

SEA POWER: CHALLENGES OLD AND NEW



Edited by
Andrew Forbes

THE SEA POWER CENTRE – AUSTRALIA

Sea Power: Challenges Old and New

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Edited by
Andrew Forbes

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Sea Power Centre – Australia

The Sea Power Centre – Australia (SPC-A) was established to undertake activities to promote the study, discussion and awareness of maritime issues and strategy within the RAN and the defence and civil communities at large. The aims of the SPC-A are:

- 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, and
- Within the higher Defence organisation, contribute to the development of maritime strategic concepts and strategic and operational level doctrine, and facilitate informed force structure decisions, and
- To preserve, develop and promote Australian naval history

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Foreword

Generating naval forces for operations is a complex business at the best of times, with operational planning sometimes limited by available forces. What is often overlooked is that major capability decisions made 20-30 years ago invariably determine what forces are available today. Behind the scenes of daily operational planning, capability planners are focused on the next 10 years making recommendations on how to improve the existing fleet, examining how strategic circumstances have changed, what technological advances have occurred, and whether current and possible future missions require ship modifications and/or capability upgrades. Concurrently, long range planners are linking the possible future strategic environment in which naval forces might operate, with forecast technological change to make recommendations on the structure and composition of the future fleet.

It is useful to look back 20 years to show how decisions made then determined the forces available today. In the mid 1980s, the Australian Government formally recast defence policy from forward defence and a reliance on allies to help defend Australia, to one of self-reliance with a concentration on operations in Australia's maritime approaches. Drawing upon decisions in hand and current plans, the Royal Australian Navy (RAN) commenced a major re-equipment program including six new *Collins* class submarines, eight *Anzac* class frigates and an additional two *Adelaide* class frigates (FFG). Still to come were six *Huon* class coastal minehunters, the two amphibious ships HMA Ships *Manoora* and *Kanimbla*, and two *Leeuwin* class hydrographic ships. All of these projects are now complete, with the final *Anzac* class frigate, HMAS *Perth*, commissioned on 26 August 2006.

The capabilities inherent in this re-equipment program were designed for the (current and forecast) strategic environment of the 1980s and beyond. When these decisions were being made, no one foresaw precisely how naval forces would actually be committed to operations. Involvement in the 1990-91 Gulf War, the annual deployments to the Arabian Gulf to enforce United Nations sanctions, and the 2003 Gulf War were on no one's horizon. Nor were operations in the South Pacific, such as to Fiji, the Solomon Islands and Tonga, as well as the major commitment to East Timor, border protection under Operation RELEX and long range fishery surveillance operations into the Southern Ocean. There have also been numerous search and rescue, disaster relief and humanitarian assistance operations in which the RAN has played a key role. That all these operations were conducted with a force primarily designed to operate in Australia's maritime approaches demonstrates the fundamental utility, flexibility and reach of naval forces.

With these thoughts as background, the RAN Sea Power Conference 2006 Challenges Old and New discussed how navies have previously and might in future be employed by their respective governments. The papers cover a broad range of

issues and were written by serving and retired officers from a number of navies, academics and industry representatives. They are presented here in five sections: setting the scene; security issues in the maritime environment; science, technology and support; issues facing today's navies; and the Royal Australian Navy.

The first set of papers examines the strategic issues facing the Australian Government that impact on how and where the Australian Defence Force (ADF) might be used, and the implications for its force structure and planning. Significantly, we remain in a continuing era of strategic uncertainty, with tensions among a number of regional countries that could impact upon Australia. This requires a stronger focus on joint operations and ADF support to other government agencies in a 'whole-of-government' approach to security issues.

Current security issues in the maritime environment generated a number of papers that examined where, how and why naval forces might be committed to operations in the region and perhaps further afield. The changing strategic environment and the possibility of maritime terrorism, leading to the Proliferation Security Initiative, is juxtaposed against concerns over access to natural resources and the need to protect maritime borders. Given the wide variety of tasks to which naval forces may be committed, multi-role capabilities are increasingly important.

Science, technology and support are critical components in delivering naval capability. The Defence Science and Technology Organisation is examining a range of issues of relevance to the ADF, while also cooperating with allied defence scientists on interoperability issues. Defence forces around the world, including the ADF, are examining network centric warfare (NCW), with Australian policies and plans contained in the NCW Roadmap 2007. The final papers in this section examine the growing importance of the classification societies to naval shipbuilding, and the maritime support provided to the RAN and the myriad of issues associated with this support.

A range of papers by serving and retired naval officers and academics on the issues facing the Canadian, United States, Malaysian and Indian navies follows, including an overview of the naval modernisation of ASEAN defence forces. These papers reinforce the notion of 'maritime Asia' with extensive exclusive economic zones that must be managed, the importance of seaborne trade, and the need for naval forces to support national interests. They also examine the importance of navies within defence forces and how governments view the security issues facing them.

The final section of the book examines the Royal Australian Navy. The first set of papers provide a good overview of the *Armidale* class patrol boat project, the conversion of MV *Delos* into the new tanker HMAS *Sirius*, and the status of acquisition plans for three air warfare destroyers. The second set of papers comprises two panel discussions by serving RAN officers. The first discussion by 'The Young Turks' outlines the view of three junior officers on the driving issues they think the RAN will face in 2030, highlighting the need to change recruitment and retention policies to ensure a sound workforce for the future, as well re-emphasising the

importance of logistics support. The second panel, comprising senior officers, discusses how future capabilities are generated, strategic issues out to 20-30 years and how these influence RAN capability requirements and ultimately Defence planning and decision-making.

While these conference papers are interesting in their own right, from a naval planning perspective they tend to lead to the conclusion that new capabilities should incorporate multi-role features as far as practicable. Future ships will need to adapt to changing strategic circumstances, and be of a size to allow improvements in technology and adaptive systems to be incorporated in the ship throughout its service life.

A general theme of all the papers is that the more things change, the more they stay the same. In general, the roles of navies are enduring and have existed in similar forms for hundreds of years. What has changed is how naval operations have been modified to incorporate the opportunities offered by new technology, including the flexibility for ships to quickly adapt from relatively benign constabulary roles to high level combat operations while deployed far from their home port.

I trust that you will enjoy the range of papers in these proceedings and to advancing the maritime debate in Australia. I'm sure they will make a valuable contribution.

P.J. LEAVY
Captain, RAN
Director, Sea Power Centre - Australia
April 2007

Notes on Contributors

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Major General Abigail joined the Australian Strategic Policy Institute (ASPI) as Director in 2005 following 37 years in the Australian Army. After promotion to Major General in 1996, he served in a range of senior leadership appointments in the Australian Defence Organisation. In his final appointment as Land Commander Australia, he commanded all of the Army's operational forces, including those operating in East Timor, Bougainville and Afghanistan.

ADMIRAL CHRIS BARRIE, AC, RAN (Rtd)

Admiral Barrie entered the RAN College in 1961. A navigation sub-specialist, he was Executive Officer of HMAS *Vampire* and commanded HMA Ships *Buccaneer* and *Stuart*. Significant postings ashore included Defence Adviser, New Delhi; Director, RAN Surface Warfare School; Deputy Maritime Commander; and Deputy Chief of Naval Staff. He was promoted to Vice Admiral on his appointment as Vice Chief of the Defence Force in 1997, and became Chief of the Defence Force in 1998, a position he held until retiring in 2002.

COMMODORE NIGEL COATES, AM, RAN

Commodore Coates graduated from RAN initial training in 1978 with the Queen's Gold Medal. He was *aide-de-camp* to the Governor-General; saw service in the Red Sea as Executive Officer in HMAS *Darwin*; served as the Senior Military Instructor and then Commanding Officer of the Corps of Officer Cadets at the Australian Defence Force Academy, Canberra; was appointed in command of HMAS *Canberra*; and took HMAS *Anzac* on operational deployment to the Arabian Gulf. He was appointed Chief of Staff to the Chief of the Defence Force in 2002, and made Chief of Staff, Headquarters Australian Theatre in 2003. He is currently Director-General Navy Personnel and Training and will be promoted to Rear Admiral in June 2007, on appointment to the position of Fleet Commander.

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Mr Galdorisi is a 1970 graduate of the US Naval Academy. He holds a Masters degree in Oceanography from the Naval Postgraduate School and a Masters degree

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MR ALLAN GYNGELL

Mr Gyngell joined the Department of External Affairs in 1969, with postings to Rangoon, Singapore and Washington. He spent a number of years with the Office of National Assessments; headed the International Division of the Department of the Prime Minister and Cabinet; and in 1993 was appointed foreign policy adviser to then Prime Minister Paul Keating. He has since worked as a consultant to a number of Australian companies and is the Executive Director of the Lowy Institute for International Policy and a member of the Australian Government's Foreign Affairs Council.

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Professor Hagan received his AB and MA degrees from the University of California, Berkeley, and a doctorate in history from the Claremont Graduate School. He served as an active duty and reserve naval intelligence officer for 27 years, retiring at the rank of Captain. An Emeritus Professor and Museum Director at the US Naval Academy, he is now Professor of Strategy and Policy at the US Naval War College, Monterey Program.

