Paper, 1999. Paul T Mitchell, ‘Small Navies and Network-centric Warfare: Is There a Role?’, Naval War College Review, vol. 56, no. 2 (Spring 2003), was a seminal but sceptical article on the subject, but was published without benefit of the recent experience of Canadian command of Task Force 151 in the Arabian Sea, which was proving the concept already was being achieved in practice; his companion chapter in this book is a much more positive perspective.
The ADF’s adoption of network centric warfare (NCW) is driving the RAN’s command and control future. Future technologies, particularly advances in information technology, will enable a more distributed command structure for the ADF, but it is critical to remember that command is, and will always remain, a human function.

The Navy Contribution to Australian Maritime Operations

In October 2005, naval personnel around the world remembered the Battle of Trafalgar; a naval battle fought in 1805. That we remember this event 200 years later stands as testimony to the great strategic victory that was won that day for the British nation.

Trafalgar was a brilliant victory. Eighteen French and Spanish ships of the line were captured without the loss of one English ship. Britain gained undisputed control of the seas around her, and the threat of invasion by France, a constant presence since the start of the Napoleonic War in 1803, was finally removed. Tactically a masterstroke of planning and execution, the sea battle also marked a strategic watershed that turned the tide of the war against France in England’s favour. It was an empowering victory for Britain, and set the scene for the final victory against France achieved by Wellington at Waterloo in 1815. It was also the last major naval battle in the age of sail.

Trafalgar exemplifies the excellence of Nelson as a commander; indeed, 200 years later, it is the victory for which he is most venerated. However, as great as Trafalgar was for Nelson, it was also a defining moment for his commanding officers and their respective command teams. Nelson, aboard HMS Victory, did not win Trafalgar alone; it was the combined effect of a number of discrete command teams acting to achieve a common goal – the defeat of the combined Fleets of France and Spain – that carried the day.

There are those who like to believe that NCW is new; certainly the technology in use tends towards the ‘latest and greatest’. However, at Trafalgar we see an excellent example of the benefits to be gained by promoting the ‘sensor-shooter-decision-maker’ relationship. In other words, at Trafalgar, we have an example of NCW at its best, given the technology available at the time.

To briefly elaborate. The primary sensor was one’s eyes; the shooter – the warships of the British Fleet, and the decision-makers, the respective commanding officers. The medium by which orders were communicated varied between signal flags and
voice. Underpinning this system was a clear understanding of the commander’s intent; this having been communicated in person by Nelson to his commanding officers the evening prior aboard Victory. The final key to success was Nelson’s trust of his commanding officers to then take the fight to the enemy, with the minimum of intervention by him. This use of mission command empowered his decision-makers to ‘fight and win’ even though Nelson lay mortally wounded in the bowels of Victory for the majority of the battle.

Much of what happened that day at Trafalgar is relevant to the way we conduct NCW today.

The Fleet

In the maritime environment, it is fortunate that interaction and cooperation between naval, land and air forces, both domestic and foreign, has been occurring for many years. The maritime culture is one of cooperation, and hence the concept of interoperability has always been valued highly.

In achieving interoperability, navies have established information-sharing networks as a matter of course. Whilst the mediums used have varied in response to technological change, the requirement to share information within the ‘sensor-shooter-decision-maker’ relationship has remained constant. Hence, it can be argued that even in the earliest days of the RAN, the elements of NCW were present.

*HMAS Stuart’s communications centre, 1988. Stuart was the first RAN ship to be fitted with Ship’s Modular Automatic Radio Teletype, the precursor to modern computer-based communications.*
In the early 21st century, it can be stated with confidence that the RAN is steadily maturing towards a fleet that is network enabled; able to operate effectively in a broad range of information enclaves, driven by a diverse range of missions and coalitions. The *NCW Roadmap 2007* aims to progress from a networked task group capability through to a fully networked Fleet by 2014. Defence Projects such as SEA1442 and Joint Project 2008 remain instrumental in the achievement of these goals, delivering critical communications and information systems (CIS) capability to fleet units.

However, with this progress towards a networked maritime force in mind, the RAN Fleet has arrived at a cusp. The critical question is now how far the fleet will embrace advanced Internet Protocol (IP) networks for command & control, and just how much of the traditional ways of communication, such as military messaging and tactical voice circuits, will be retained.