MR PETER HAYDON

Mr Haydon attained the rank of Commander in the Canadian Navy, serving in submarines, destroyers and on various naval planning staffs before retiring in 1988 to pursue a second career as an academic. He is now a Senior Research Fellow, with the Center for Foreign Policy Studies at Dalhousie University in Halifax, and an Adjunct Professor in the Department of Political Science. He has taught maritime strategy and civil-military relations at Dalhousie and for the Royal Military College of Canada; writes and lectures on Canadian naval policy and operations during the

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Mr King joined the Defence Materiel Organisation in 2004, and has gained over 12 years experience working with combat system projects, including a secondment to the USN FFG Combat System Test Center as a Test and Evaluation Engineer. Since leaving the RAN, he has held a variety of positions in defence industry, including General Manager of an Australian SME. Since 2001 he has held a number of senior positions within the Australian operations of a major multinational defence company including Program Manager for the Replacement Combat System for *Collins* class submarines.

COMMODORE PETER LESCHEN, RAN

Commodore Leschen joined the RAN College in 1974 and graduated with a BSc from the University of New South Wales. He received training in several RAN and RN ships; worked in Navy Office; and served on the staffs of the RAN and Joint Services Staff Colleges and the USN Naval Doctrine Command, before taking command of HMAS *Brisbane*. Since then he has been the Director Maritime Combat Development; Director Sea Power Centre - Australia; Chief Staff Officer to Chief of Navy; Commander Australian Surface Task Group/Deputy Commodore Flotillas; Deputy Maritime Commander and Chief of Staff Maritime Headquarters. He has also attended the Defence and Strategic Studies Course, and is now Director-General Command and Control Implementation Team in Australian Defence Headquarters.

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REAR ADMIRAL TREVOR RUTING, AM, CSC, RAN

Rear Admiral Ruting joined the RAN in 1968 and graduated from the RAN College and the University of NSW with first class honours in Engineering (Naval Architecture). He then gained an MSc (Naval Architecture) at University of London. He has served in Navy Office in the Directorate of Naval Ship Design, Forward Design (Ship Projects), and Navy Policy; on COMAUSMINPAB staff as the Principal Engineer Officer; in Maritime Headquarters as CSO(E), Support Command-Navy, as Project Director in Defence Acquisition, and as Director-General Surface Warfare Systems; and participated in several navy studies. He was the inaugural Director-General Maritime Support in DMO, then Director-General Major Surface Ships within the Maritime Systems Division of DMO. He is now Head Maritime Systems.

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Vice Admiral Shalders joined the RAN College in 1967. He has commanded the Papua New Guinean patrol boat PNGS *Samarai*, and HMA Ships *Sydney* and *Darwin*, the latter during the 1990-91 Gulf War. He has also held several senior joint staff and single Service positions. On promotion to Rear Admiral, he became the inaugural Director-General Coastwatch. He is also a graduate of the US Naval War College and the Royal College of Defence Studies. He became the Vice Chief of the Defence Force in 2002 and was appointed Chief of Navy in 2005.

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First Admiral Sutarji bin Hj Kasmin joined the Royal Malaysian Navy in 1970. He served as Commanding Officer of a diving tender, patrol vessel, offshore patrol vessel and PASKAL (the Naval Special Warfare Unit); served as the Director of Malaysian Armed Forces (MAF) Defence Operations; and as Chief, Directing Staff of the MAF Defence College. He earned an MA in Policy and Security Studies in 1995 from Universiti Kebangsaan Malaysia and a PhD in Integrated Coastal Zones Management from Universiti Putra Malaysia in 2003. That year he was also appointed as the Commandant of the College and promoted to First Admiral. He retired in 2005 and is now a Senior Fellow to Universiti Kebangsaan Malaysia, conducting research on protecting Malaysian maritime territory.

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Dr Sutton has been involved in a wide variety of maritime research activities from experimentation, to combat systems integration studies and weapon-target allocation research, and has also been involved in The Technical Cooperation Program. He was an exchange scientist at the US Navy Warfare Development Command, where he co-led the Coalition Initiative within Fleet Battle Experiment Kilo. He became the Navy Scientific Adviser in February 2005, providing advice to Navy Headquarters staff on science and technology issues. He is now Science and Technology adviser to the Air Warfare Destroyer Project.

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CAPTAIN JOHN VANDYKE, RAN

Captain Vandyke joined the RAN College in 1979. After undertaking the Principal Warfare Officer course he was posted to HMAS *Sydney* as Direction Officer, participating in Operation DESERT STORM and subsequently in the maritime interception force enforcing UN sanctions in the Red Sea. He joined HMAS *Hobart*; later returned to HMAS *Watson* as an instructor at the Principal Warfare Officers School; joined HMAS *Arunta* as the commissioning Executive Officer; and worked in the Directorate of Naval Officers' Postings before completing a Masters of Management. He took command of the *Anzac* class frigate HMAS *Warramunga* in 2003, and in early 2005 joined the Air Warfare Destroyer Program Office as Capability Director.

CAPTAIN JOSÉ LUIS URCELAY VERDUGO

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PROFESSOR DR WU SHICUN

Professor Wu Shicun graduated from the Faculty of Economics, Nanjing University in 1984 and obtained a PhD in History at Nanjing University in 1997. He has been a visiting scholar at the School of Advanced International Studies at Johns Hopkins University, and a senior research fellow at the Asia-Pacific Center for Security Studies. He is also President of the National Institute for South China Sea Studies.

Abbreviations

AAW	Anti-air Warfare
ABCA	America, Britain, Canada and Australia
ABO	Access, Basing and Overflight
ABS	Australian Bureau of Statistics
ABSI	Automation of the Battlespace Strategic Initiative
ACINT	Acoustic Intelligence
ADAS	Amphibious Deployment and Sustainment (ship project)
ADF	Australian Defence Force
ADHQ	Australian Defence Headquarters
ADO	Australian Defence Organisation
AEW&C	Airborne Early Warning and Control
AEOI	Atomic Energy Organization of Iran
AFP	Armed Forces of the Philippines
AG-1	Action Group 1
AG-6	Action Group 6
AIS	Automatic Identification System
ALCM	Air-Launched Cruise Missile
ALKI	Archipelagic Sea Lane (Indonesian)
ANZUS	<i>Security Treaty Between Australia, New Zealand and the United States of America 1951</i>
AOR	Auxiliary Oiler Replenishment
APIOR	Asia-Pacific-Indian Ocean region
AR	Arrival Rate
ARC	Australian Research Council
ASC	Australian Submarine Corporation
ASEAN	Association of Southeast Asian Nations
ASIC	Air and Space Interoperability Council
ASLP	Archipelagic Sea Lane Passage
ASPI	Australian Strategic Policy Institute
ASMD	Anti-Submarine Missile Defence
ASuW	Anti-Surface Warfare
ASuW-Swarm	Anti-Surface Warfare/Swarm Attack
ASW	Anti-Submarine Warfare
AUSCANNZUKUS	Australia, Canada, New Zealand, United Kingdom & United States
AWD	Air Warfare Destroyer

BIW	Bath Iron Works
C2	Command and Control
C3	Command, Control, Communications
C4	Command, Control, Communications, Computers
C4I	Command, Control, Communications, Computers, Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance
C4ISTAR	Command, Control, Communications, Computers, Intelligence, Surveillance, Targeting, Acquisition and Reconnaissance
CCDG	Chief of Capability Development Group
CCEB	Combined Communications Electronics Board
CCRP	Command and Control Research Program
CDF	Chief of Defence Force
CDG	Capability Development Group
CDS	Chief of the Defence Staff
CIA	Central Intelligence Agency
CIE	Collaborative Information Environment
CN	Chief of Navy
CNO	Chief of Naval Operations
CO	Commanding Officer
COC	Certificate of Classification
COSC	Chiefs of Service Committee
COTS	Commercial-Off-The-Shelf
CPC	Combined Policy Committee
CRN	Contact Refinement Node
CSC	Continental Shelf Commission
CSG	Carrier Strike Group
CSSE	Combat System – Systems Engineer
CTF	Coalition Task Force
CV	Aircraft Carrier
CVA	Aircraft Carrier, Attack
CVF	Future Aircraft Carrier
CVN	Aircraft Carrier, Nuclear
DCP	Defence Capability Plan
DDG	Guided Missile Destroyer
DD(X)	Multi-mission Surface Combatant
DMO	Defence Materiel Organisation
DMS	Defence Maritime Services
DSTO	Defence Science and Technology Organisation
EBO	Effects-Based Operations
EEZ	Exclusive Economic Zone

EiS	Eyes in the Sky
ESG	Expeditionary Strike Group
ESSM	Evolved Sea Sparrow Missile
FAC	Fast Attack Craft
FDI	Foreign Direct Investment
FFG	Guided Missile Frigate
FFH	Helicopter Capable Frigate
FIAC	Fast Inshore Attack Craft
FMOC	Future Maritime Operating Concept
Fn	FORCEnet
FPDA	Five Power Defence Arrangements 1971
FPS	Function and Performance Specification
FREMM	Frégate Européene Multi-Missione
G8	Group of Eight: Canada, France, Germany, Italy, Japan, Russia, United Kingdom, United States
GC	Group Counsellor
GDP	Gross Domestic Product
GFE	Government Furnished Equipment
GIG	Global Information Grid
GPS	Global Positioning System
GSO	Geostationary Orbit
GWOT	Global War on Terrorism
HAZMAT	Hazardous Materials
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
HNA	Hardened and Networked Army
HVU	High-Value Unit
IACS	International Association of Classification Societies
IAEA	International Atomic Energy Agency
ICAO	International Civil Aviation Organization
ICJ	International Court of Justice
ID	Identification
IISS	International Institute for Strategic Studies
IMB	International Maritime Bureau
IMF	International Monetary Fund
IMO	International Maritime Organization
IN	Indian Navy
ISR	Intelligence, Surveillance and Reconnaissance
JCA	Joint Combat Aircraft
JSF	Joint Strike Fighter
LCF	Luchtverdedigings en Commando Fregat

LCS	Littoral Combat Ship
LHA	amphibious assault ship (Landing Helicopter Assault)
LHD	amphibious assault ship (Landing Helicopter Dock)
LIO	Leadership Interception Operations
LPA	amphibious transport (Landing Platform Amphibious)
LPH	amphibious transport (Landing Platform Helicopter)
LST	Landing Ship Tank
LOSC	<i>United Nations Convention on the Law of the Sea 1982</i>
MALSINDO	Malaysia, Singapore, Indonesia (joint patrols)
MANA	Map-Aware Non-Uniform Automata
MAR	Maritime Systems Group
MARPOL	<i>International Convention for the Prevention of Pollution from Ships 1973</i>
MDA	Maritime Domain Awareness
MHQ	Maritime Headquarters
MIC	Multinational Interoperability Council
MIP	Multilateral Interoperability Program
MIO	Maritime Interception Operations
MMEA	Malaysian Maritime Enforcement Agency
MOAS	Mine and Obstacle Avoidance Sonar
MOE	Measure of Effectiveness
MOOTW	Military Operations Other Than War
MOP	Measure of Performance
MOTS	Military-Off-The-Shelf
MSD	Maritime Systems Division
MSO	Maritime Security Operations
MVD	Medium-sized Vessel Derivative
NAMRAD	Non-Atomic Military Research and Development
NATO	North Atlantic Treaty Organisation
NCMW	Network Centric Maritime Warfare
NCW	Network Centric Warfare
NDIA	National Defense Industrial Association
NEC	Network Enabled Capability
NECC	Navy Expeditionary Combat Command
NGO	Non-Governmental Organisation
NGPV	New Generation Patrol Vessel
NHQ	Navy Headquarters
NPT	<i>Treaty on the Non-Proliferation of Nuclear Weapons 1968</i>
NZ	New Zealand
OCD	Operational Concept Document
OEF	Operation ENDURING FREEDOM

OIF	Operation IRAQI FREEDOM
OLM	Organisational Level Maintenance
OODA	Observe, Orient, Decide, Act
OPEC	Organization of the Petroleum Exporting Countries
OPV	Offshore Patrol Vessel
OSW	Operation SOUTHERN WATCH
PLA-N	People's Liberation Army-Navy
PN	Philippines Navy
PNG	Papua New Guinea
PSI	Proliferation Security Initiative
QDR	Quadrennial Defense Review
R&D	Research and Development
RAMSI	Regional Military Assistance Mission to Solomon Islands
RAN	Royal Australian Navy
RAS	Replenishment at Sea
RBC	Reach Back Cell
RCN	Royal Canadian Navy
REA	Rapid Environmental Assessment
ReCAAP	Regional Cooperation Agreement on Combating Piracy and Armed Robbery Against Ships in Asia
RFP	Request for Proposal
RIMPAC	Rim of the Pacific
RIRC	Rigid Inflatable Raiding Craft
RMN	Royal Malaysian Navy
RMSI	Regional Maritime Security Initiative
RN	Royal Navy
ROE	Rules of Engagement
RPF	Russian Pacific Fleet
RPG	Rocket-Propelled Grenade
RSN	Republic of Singapore Navy
RTN	Royal Thai Navy
RUSI	Royal United Services Institute for Defence and Security Studies
S&T	Science and Technology
SADI	Skilling Australia's Defence Industry
SBCM	Sea-Based Cruise Missile
SCS	South China Sea
SLBM	Submarine-Launched Ballistic Missile
SLCM	Submarine-Launched Cruise Missile
SLOC	Sea Lines of Communication
SM2	Standard Missile 2

SOLAS	<i>International Convention for the Safety of Life at Sea 1974</i>
SOSS	Soviet Ocean Surveillance System
SOSUS	Sound Surveillance System
SPAWAR	Space and Naval Warfare
SSA	Shared Situational Awareness
SSBN	Nuclear-powered Ballistic Missile Submarine
SSC San Diego	SPAWAR Systems Center San Diego
SSGN	Nuclear-powered Cruise Missile Submarine
SSK	Diesel-Electric Attack Submarine
SSN	Nuclear-powered Attack Submarine
SUA	<i>Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation 1988</i>
TACSIT	Tactical Situation
TAGOS	Tactical Auxillary General Ocean Surveillance Ships
TDA	Tactical Decision Aid
TLAM	Tomahawk Land Attack Missile
TOI	Targets of Interest
TOR	Terms of Reference
TTCP	The Technical Cooperation Program
UAV	Uninhabited Aerial Vehicle
UCAV	Uninhabited Combat Air Vehicle
UK	United Kingdom
UN	United Nations
US(A)	United States (of America)
USMC	US Marine Corps
USN	United States Navy
USNS	United States Naval Ship
USV	Uninhabited Surface Vehicle
UUV	Uninhabited Underwater Vehicle
WMD	Weapons of Mass Destruction
WPNS	Western Pacific Naval Symposium

PART 1

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Setting the Scene

Challenges Old and New

Russ Shalders

At the first of these conferences, in January 2000, the Chief of Navy (CN) of the day, Vice Admiral (VADM) David Shackleton, who I am delighted to see in the audience, set out to provide a forum for professional discussion which would serve to chart a course through an uncertain future. I attended that conference, and have in fact attended all of the subsequent Sea Power conferences. I think we have created the forum that David Shackleton and VADM Don Chalmers before him had in their mind's eye, and we have all profited immeasurably as a result of the many hundreds of excellent speakers and presentations made since that first conference six years ago.

As an aside, in January 2000 I was Director-General Coastwatch, having been appointed to that position some four months earlier by Admiral Chris Barrie, who was then Chief of Defence Force (CDF). Amongst the hundreds of suspect illegal entry vessels, and the thousands of suspect unlawful non-citizens who were descending on Australia at the time, I was also supporting the Australian Federal Police in a counter-drug operation throughout January of that year. On the opening morning of the conference, I happened upon VADM Shackleton who greeted me with his usual bonhomie and a booming statement along the lines of, "Are you enjoying the holiday house over at Customs?". I am not sure if David remembers, but I was pleased to report that, no, I was being kept busy and that very morning had successfully executed a snatch operation which resulted in the seizure of 500 kg of cocaine from a yacht on Patonga Beach, some 20 km north of here. Things are different now!

The theme of this conference is *Challenges Old and New*. Let me briefly introduce some of the challenges that I perceive for the Royal Australian Navy (RAN) of today and for those who will follow us in the 21st century. Most have an Australian focus but I sense that all will strike a chord with our visitors from overseas.

At the last Sea Power Conference in 2004, my predecessor, VADM Chris Ritchie gave the keynote speech where he focused on positioning the RAN for the future. The Defence Capability Review outcomes had recently been released and they boded well for the RAN. The announcement of two large, helicopter capable amphibious transports (LHDs) and a heavy sealift ship, signalled the government's strong support, and were welcome news. Equally, government endorsement of the Air Warfare Destroyer (AWD), the introduction of a Standard Missile 2 (SM2) capability into the *Adelaide* class guided missile frigates (FFGs), and ongoing improvements to the *Anzac* class frigates (FFHs) gave us all a very positive outlook. That positive outlook continues two years on. There was also mention of the need to not only attract and inspire high quality people, but also to train and educate them to think innovatively, provide them with opportunities to experiment with new ideas, and be receptive to reshaping doctrine and tactics.

VADM Ritchie also reflected on what the RAN had been called upon to accomplish in recent years:

- he cited contributing to remote international coalitions
- he noted the need for increased port and harbour security
- he highlighted the need to be able to effectively board and search suspect vessels
- he noted a continuing need to provide humanitarian assistance to regional nations
- he noted the obvious need to be ready to enforce regional peace and security.

All of these maritime roles and functions continue, and have been well practised and professionally executed in a variety of operational theatres around the world since January 2004.

So what has changed since the RAN Sea Power Conference 2004? Let me start with the acquisition arena.