On the one hand, the Fleet has significantly expanded its existing IP-based networks, with the introduction of leading edge capability such as Sub Net Relay and wideband satellite communication capabilities in selected major fleet units. Whilst this will initially be done in response to operational imperatives, the ‘push’ for a wider fielding of this capability will result.

On the other hand, there remains continual debate over what legacy CIS systems and procedures the RAN should and must retain. Driven by a powerful combination of factors such as interoperability, cost and conservatism, fleet units now operate in a CIS environment that reflects a combination of broadband IP-networks and the more traditional communications networks such as tactical voice and military messaging.

Complicating this is the knowledge that there is a significant difference between the left hand edge of CIS capability in the RAN Fleet, and the right hand edge of capability. While it would be unfair to compare, side-by-side, the CIS capabilities of a patrol boat to that of an upgraded frigate, it is reasonable to compare the CIS capabilities of two frigates of the same class, or even that of two major fleet units. As the situation currently stands, some units are sailing with a disproportionately greater aggregate CIS capability than those of their sisters. So why is this so and where is this taking the Fleet?

Even though some may wish for a complex answer, the simple truth is that interoperability is the key driver. Even though the RAN is a medium navy in today’s terms, interoperability has proven to be a key force multiplier for the Fleet. This explains why, when an Australian warship is earmarked for coalition operations, the system goes to great lengths (and expense) to ensure that the ship is able to play on the same field as the other participants. The influence of allied and regional naval CIS capability in spurring on the growth and development of our own organic communications capability cannot be overstated. Our embracing of NCW as a key warfighting enabler supports this statement.
As technology continues to advance, particularly in the field of information communications technology (ICT), the capacity of communications systems to convey, process and display information is also forging ahead. This empowers the NCW system; enabling an expansion of the tactical picture from horizons initially limited by one’s vision to nowadays, horizons that are only limited by the storage capacity of one’s track management database.

The RAN Fleet currently stands at the base of a rapidly building wave called NCW. It is the tsunami of naval communications. The RAN Fleet’s ability to ride this wave, which for reasons of interoperability and strategic relevance it needs to do, will be largely determined by two considerations. First is the ability of key Defence ICT projects to deliver relevant CIS capability quickly and effectively. Whilst easy to state, this is particularly challenging when the dynamics of the ICT environment result in a technology refresh every 18 months, and a major capability leap and/or an organisational change every three to five years. The second consideration is simpler. It is the ability to say no. Just because a particular capability is new, or someone else is using it, doesn’t mean we should adopt it. The proliferation of stovepiped CIS capability within the Fleet attests to past practice in this regard.

The core of the future RAN Fleet is a networked-enabled, not network-dominated force. As we embrace NCW and introduce significant CIS capability into the Fleet, our focus must remain firmly on the ‘fight and win’ requirement. Inherent in this is our continuing ability to interoperate with joint, allied and coalition members, and to be seen as an equal player capable of taking the lead as required.
Information Needs in the Maritime Environment

With the NCW construct in mind, it is posited there are two ways that a warship can be viewed.

First, is that of a sleek, grey ship charging through the waves, battle ensign hoisted, displaying an impressive array of sensors and weapons that enable it to fight and win. This view is arguably the most popular one, and emphasises the ‘sensor-shooter’ capabilities of a warship. As arguably the area that attracts the greatest public commentary, it is a view that is never far from the minds of us all.

The second view takes the approach that a warship is a critical node within an information-sharing network. The ship can be imagined as a telephone pole that has a myriad of interwoven cables extending from it; each cable receiving and transmitting a specific information exchange requirement. This view is the harder one to sell, least of all understand. It is hard to easily explain this view to the layman, particularly if one appreciates that each cable has its own specific security, bandwidth and shore infrastructure requirements, and each these factors has to be working in order for the ‘cable’ as a whole to work. When one further considers that the information capacity of each cable changes every 18 or so months, the final result is indeed complex.

So what are the information exchange requirements of a warship? What information do the decision-makers aboard a fleet unit need, in order to ‘fight and win’?