Projects addressing our current fleet cover a wide range of capabilities. I have talked of SM2 and the *Anzac* frigate upgrades. Similarly, we are upgrading the Seahawk helicopters, the *Collins* class submarines and the patrol boat fleet. HMAS *Westralia* will be replaced this year via conversion of the tanker MV *Delos* to HMAS *Sirius*. The third phase of this same project will seek a replacement for HMAS *Success*. Great strides have been made in modifying and upgrading our current assets in the past two years. The point I wish to stress is that these efforts must continue. The challenge here is one of maintaining the effort and maintaining the necessary funding lines. We are doing okay at present but the pressure in this area will remain relentless.

Projects aimed at delivering the future fleet seek to exploit the advantages of new technologies to achieve savings in personnel and operating costs, and to deliver enhanced capability. The two most significant projects, not only in complexity but also in size, are Project SEA 4000, Air Warfare Destroyer; and Joint Project 2048, the amphibious ships (LHD).

The Amphibious Ship Project will deliver capability to replace that currently provided by HMA Ships *Tobruk*, *Manoora* and *Kanimbla*. Our new LHDs, to be called *Canberra* and *Adelaide*, will have the ability to embark, sustain and deliver in good order by sea, a combined arms battle group (comprising a landing force of approximately 1200 and a support group of 800). They will be able to sustain the embarked force afloat for up to 45 days and ashore for ten days and they will provide command and control (C2) to direct the amphibious battle group or the follow on Joint Task Force. *Canberra* and *Adelaide* will be able to deploy some 6000 nm at a fast routing speed of 20 knots. They will be able to simultaneously deliver an air mobile combined arms team (of around 200 troops with a mix of personnel and weapons) using state of the art helicopters. They will also have the capacity to embark and land several hundred vehicles, including the M1A1 Abrams main battle tanks. *Canberra* and *Adelaide* will significantly increase our reach and our ability to operate as a joint force in the littoral environment. This is an exciting project, which will be a watershed for the RAN.

I am delighted at the Governor-General's agreement to name the AWDs *Hobart*, *Brisbane* and *Sydney*. The *Hobart* class, manned by the superlative sailors of the RAN will indeed be a force for good and a force to be reckoned with.

The challenge in procurement projects of the scale and complexity of the AWD and the LHD is similar to that impacting our update projects for FFGs and the *Anzacs*. In both instances we need to maintain the impetus given us by a supportive government and demonstrate to the Australian public that we are spending their tax dollars wisely and well. In both cases, I am confident we are off and running.

I mentioned operational tempo when relating Chris Ritchie's review of two years ago. May I take this opportunity to introduce the *Database of Royal Australian Navy Operations 1990-2005?*¹ This Working Paper has been produced by the Sea Power Centre - Australia, to outline what the RAN has been busily doing for the last 15 years. It is an excellent resource to generate a better understanding of the breadth of RAN operations, and I commend it to you.

The next challenge is more difficult to confront, and certainly to overcome. The RAN faces a highly dynamic security environment, far more complex, uncertain and potentially threatening than any we have faced before. To effectively operate in this environment we require tools that will not only assist in time of war, but which can be applied instruments for stability, security and reconstruction in our region. Sea power, and the way that international navies collectively wield it in the 21st century must adapt to this new environment. I think judicious use of sea power will require greater global cooperation, increased pursuit of interoperability and better understanding of the nature of the threats we face.

Each navy has particular navies with whom they are used to operating. Since the end of the Cold War, and more particularly since 11 September 2001, we have seen more non-traditional coalition task groups being formed. The focus is gradually shifting from big ships, high-end warfighting and blue sea operations to a much more diverse set of operating parameters in a very different environment to that which shaped our early years. From an Australian perspective, this new environment has been evident in our participation in the Maritime Interception Force in the northern Arabian Gulf, in the cooperation between the Australian and South African navies in the demanding Southern Ocean fisheries protection activities of recent years and, most pointedly, in last year's operations to assist those devastated by the Asian tsunami that caused so much destruction at the end of 2004. The cooperation evident in tsunami relief activities is a perfect example of how sea power can be used to foster security and help to build lasting relationships. This challenge, of being able to work together effectively, is one we have been addressing for many years and, again, I think you will agree that we have made good progress.

Perhaps no other challenge is as daunting right now as that of defining our future force structure. The RAN of the future will include the varied and sometimes competing requirements of border security, the global war on terror, major combat operations, humanitarian assistance, peacekeeping operations and naval presence - all within budgetary constraints, industrial capacity and national infrastructure.

There is nothing new in that line of thinking but the challenges here will prove difficult.

New opportunities and security challenges will require new skills and our sailors must be able to operate and fight in a range of different environments. I fully subscribe to the belief that the greatest single strength of any navy is the calibre of its officers and sailors – and our people are definitely first rate. Their outstanding track record in recent years is testament to this. Success at sea ultimately depends on those who crew our ships. A navy is so much more than just a fleet of ships. And so to the people issue, it is possibly our greatest challenge but equally the greatest opportunity.

People management is about putting the right people, with the right skills, in the right place, at the right time. The key is to implement personnel strategies and initiatives that strike a chord with what our people and their families desire, at the same time as meeting the needs of the organisation. As a young lieutenant in Officers' Postings some 27 years ago, I used to tell my constituents that while I could apply 49 per cent of my effort to satisfying their whims and desires, the other 51 per cent had to be directed to the needs of the RAN. The current Directorate of Naval Officers' Postings desk officers are probably more politically correct but the equation remains the same.

While the RAN must maintain step with an increasingly diverse society, and we must try to deliver contemporary personnel policies, the needs of the RAN have to remain paramount. We must provide incentives and support to engage and motivate our people, enabling them to do their job well so they can remain happy working in the organisation. The challenge here is of course retention and I applaud the range of initiatives encapsulated in the Sea Change program introduced by my predecessor some 18 months ago.

The people challenge, whether characterised as recruiting, retention, or both, is not insurmountable, but it will prove difficult. We know what we've got to do and we are moving forward with a sensible and worthwhile plan.

I think it's probably impossible to foresee, or fully comprehend, all the challenges of the future. In our business, they are considerable in scope and complex in nature. We are in an era of uncertainty. But, by building a balanced force that is resilient, agile and adaptable, with the spread of capabilities required to meet the demands of a multi-mission, multi-task environment, we can manage the risks to an acceptable level in order to achieve the government's aim – the defence of Australia and her national interests.

The RAN's challenges are not insurmountable. I like to think of opportunities that we must grasp and pursue vigorously.

Reflections on the Future

Chris Barrie

It gives me a great deal of pleasure to have been asked to address you here today as the keynote speaker for the RAN Sea Power Conference 2006. This is the first occasion since my retirement on which I have spoken publicly. I also believe that we have reached an important crossroad in decision-making about our future – and this lines up very neatly with the theme of this year’s Sea Power Conference – *Challenges Old and New*.

Today I speak to you as a recently retired naval person. And, before I get into the main thrust of what I want to say, I think a few preliminary remarks are appropriate – mainly because in the day-to-day management of our defence force some critical, but important matters, frequently get overlooked.

For my first preliminary, I want to focus on the nature of war. War is a very brutal business, and a clash of arms – to contest an outcome that is essentially political in nature through the use of force – ought to be everybody’s business.

War is not a matter simply for an all-volunteer force such as we have in Australia, but is a matter involving every Australian. This is what Clausewitz wrote about many years ago when he claimed that “war is the continuation of politics by other means”. For Royal Australian Navy (RAN) people our “nature of war” is quite different to our Army or Air Force colleagues. We will sink or swim according to the ability of our team to get things right. For us there is very little scope for an individual to take his or her chances in battle. I think that we often forget that this is the essential nature of our business.

For my second preliminary, I want to focus on what makes us unique, in the Australian context, at least. And it is a fact I believe, that the wearing of the uniform of our armed forces by our personnel and their acceptance of the responsibilities, accountabilities and duties of a military life, mean that we are the only personnel authorised under the law to use force in the pursuit of our national interests – whatever they happen to be. It is this that makes RAN people special!

Another take on what makes us unique is our strategic geography. As I look at a map it seems pretty obvious that Australia is a continent surrounded by water. Over all the time I have spent looking at maps I am often reminded that I cannot find another country with a similar strategic geography. Look out to the east and the south and west: we Australians do operate in a maritime environment. Looking towards our north-west we can see that the Australian land mass lies at the bottom of an archipelago that reaches down into this part of the world from the European heartland, through Asia. These are indisputable facts of our geographic situation. Does it make us unique? You bet it does. Surely it means that our defence interests are going to be focused strongly on the maritime environment.

For my third preliminary, I want to focus on operations. I hold strongly to the view that the conduct of naval and/or military operations is a here and now thing. Because I am confident that ordinary Australians do not possess any extraordinary qualities of bellicosity, I find it difficult to conceive that our community would support the use of our forces in the aggressive occupation or invasion of another country, nor would we seek to impose our will on other people. I think that this is the way Australians see the world. But this must never be taken to mean pacifism or to suggest that if an adversary tried to do these things to us that we would put up little resistance. Quite the contrary, I believe. The conduct of naval operations, in my experience, requires us to think deeply and carefully about how well placed we would be in any come-as-we-are war. In addition, whenever we begin operations we must be mindful of the reality that all operations bring with them uncertainties and risks. Thus, to contemplate the conduct of operations without having an adequate reserve of numbers and capabilities seems to me a recipe for disaster.

For my fourth and final preliminary, I want to focus on people. You know, one of the wonderful things I have had to do over the past three years or so has been to reflect on the quality of the people that I worked with in the RAN, the other Services, industry and other echelons of government. Nearly all the people that I have met and dealt with over the years have exhibited fantastic resourcefulness, dedication, a wide range of skills, a high degree of intellectual horsepower and boundless energy. So whenever we begin to think that certain tasks are beyond us, or too hard, I want to respond by reminding ourselves that our country was created just 105 years ago and in that century of existence we have achieved many wonderful things by dint of good people who stood ready to meet the challenges that lay in front of them. Thus we have earned our place in the world today as a competent, well respected and generous community that has shouldered more than its fair share of the international burden.

So much for the preliminaries; I will refer back to them as I look forward in my reflections on the future. What I intend to do now is to speak to no more than six of the main lessons that I learned through observation and reflection in my 41 years of naval service, and then to project forward and look at the implications of these lessons for the maritime community and the RAN of the future.

My thinking horizon extends out over the next 50 years. At first, 50 years seems like a long way ahead. You may say that we cannot possibly know what the next 50 years will bring. And I agree that uncertainties, some of them real surprises, will cause us to change the execution of our plans and even adopt new ones. But, I would argue that an organisation that is thorough in its planning is better prepared to deal with uncertainties than one that has not bothered.

In addition, given that my own Service career lasted over 41 years (out of the 105 years since Australian Federation), 50 years really is not that far ahead. Furthermore, I reckon a good case can be made in arguing that the dynamics of today's situation demand that we begin to think this far out if we are to shape the kind of outcomes we desire, rather than simply becoming the victim of circumstances.

First, I want to make a few predictions about the kind of operating environment I think will prevail in 50 years time:

- **Maritime activities will be greatly more regulated than anything we have experienced to date.** I grew up with an international law based on as few restrictions as thought sensible, designed to restrict and limit the ability of mariners to use the high sea freely. A long and protracted series of negotiations produced the *United Nations Convention on the Law of the Sea 1982* (LOSC). That convention significantly reduced the freedoms on the high seas through extended zones of various kinds, and greater regulation of activities. Today, I believe there is an even greater reason to regulate more closely the activities of seafarers as we try to deal with piracy, terrorism, direct attacks against shipping by suicide craft, armed attack parties and mines, to say nothing of the prospect of a nuclear or weapons of mass destruction (WMD) attack either inside a port facility or on a ship in coastal waters, or other environmental aspects. Moreover, just for counter-proliferation operations we are going to need the ability to track cargoes comprehensively from point of origin, through transition facilities, transport links and ports of arrival – case-by-case, container-by-container and vehicle-by-vehicle. So I expect, that by the year 2050, we are likely to have various international procedures and processes for monitoring the use of the seas by any party, and a more sophisticated tracking and monitoring system to track ships and cargoes than the International Civil Aviation Organization (ICAO) operates in the airways today. There will be no such concept as the free use of the high seas.
- **Australia will have become a relatively insignificant country in the Asia-Pacific region.** Our population has reached 20 million. Comparing this to many cities in the world, such as Shanghai, our population is not large. And when we think about the size of the Australian continent and the off-shore maritime zones – one tenth of the earth’s surface – it gives me cause for concern. I recall that when General Fu Quan You, the Chief of the General Staff of the PLA, visited Australia a few years ago, he told me that he had been so surprised to find that on the flight from Beijing to Canberra one half of the flying time was spent over mainland Australia! Moreover, according to the most likely case developed by the Australian Bureau of Statistics we are informed that, in 2050, Australia will have a population of 28 million people. You might want to think about the implications of growth in our population in comparison with nearly all of our friends and neighbours in the Asia-Pacific region over the same period.
- **It will be impossible to find sufficient young people to join the all-volunteer ADF.** According to some research work done at the Centre for Economic Policy Research at the Australian National University, Australia’s labour force is undergoing a transformation.¹ It shows that over the next three decades there will be a substantial decrease in the share of young people in the work force, down from around 38 per cent to about 31.5 per cent. In addition, people aged 25 to 34 will account for a decreasing proportion of the labour force, from 26 per cent in 2003 to 23.9 per cent three decades later. At the same time, the proportion of

people aged 55 to 64 will more than double, from 5.3 per cent to 11.2 per cent. A similar trend is also projected for the 45 to 54 age group with an increase from 7.7 per cent to 9.9 per cent. Such compositional changes will have implications for the structure and nature of employment. We will not be shielded from the flow-on effects of this downturn in available able-bodied labour.

- **Australians will feel resentful and untrusting of alliance arrangements.** Pressures on the ANZUS (*Security Treaty Between Australia, New Zealand and the United States of America 1951*) alliance relationship between the US and Australia over the next 50 years could easily lead to a fracturing of the alliance. It may be taken as being moribund and worthless in the US as Australia becomes less significant in its region, and may be resented by a significant majority of Australians who feel it delivers very little of substance, especially if access to markets in the US is restricted. The relationship with China may become hugely more important to Australia for economic and social reasons.
- **Oil dependence will be killing opportunities for economic growth and even the sustainment of global trading flows.** The inefficient use of limited oil reserves will be extremely costly; the costs of maintaining an extensive internal transport infrastructure and a coastal fringe population distribution will force the abandonment of past policies in Australia over the use of coastal and international shipping. New technology, high-speed fuel-efficient shipping will be needed for our economic sustainment. Furthermore, our own flag shipping may be needed to serve international routes at very competitive freight rates that compensate for high labour costs of production in our commodity exports.

So let us begin.

Some of you here who have heard me speak before, may have heard me say that the RAN I joined in 1961 is very different from the RAN I see today. The kind of force structure we operated then was very different to what we have today. We seemed to draw a great deal from our connections with the Royal Navy (RN) and indeed, not to put too fine a point on it, many of us regarded ourselves as a simple extension of the RN operating from a country on the other side of the world. A particular memory was the “can do” attitude that prevailed in nearly every aspect of the way the RAN went about its business. Going to sea was a risky business and those risks had to be accepted without question. For example, in 1963 the graduating year from the Naval College numbered 16 fine young officers. They all went off to sea for their initial midshipman’s training year. But, by the time I graduated one year later in 1964 only eight of the 1963 graduating year had survived the first year at sea. Four of them had perished in an accident in the Whitsunday Islands, and the other four had perished at sea in the collision between HMA Ships *Melbourne* and *Voyager*.

I could be wrong, and I know many of you will have better memories of the various Royal Commissions and other inquiries that took place at the time, but my impression was of a navy that did not take its business seriously enough. There was a prevailing attitude that losses such as these were inevitable, even during

peacetime evolutions. Risks, sometimes unacceptable risks, were taken as part of our normal operating procedures. In my view we had a distinct view that “can do” was more important than “ought to do”.

In 1967, I was privileged to go to the US to commission the third of our DDG class ships, HMAS *Brisbane*. We commissioned *Brisbane* on the same day that Prime Minister Harold Holt disappeared at Cheviot Beach and, of course, we struggled to make the news! My experience in the US of pre-commissioning training at a personal level, and work up training at the ship’s level, made a very deep impression. Everything was taken seriously, even the firefighting training, which I clearly remember even to this day! This left an indelible impression in my mind about the importance of a training systems approach and, where possible, realism in the training of people if they are to be properly equipped physically and mentally for work at sea.

In 1977, I was posted to be a guest student at the Australian Army Staff College at Queenscliff in Victoria. What an amazing experience my time at Queenscliff turned out to be. Nearly all my Australian colleagues were Army officers with operational experience from the Vietnam War. They were a truly amazing bunch of people. And I learned a lot in the course of that year: how to complete an appreciation Army style but, more importantly, about military connections with the Australian community. Every place we visited in Australia during that year saw us make a visit to the local Returned and Services League club. The Army takes community relationships at the grassroots level to be very important. And finally, I learned what a very different community of people Army people are.

At this point I would like to pay special tribute to the people that I had the pleasure to work with and serve during my first posting into Navy Office in Canberra in 1978-79. This was an important period for the RAN because the naval staff were intent on the acquisition of an aircraft carrier, or three, to replace *Melbourne* and HMAS *Sydney*. A great deal of effort was focused on mounting the case for the carrier. In my lowly position as the staff officer to a newly created Director-General of Naval Plans and Policy, I saw a great deal of the naval bureaucracy at work. Our Chief of Naval Staff was Admiral Sir Anthony Synott and he went on from that job to become the Chief of the Defence Force Staff. Working in my particular area early on – as a staff officer to Rear Admiral Alan Willis – was Commander, later Admiral Alan Beaumont who eventually also became the Chief of Defence Force. My immediate boss was Commodore Alan “Rocker” Robertson. I learned a great deal from “Rocker” and it was certainly the RAN’s loss when he retired at the end of my first year there. His successor, my second boss, was Commodore, later Admiral Michael Hudson, who was our Chief of Naval Staff in the late 1980s and early 1990s. This was quite a collection of talent, and from each of them I learned a great deal about how things really work!