The problem with discussing information exchange requirements is that nowhere has the decision-maker at sea, operating as part of the ship’s command team, actually defined in both qualitative and quantitative terms, their information exchange requirements. I suggest there is much intuitive understanding of the subject, and certainly academic and scientific assessments have been conducted, but where, for example, is the prioritisation of a ship’s Common Operating Picture (COP) when compared to the ship’s RESTRICTED email system defined? Indeed, is this prioritisation between information exchange requirements static or dynamic?

The RAN has not tackled this subject with any degree of conviction or certainty; and with good reason. There is no Fleet CIS capability baseline; so there is nothing to measure existing CIS capability against. Does a unit have what it needs to ‘fight and win’, or is its organic CIS capability coming up short of ‘expected’ requirements? Likewise, there is no complete ownership or control of Fleet CIS capability by the Fleet; so access to essential enabling activity such as the provision of communications bearers, for example satellite communication satellites, is determined by organisations external to the Fleet. Crucially, there is no defined boundary between the tactical information environment that the Fleet uses to ‘fight and win’ (the Maritime Tactical Wide Area Network) and the larger, and more corporate-orientated Defence Information Environment. Hence, issues such as security policy and practice, capability development, operational support and software configuration management are areas where two worlds collide.
A Defence hosted payload on an Intelsat communications satellite was launched from the Baikonur Cosmodrome in Kazakhstan on 25 March 2012. The satellite is a critical component in the ADF’s communications capability and will increase the effectiveness of the ADF’s capabilities worldwide. (ADF)

It would be remiss of this author, having raised the topic, to not attempt a reasoned answer to the information exchange requirement question. This paper posits that broadly speaking, there are four information exchange requirements for a ship’s command team:

1. Information exchange between Corporate/Enterprise Systems, for example, personnel and logistic management information systems.

2. Information exchange in direct support of operational decision-making, eg operational planning activities, command administration, links to higher command, for example, OPCON, Operational HQ

3. Information exchange in direct support of Tactical Decision-making, for example, force tactical manoeuvre, COP, tactical command and control, Indicators & Warning intelligence

4. Information exchange that supports Quality of Life (QoL), for example, satellite television at sea, email, internet web browsing.

Having broadly defined a ship’s information exchange requirements, it is interesting to observe the following developments within the Fleet:
1. The greatest use of bandwidth stems from the corporate/enterprise information systems and QoL services. Similarly, the greatest driver for increased bandwidth is coming from the provision of QoL services.

2. Failure to provide frequent and reliable connectivity for corporate/enterprise information systems directly impacts on the command’s ability to meet RAN and Defence governance and accountability requirements. These requirements are levied on the Ship’s Commanding Officer and are mandatory.

3. Information exchange in support of operational and tactical decision-making largely uses commercial-off-the-shelf solutions protected by MILSPEC information security systems and procedures. This introduces significant sustainment and obsolescence issues, given the ICT refresh dynamic and the tendency for commercial ICT providers to focus on provisioning current ‘vogue’ capability vice sustaining superseded technology.

4. There exists redundancy with respect to operational and tactical information exchange. However, this redundancy is provided by the retention of ‘legacy’ communication systems such as HF RATT and visual signalling.

5. Once a QoL service has been introduced, it is extremely difficult to either (i) remove the capability from the ship or (ii) fail to provide it on a continuous basis. Examples such as email and satellite television at sea are pertinent. Indeed, failure to provide reliable QoL services can impact negatively on retention and also receive Ministerial attention.

There is a saying that ‘theory is often at odds to reality’. It is interesting to observe that much of the impetus for increased CIS capability within the Fleet is coming from the NCW focus. The provision of capability such as MASTIS – the Fleet’s Wideband Satellite capability (approx 3 megabytes per second), has origins in improving the fleet’s ability to operate within a networked environment. Ironically, however, the most immediate benefits delivered to the ships so fitted, has been substantially increasing the bandwidth assigned to the information exchange requirements of the corporate/enterprise information systems and to the QoL services. However, RAN units have satisfactorily performed CTG duties in the Persian Gulf with an aggregate bandwidth of 128 kilobytes per second. Perhaps this could lead one to ponder exactly just how much bandwidth a ship actually needs to conduct NCW? Is it really as much as we believe?
The Ship’s Command Team

It is a complex, but predictable picture that has been painted in this paper. There is a third dimension to NCW that arguably introduces a further complex, but less predictable factor into the NCW equation. This is the ‘human dimension’.