Now I would like to bring these vignettes more up-to-date. My next story concerns the inevitable problem of trying to balance the RAN budget. I had grappled with some of our financial problems down at Maritime Headquarters (MHQ) when

life was pretty simple. We operated the ships and accordingly we thought all effort ought to be concentrated on supporting our desire to get our ships to sea. We grappled with new measures like the reduced activity period though we could never see how this would save a dime. But after my wonderful time at MHQ, I found myself in Navy Office trying to manage the decision-making process so the CNS could set priorities and allocate resources properly. I found this to be a nearly impossible task. Firstly, naval officers seemed hell-bent on having nothing to do with the financial processes – that was for the bean counters! Secondly, my bean counter colleagues in Navy Resources and Planning Branch struggled always to finalise a figure for our expenditure and how this ran against the budget. It used to swing around wildly, even on a daily basis. I discovered great sympathy for the job they had to do because, frankly, our financial control systems left a great deal to be desired.

Finally, on the political front I had the privilege as CDF to serve four Ministers for Defence. Each of them approached the management of the portfolio in different ways. They each had different strengths and weaknesses. But they were invariably tremendous supporters of our sailors, soldiers and airmen. We should never forget that. In the course of a discussion with one Minister I made a casual remark about the need to promote a particularly thorny issue of the Defence case to other politicians. I was reminded quite curtly that we should never misunderstand the role the government plays. He said that government generally tries to deliver to the people what the people want. The government responds to demand from the community. And so, he said, do not waste your effort trying to persuade politicians, rather get out there and get the community to support you. Food for thought I believe.

To finish up, I will focus on four areas that we need to work on. These will be:

- the balance between our international and national roles
- our force structure requirements and how we must do better
- connecting with our community
- our most important resource.

The Balance Between Our International and National Roles

Shortly after assuming his command as the US Chief of Naval Operations (CNO) last year, Admiral Mike Mullen called for an expanded international naval cooperation. As it has been put, he is after that proverbial 1000-Ship Navy.

Calls for enhanced maritime cooperation are not new. In fact I recall our close involvement in the Western Pacific Naval Symposium through hosting the first meeting here in Australia in 1988. Furthermore, I recall that in the early 1990s we had a significant program of international exercises with regional navies each year that were well received and very successful. These exercises were based on a framework of bilateral arrangements that worked well.

The key issue this more recent call raises is precisely how an enhanced cooperation might work. I do not think that anyone has any doubts about the objectives: dealing with pirates, organised crime, people smugglers and drug dealers,

for example. Nor does anyone suggest that any one navy can do such a task world wide all by itself. But the bottom line is just how would any such arrangements work? Just cooperatively?

Well I do not think that cooperatively is going to be enough. First, I think the political leadership in like-minded countries would need an early involvement in discussions as to how the proposed cooperation would work. Second, there are bound to be the inevitable interoperability issues in values, doctrine, communications, command and control to name just a few. Third, there would be the legal aspects to consider. We have had some experience of what happens when forces come together for a common purpose, but then find that legal frustrations arise because we do not share the same views on international conventions and so on.

To finish this aspect I refer back to my prediction that by 2050 the freedom to use the high seas may disappear altogether under the mounting pressure to deal with these kinds of problems. Maybe the navies of like-minded countries can get together to begin the process of building a new system to manage all traffic on the seas as the technology now allows?

The RAN has always been at the forefront internationally. Over the years we have developed very good peer-to-peer relationships with colleagues throughout the Asia-Pacific region and elsewhere. Indeed the presence here today of so many Chiefs of Defence and Navy, and other international guests, stands as testimony to this perspective. I am sure that we look forward to continuing our work with you.

There has to be some balance with our national priorities as well. It is in this aspect that I wonder if we have done enough. Going back to my earlier point, the RAN is the maritime force under Australian law charged with the task of using force in Australia's interests. Thus it is possible to find that we often do not pay sufficient attention to working with other members of our maritime community for common purposes.

This reminds me about the coastguard debate. I reckon that it would be a great luxury to have a coastguard and a navy. We could mirror exactly the US in this regard but I cannot see how we would avoid duplication of effort and additional overheads, no matter what kind of management framework and operating systems were put in place. If I am right that a coastguard does not make sense in the Australian case, the RAN - in conjunction with other civil authorities - must take on many of the tasks and roles of a coastguard, especially where the use of force may be involved.

Our Force Structure Requirements and How We Must Do Better

I want to turn now and talk a little bit about the balanced fleet. It is a curious thing but every time I have conducted war games on any serious maritime or military contingency I have been surprised at the panoply of forces we would like to deploy to support our strategic intent. This is the main reason I have always believed in the concept of the balanced force. Moreover, to maintain a force that is not balanced invites an adversary to exploit an obvious weakness.

Now on looking back over the years I would say that we have done a pretty good job of maintaining a sufficient and a balanced force. But, as I know from operations I was involved with a few years ago, there is not a great deal of spare capacity if a demanding, dispersed task falls our way. And of course I do not mean that we would be caught out for a very limited period of time; rather the numbers have a quality of their own when it comes to long-term tasking.

So given the size and composition of our existing fleet I would make the following points:

- How are we going to deal with Southern Ocean fisheries problems in the future? Surely we have got to the point where we need to think of a more robust and long-term solution to policing our southern waters? While we have in the past been able to respond to illegal fishing through ad hoc measures, the possession of large ships with very good seakeeping qualities and long endurance characteristics, and the ability to operate helicopters and boats safely in a variety of sea states by day and night, would help.
- Are we satisfied that we will have sufficient numbers of ships and submarines to deal with likely conventional and asymmetric tasks? I can see that many problems of policing such as in drug busting, and countering smuggling operations, that used to lie within the ambit of constabulary responses, today require the application of sophisticated capabilities that were once the preserve of the conventional warfighting force.
- And while we are on the subject of submarines, is it time to begin thinking about our future submarine requirements? I think so.

Turning now to Australian industry involvement it seems very curious to me to hear people speaking that we should not try to build any significant future vessels here in Australia. Now I appreciate the arguments as to why we would go offshore, but to me it would be a pity not to employ Australians in building the sort of naval forces we need. Moreover, in many cases the characteristics we need for high-speed, long endurance, and self-sustaining capabilities demand that we take a very good look at our options to do the building ourselves. Only on the basis of significantly increased costs should we consider an overseas build, but this is an area where industry must play its part too.

And that brings me to the Defence Materiel Organisation (DMO).

It has been a long held view of mine that defence acquisition would be greatly improved if we could cut down on the time it takes from bright idea to delivered product. At present the extended processes we use to get to a decision point – at which real work on a contract can begin – increase the cost of participation in the business substantially, and do not deliver new, more advanced capabilities to our forces in a timely way. In my view, we should demand that it take no more than eight years to go from bright idea to delivered capabilities. In the case of shipbuilding, I would draw on a pipeline model to deliver a new fleet ship every 18 months to two years. And then we can vary the size of the fleet by varying the paying off dates of our ships and bypass the need for substantial upgrades.

Finally on this subject, I further believe that DMO should be a separate entity from the Department of Defence. It should be an entity with which we can have a contract. Thus we would not be funnelling expensive Service personnel into DMO, except for supervisory tasks, and we would provide good job opportunities for some people to take up when they leave the forces.

Connecting with Our Community

When we think of connecting with our community we almost always think in terms of media coverage – TV, radio, Internet and newspapers – but since my retirement I have been struck by the number of people I have met who have either once served or know someone who served in the RAN. I appreciate only too well how hard it is to get the right sort of material into the media and yet, as I said earlier, our real task is to promote ourselves, our activities and our needs in the Australian community.

It does seem to me that having a really smart website can do a great deal, not so much with people of my generation, but with those 18-30 year-old people we would like to see onboard. Of course the same website can be used for promotional purposes as well but it must be world class to reach the right group of people and capture their imagination!

Additionally, it is interesting to note that during the community consultation process we conducted in support of the White Paper in 2000, it was the website that far outweighed all the other forms of communications medium such as public meetings, briefings and print media articles in getting our messages about the choices across to the public.

Somehow I think that we ought to find a way to embrace those former navy people in our community who can help explain about the RAN and navy life to people who would like to know. While on this topic, I should re-assert a point that I made when I gave a nationwide television address through the ABC on becoming CDF: the point I made concerned bad publicity. Seriously, the only way to deal with this problem is to do our utmost to clean up our act. We have to eliminate wherever possible the sources of poor image stories such as our misbehaviour and stories that impugn our leadership reputation.

Our Most Important Resource

We are accustomed to thinking that we are short of dollars. This is our classic refrain, trying to do more with less. We have yet to show ourselves competent managers of our money and I strongly support considerable effort being put in to getting the RAN's finances under management control. And the same must be said for all of Defence, too.

We face serious obstacles in finding the high quality people we are going to need to send down to the sea in ships and submarines and naval aircraft way out to 2050. We are accustomed to hearing about Defence recruitment problems, especially during the Christmas slow news season. But, you know, the facts are that Australia possesses an all-volunteer force and it is this force that has proved its

quality beyond doubt in recent operations. Yet recruiting is difficult; it is a constant problem. It is obvious of course that this should be so. The government likes to have low unemployment, and when unemployment reaches an all-time low such as we have today then we have double jeopardy!

A second and equally important factor reaches back to community perceptions. When our young people are committed to operations about which they feel good in themselves and in the job they are committed to do, and they do it well, they will feel justifiably proud. The reverse is true too.

On top of these perspectives, as I pointed out earlier, by all measures Australia's work force of young people is going to reduce substantially over the years ahead. Only about four years ago it was suggested that between the years 2020 and 2030 only 40,000 new entrants would join the work force. In such a climate we will not be able to attract the number of people we need, even if we attempted the usual financial incentives used in the past. For these reasons I consider that we ought to begin to think how and when we should shift to a universal national service structure to obtain young people for our armed forces, and other critical institutions. There would be significant implications for training systems and our platforms and installed systems if this measure had to be adopted. We must not let this creep up on us.

Summary

It has been my great privilege to give this keynote address here today. I have not answered most of the questions that I have raised. I do anticipate that some of the other speakers will address them. If they do not, may I leave it to you to seek out their views?

Nonetheless, I do not think that there are any easy answers to any of the problems we face. While we can be confident about our fleet and the people who serve in it today, I do worry about tomorrow's fleet. While we have first class relationships with other navies all over the globe, once more I think we will need to attend to them.

My most pressing worry is about where our future sailors are going to come from, and how we will be able to provide sufficient personnel for all the other tasks that we will have. Will we draw from a pool of universal national service personnel or will the forecasts, projections and gloomy predictions turn out to be false? I hope so but that is not a reason to put off beginning this serious planning work now.

Finally, may I finish by offering that it is in the field of coaching, mentoring and leadership of today's RAN that our future truly belongs. I reckon that we are in good hands at the moment.

Australia's New Security Environment

Allan Gyngell

I hope that this conference will serve to inspire and enthuse you for the work ahead. We have got to get started, and get started now.

I am going to use the term “security environment” very broadly to describe all those conditions of the external world that shape, in important ways, Australia’s capacity to secure its core interests and to protect its people and its infrastructure.

The important question I want to ask first is how much of Australia’s security environment really is new?

Like all the members of our species, we humans are genetically programmed to distinguish the fresh from the familiar. Over the long millennia of evolution, natural selection favoured hominid brains, which were best able to pick out what was new in the environment around them. This has obviously been a good thing for our survival but change usually comes more slowly to the geopolitical landscape than the appearance of a saber-tooth tiger on the prehistoric savannah, so I want to begin by speaking about continuity.

A core and unchanging element in Australia’s security environment is, of course, our geography: the fact that Australia is a nation on a continent; that it has no contiguous land borders with other countries; that a barrier of sea and air protects us from the outside world. This barrier provides protection not simply against traditional forms of invasive threat, but against the emerging non-traditional threats such as pandemic disease and illegal people movement. Not total protection, of course, and in some important ways the security value of the barrier is diminishing, but Australia nonetheless has a margin of comfort in dealing with such threats that many other countries lack.

In global terms, geography has placed us at the end of a heavily populated archipelago of islands stretching from the Asian mainland through to Melanesia, rather far from our key traditional allies and from many of our most important markets.

Geography, together with geomorphology and climate, has also determined the nature of the continent’s resources and their distribution. The combination of these natural forces has in turn helped to shape yet another implication for our security: a population that is small but relatively affluent.

It is not just the physical world that influences our security environment; our history and culture do too. Our experience as a nation affects the way we interpret developments in the outside world, the way we define our interests and the direction in which we try to influence outcomes. Like our geography, that does not change either, or at least it does not change quickly.

In saying this, I certainly don’t mean to imply that the strategic implications of these physical and human factors are in any sense immutable. The intention or will

of major international actors, technological developments, even local politics, can change the meaning of geography very dramatically and very fast.

But, as you may have guessed from the fact that I have chosen to start with continuities, I am naturally sceptical of claims of sweeping change in the world. They crop up too frequently in the rhetoric of ministerial speeches and the commentary of pundits to be always true. But I am nevertheless quite prepared to concede that the past 10 years have genuinely been a transforming period in Australia's security environment.

It is this decade between 1996 and 2005 that I want to address. Ten years is a long enough period for us to be able to begin to distinguish significant changes from the transitory.

The roots of these changes lie back in 1989 with the unexpected revolutions in eastern Europe that were to culminate three years later in the dissolution of the Soviet Union. This was genuinely what Hegel would have called a world historical event. The structure of the international system disintegrated along with the Cold War that had dominated the 40 years of post-World War II international politics. The victor in that war, the US, was left as its sole superpower, the only country with the capacity to deploy effective force anywhere on the globe. In the face of change of this magnitude it necessarily took time for the key players to adjust to the new environment. Throughout the early 1990s the precise form of this emerging international order was obscure, as was the role the US would play in it.

From the middle of the 1990s to the end of 2005, we began to see more clearly the shape of the new system, and to discern its implications.

Two critical events - the 1997 Asian financial crisis and the terrorist attacks of 11 September 2001 - were the harbingers of change in Australia's security environment. But these events reflected deeper structural shifts in global power that I want to focus on today. These were, firstly, the slow rebalancing of global power towards Asia and, secondly, the significant increase in the power of transnational, that is non-state, actors in the international environment. Both these, in their turn, had their origins in the communications and technological revolution that we describe in shorthand as globalisation.

The Asian financial crisis began in Thailand in 1997 and spread rapidly, fanned by the formal or informal linkages that most of the so-called Asian tiger economies had established between their currencies and the US dollar. Between 1995 and 1997 the US dollar had risen nearly 60 per cent against the Japanese yen and it had dragged the Asian currencies up with it. Exports began to fall and the current accounts of regional countries were exposed to closer scrutiny. That scrutiny exposed serious structural flaws in some regional economies. Their regulatory agencies were weak and opaque, their banks and other financial institutions poorly regulated and vulnerable to politically-directed lending and their legal systems were corruptible.

Thailand was the first economy to be hit. Speculation by currency traders, including some of the world's largest financial institutions, intensified from May

1997. Unable to defend its currency, the Thai Government was forced in July 1997 to float the baht.

One by one, in slightly different ways, South Korea, Malaysia, Singapore, the Philippines and, finally, Indonesia were also infected. Any short-term money that could be pulled out of regional banks and stock exchanges fled, as foreign investors began nervously to question their commitment to Asia as a whole. The result was catastrophic: a US\$100 billion reversal of capital inflows to South Korea and the ASEAN countries in a single year from 1996-97.

The International Monetary Fund (IMF) and the World Bank offered financial assistance to the countries affected but loans came with increasingly elaborate requirements for the application of austerity measures, often in areas quite peripheral to the crisis. Actively driven by the US Treasury, the IMF used economic pressure to achieve broader political ends. Even the IMF now accepts that its prescriptions were seriously flawed.

It was in Indonesia that the interplay of the US Clinton Administration's economic and political objectives were to have the deepest impact. Under intense pressure from the IMF, unable to staunch the economic crisis and with few reserves of political support left to draw upon, President Soeharto, who had governed Indonesia since 1965, resigned in May 1998.

With him went the New Order regime that had in so many different ways shaped Australia's security environment, mostly beneficially, for more than 30 years. A centralised, authoritarian state dominated by the military suddenly became an open, decentralised, rather chaotic democracy.

A further consequence of the financial crisis came when Soeharto's chosen successor, the eccentric B.J. Habibie, unexpectedly opened up the question of the future status of East Timor. The results of the United Nations supervised referendum and the violence that followed are well known. After the Australian-led intervention, East Timor emerged as an independent but fragile state in the region – another important change in Australia's security environment.

In retrospect, the surprising thing in the aftermath of the financial crisis was Asia's resilience. By 1999 all the Asian tigers had returned to positive growth (although still well behind their starting point).

A great deal of the responsibility for that result was the emerging economic power of China. With its currency fixed and its economy more controlled than the other developing Asian economies, China sailed through the crisis without a hitch in its growth. Perhaps the most important consequence of the financial crisis was to hasten and cement China's rise as a major economic and political power. This rise had its origins in the historic decision of Deng Xiaoping to bet on the market system as the best way of preserving the power of the Chinese Communist Party. China's economic growth averaged more than 9 per cent a year between 1995 and 2004, and gross domestic product (GDP) per person almost doubled. Foreign direct investment (FDI) flooded into China. In 2001, it was admitted to the World Trade Organization and by 2003 it had become the world's largest recipient of FDI. It

is now the single most important contributor to the overall growth in world trade. China also used the crisis to burnish its credentials as a regional political leader, for example by contributing to the IMF relief packages for its neighbours and by helping to develop regional responses to the crisis, like the Chiang Mai Initiative on bilateral currency swaps.