Irrespective of its location, state of readiness, or mission, a fleet unit is simultaneously a defence business unit, a warfighter, and an operational vessel. Each of these activities demands the constant attention of the ship’s command team. The focus of decision-making must constantly shift from one fundamental activity to the next. In the words of one commanding officer, ‘twenty four hours is a long time at sea.’

The complexity of the decision-making environment aboard a fleet unit is further compounded by cultural approaches to command. Some commanding officers insist on reviewing all signals prior to despatch from a ship; others, delegate release authority to key decision makers within the command team. Some, are comfortable with key activities being planned and executed via emails; others, insist on military messaging to fulfil this function. Whatever the preference, one truism stands, the quantity of information being sent to and from a ship continues to increase; the majority of it being transparent to the command.

The ship’s command team comprises, broadly speaking, the commanding officer, the heads of department, and the operations officer. Invested in this team is the responsibility for the planning and execution of all activities involving the ship. Business activities and the day-to-day running of the ship is typically the responsibility of the Heads of Department, answering to the Commanding Officer. The conduct of operational and tactical activities is vested in the principal warfare officers (PWOs [when borne]), the navigating officer and the ship’s operations officer; again answering to the commanding officer.

So how does NWC impact on this team? There are two separate effects.

First, is the previously mentioned expansion of information exchange supporting the Corporate/Enterprise information systems. This is a predictable consequence noting that these systems are generally the greatest users of the available bandwidth. The impact on the ship’s command team is most immediately felt by the commanding officer and the respective heads of department; as the quantity of business related information being sent to and from the ship is increased. Gone forever are the days when the command team only had to focus on administrative correspondence alongside in port. The contemporary environment requires constant attention to these issues, irrespective of the operational workload placed on the command team.

The second effect is the enhanced situation awareness being delivered to the ship’s operations staff. Greater amounts of tactical data are now being passed into the ship’s operations room, both pictorially and in text form. Additionally tactical voice circuits remain essential, so the contemporary PWO now has to listen, watch an increasingly complex and far ranging tactical picture, and type – often at the same time.
The combined effect can be seen in the commanding officer. The image of a commanding officer wearing anti-flash sitting in the Operations Room, headset on, clipboard and pen in hand, head of department hovering close by, is all too common. One is reminded of those ancient marble statues of Atlas, head and torso bowed, bearing the weight of the world upon his shoulders.

**The Human Dimension to Decision Making**

Colonel John Boyd once stated, ‘Machines don’t fight wars. People do, and they use their minds.’ A famous fighter pilot, and an individual renown for his great intellect, Colonel Boyd devoted considerable energy to understanding the mechanism of human decision-making. The most famous outcome of this was his OODA Loop; a concept that Boyd drew a little over a year before he died.

The OODA Loop describes human decision-making in the context of four key activities: Observation, Orientation, Decision and Action (see Figure 26.1).

This chapter has already hinted to a key impact of NCW on a ship’s command team. The increase in information flowing to and from a ship, and the requirement for this to be processed by the ship’s command team, is significant. Relating this to Boyd’s OODA loop, it can be deduced that without any further intervention or information filtering, the decision-making capability of the individual can reach maximum capacity.

![Figure 26.1: The OODA Loop](image-url)
As much as theory can be espoused, and acknowledged, it is essential that, as an organisation, changes in the way in which we communicate must occur. Recently, the RAN participated in Exercise Talisman Sabre, a combined exercise with the US Navy’s 7th Fleet. To quote a senior communications officer aboard an Australian frigate, ‘the quantity of information was horrendous.’

It is ironic that, in an era where required reaction times to events are reducing, the quantity of information one is required to process is increasing. The words of that communications officer should resound in our collective minds as we embrace NCW in the fleet.

**Challenges**

The implementation of NCW in the maritime environment poses two key challenges to a ship’s command team. They are first, managing existing CIS capability and second, the processes governing the delivery and management of information.

The *NCW Roadmap 2007* details four key actions that will continue the ADF on the road to becoming a fully NCW force. Of the four, ranking second is ‘establish the Network that will link engagement systems with sensor and command and control systems and provide the underlying information infrastructure upon which the networked force will be developed.’

As this action indicates, a key activity is the delivery of new networks to the ADF that will enable the conduct of NCW.

The Fleet’s experience with the management of the delivery of CIS capability is not strong. Factors such as the timely delivery of communications capability into fleet units, capability that is incomplete due to poor project scoping, a proliferation of discrete CIS capability (aka stovepipes), and a lack of operator training has soured the experience at the ship level. Similarly, the increased demands being placed upon Ship’s Command and Communications Teams has not been adequately catered for, as ship’s scheme of complements continue to reflect a manning construct established, in some cases, in the early 1980s.

It is crucial that these factors are addressed before new capability is delivered to ships. The *Defence Capability Development Manual 2006* offers a robust framework for ensuring this occurs. In considering all the Fundamental Inputs to Capability in the project phase, capability will be delivered to the fleet that is well-developed and cognisant of the impost placed in ship’s companies at the time of delivery.

Likewise, the aim must be to deliver a common hardware and software solution across the Fleet. Whilst some variation may be required by platform type, pushing for a common equipment baseline minimises the raise, train and sustain requirements. The effect of this can not be overstated.

The second challenge, the delivery and management of information, is harder to solve.
Contemporary literature suggests that the human mind has the ability to comprehend up to 600 words a minute. The literature further states that the average person can read up to 250 words a minute, speak at 120 words a minute, and type at 35 – 50 words a minute. In a similar vein, the literature suggests that the human mind can take in an A4 sized picture in a quarter of a second; however the degree to which the information is comprehended is not clear.

The above indicates that the most efficient method of communicating information to a decision maker is by pictures, followed by reading text. The slowest method of communication is by typing.

In examining how NCW is conveying information to the decision-maker, it would appear that a combination of pictures and text is the most efficient. Perhaps one should question the prevalence of ‘Chat’ as a means of conducting tactical command and control, noting the limitations of typing when compared to that of using one’s voice.

Whatever the solution adopted, it is essential to minimise the amount of information required to be processed by the decision maker. Placing this into the context of a ship, the imperative must remain on the delivery of the right information, at the right time, and to the right person. The intelligent limiting of information being delivered to the decision maker must then also optimise towards methods that promote rapid comprehension, such as text and pictures for information pull and voice for information push.

Opportunities

The implementation of NCW in the fleet offers great opportunities for the ship’s command team. Enhanced situational awareness and improved decision-making will deliver more effective operational effects in the maritime battlespace.

The delivery of greater CIS capability into the Fleet, spurred on by the NCW requirement, is also delivering positive results. Greater bandwidth is now facilitating more effective business activities, improving QoL at sea, and is providing greater options for the conduct of operational and exercise planning and execution.

Provided the widening gap in Fleet CIS capability is managed correctly, NCW will also deliver greater interoperability for our maritime forces. The ability to participate in combined and allied exercises or operations as a respected and equal player will be highly welcomed, both by the RAN as well as by our allies.

Conclusions

This chapter examined the impact of NCW on the ship’s command team. It posited the implementation of NCW in the tactical maritime environment presents substantial challenges and opportunities for the ship’s command team. It further posited that to fully capitalise upon the enhanced operational capability delivered by NCW, it is important to understand the human dimension to command decision-
making. As a critical node in the ‘sensor-shooter-decision-maker’ system, the ship’s command team must be able to operate effectively and efficiently in an environment dominated by information and multiple communications networks.

The successful implementation of NCW into the RAN Fleet will rely on two key factors: the effective delivery and management of the enhanced CIS capability that NCW provides; and by ensuring that the human dimension to decision making is fully considered in the NCW construct.

The final word, given this chapter’s introduction, will be left with Admiral Lord Nelson, who said, ‘My disposition cannot bear tame and slow measures.’

One can be quietly confident, as the RAN Fleet embraces NCW and improvements in decision making and operational effectiveness result, Nelson would be well pleased.

Notes

5. There are eight Fundamental Inputs to Capability: Organisation, Personnel, Collective Training, Major Systems; Supplies, Facilities, Support, Command and Management