By the end of the decade of the trans-millennium, and largely as a result of China's growth (because Japan, the world's second largest economy, had stagnated through much of the period), Asia had recovered its position, and had emerged with more resilient economic structures. In addition, and more importantly for the long term, much of the region's trade and economic growth was being generated by intra-regional trade. Between 1995 and 2004 China's receipt of East Asian exports roughly tripled. On current trends, China will be the region's major export market within the next few years. Much of this trade still flows elsewhere, to the US in particular, but with domestic demand growing so strongly in China and India, that will change.

The important geopolitical development here is not just China's economic growth but Asia's return to a central position in the global economy and power structure. You can measure the size of economies in a couple of ways, but if you use purchasing power parity, which is best for comparing wealth between nations, the US is the largest economy in the world, but three Asian countries - China, Japan and India - fill the next spots.

There's nothing especially remarkable about this. The really extraordinary thing is that we had a couple of centuries in which - largely because of the industrial revolution in Europe - the wealth of two of the world's most populous countries, nations with old and sophisticated cultures, slumped so precipitately. In 1820, China and India together were worth almost 50 per cent of world trade, but by 1950 that had dropped to only 7 per cent. In 2001 the figure was back up to almost 20 per cent.

The rise of India has been less dramatic than China's but is still impressive. It seems to have entered a new phase of sustained growth at higher levels of around 7 per cent a year led by the export of services rather than manufactures.

So what we have seen during the years of the trans-millennium is the restoration of China and India to their former positions of importance in the global economy, just as you would expect from two countries with a combined population not far off 2.5 billion people.

Whatever caveats must be made about the dangers of projecting growth figures, it is hard to avoid the conclusion that by the middle of this century China and India's economic importance in the world will have increased substantially. Measured by purchasing power, China had 13 per cent of the world's GDP in 2004. By 2050 it is expected to reach 20 per cent. India will grow from 6 per cent to 12 per cent; the US will slip from 21 per cent to 14 per cent and Europe from 21 per cent to 10 per cent. Australia will slip more modestly from 1.1 per cent to 0.7 per cent.

So far we have been talking just about economic growth. But economic strength is a necessary foundation for two sorts of power: hard power, that is military weight

and the willingness to use it, and soft power, which is the capacity to influence people culturally and through ideas. The degree to which such power is developed and used depends on other factors, including culture, politics and historical experience, but Asia seems likely to provide a growing source of both forms of power in the years ahead.

China and India will inevitably seek to develop military capabilities commensurate with their size and influence. Both face enormous challenges of sustaining growth and development. Like Japan, they will have an eye on the security of the supply lines of resources and energy so critical to their continuing growth. But how will they manage that process? And how will the US react? These are potentially dangerous questions, further complicated by unresolved problems across the Taiwan Strait and on the Korean Peninsula.

It is important not to overlook Japan in any survey of the region. Japan is in some ways the most unpredictable major power in the world at present. What I mean by that, is that while China – at least at the government level – has taken a national decision on its future, I am not sure that the same is true of Japan. Japan remains a huge economy – on exchange rate measurements the second largest in the world – and the world's third largest military force. After a decade and a half of economic stagnation as a result of structural problems in its economy, a declining population, and faced with the rising power of China, Japan is undergoing a basic reassessment of its future. Its economy is experiencing deep changes, its political system has been shaken up by Prime Minister Koizumi's success in remaking the dominant Liberal Democratic Party, and it is reassessing elements of its post-war pacifist constitution. As a result of all this, though with typical cultural introversion, Japan is engaged in a fundamental debate about its future that will have large consequences for Asia.

On the second sort of power, soft power, Asia will also be more important. We have been used to thinking about globalisation as being the same thing as Americanisation or Westernisation. But that is changing. Koreans have already joined the Japanese as Asian global brands, but China and India will certainly be next. Even in popular culture – a vital source of soft power – Bollywood, Japanese Manga comics and *anime* and Chinese martial arts films are having a growing impact.

You might ask what is new about this for Australia's security environment. After all, Asia has been a forum for our security interests for the past hundred years. The answer is that Asia is now more likely than at any time since Australia's European settlement to be the principal centre of global growth, and the crucible of strategic competition, and that it will contain a number of more independent and more powerful actors with the desire and the capacity to influence the 21st century world.

Let me turn now to the second great event of the trans-millennium for the Australian security environment: the Al Qaeda terrorist attacks of 11 September 2001, reinforced by subsequent terrorist assaults in Bali, Madrid, London, Jakarta and elsewhere.

These attacks had consequences that are still being worked through.

They resolved, temporarily at least, the debate within the US about how active a role it should play in the world. They focused world attention, including Australia's, more directly on the issue of fragile states and global borderlands, and more generally on threats from distant regions. They underlined the fact that threats in the world no longer came from nation states alone but from a range of other transnational actors, and that these included groups that were not susceptible to traditional doctrines of deterrence and could not be dealt with by traditional military forces alone.

Since its emergence as the victor in the Cold War, the US had been grappling in different ways with the question of how it would use its power. Would it be an active leader seeking to shape a new multilateral foundation for the emerging world as the generation of Americans at the end of World War II had done? Would it see itself more modestly as a balancer, a member of a concert of powers, intervening selectively when it felt its interests were affected? Or would it use its power assertively to preserve this unipolar world? The 11 September 2001 attack had the immediate effect of galvanising the US and giving it, initially at least, a purposeful unity directed against international terrorism. It resolved the debate about how Washington should use the power with which it had emerged from the end of the Cold War. The answer was: actively.

In 2002 the Bush Administration launched its ambitious National Security Strategy, a unilateralist document whose ambition Owen Harries described as being "no less than to effect a transformation of the political universe".¹ Soon afterwards, it linked the war on terrorism with the invasion of Iraq. At this point the temporary national and international consensus on American power was fractured.

It is too soon to see the full security implications of the Iraq war. For Australia, however, the lessons the US takes from its experience there will shape our security environment in important ways. Already public polling in the US is detecting a sharp increase in isolationist sentiment among the American public. How that translates in the post-Bush political environment will matter to us.

The Iraq war also brought home another important development of the trans-millennium. During the Cold War the function of alliances was clear. In an almost mechanical way the weighting on each side matters during a period of bipolar balance. But alliances in a period of unipolarity or multi-polarity matter much less. What are they there to do? How are they structured? What sustains them? We have yet to answer that question properly. It seems to me that not nearly enough attention has yet been paid to this question. But signs are emerging. Coalitions of the Willing are proving to be a more flexible and responsive mechanism for action in the new environment. East Timor (although formally under UN auspices), the Regional Assistance Mission to Solomon Islands (RAMSI) and Iraq were all in their different ways manifestations of such an approach.

A second major consequence of the emergence of Jihadist-Salafist terrorism from the wastelands of Afghanistan and Sudan and the southern Philippines was that the security and human costs of ignoring the global borderlands became more

apparent. During the Cold War the newly decolonised countries of the Third World were important as tokens in the global power struggle between the US and the Soviet Union. After 1989, that relevance faded, and the great powers turned their attention away. The lesson of 11 September 2001 was that, whether from a hard-nosed security viewpoint or a humanitarian one, the margins of the world could not be ignored.

The security policy consequences for Australia of this lesson included the successful intervention in the Solomon Islands, the development of active counter-terrorism partnerships with Indonesia and other South East Asian neighbours and, less successfully, the proposed Enhanced Cooperation Program with Papua New Guinea.

The terrorist threat, which linked our immediate region directly to the Middle East, also had the effect of expanding Australia's views of its security environment. Perhaps the most ambitious, but also the most comprehensively ignored, statement in *Australia's National Security: A Defence Update 2005* was this: "Australia's vital interests are inextricably linked to the achievement of peace and security in the Middle East".² This is a remarkably bold assessment by the government. Vital interests by definition are those we would have to use force to protect. The new statement goes well beyond the much more cautious words of *Australia's National Security: A Defence Update 2003*, which simply noted that "In some regions of high strategic significance to Australia, notably North Asia and the Middle East, it is still conceivable that conflict could occur directly affecting Australia's interests".³ *Defence 2000: Our Future Defence Force* did not refer to the Middle East at all.⁴ So in five years "the achievement of peace and security in the Middle East" has gone from being unmentioned in a strategic review to being a vital national interest. As it happens, I don't agree with the judgment, which seems to me to be far too loosely stated to be useful, but it reflects a more widely held view of the expanded geographical scope of our security environment.

In addition to a geographical expansion, we have also experienced an expansion in the sources of security threats. Because lying beneath the emergence of internationally focused terrorism was a deeper change in the international system: the rise in the number and importance of transnational actors, groups outside the state system but with the desire and capacity to influence world politics. This was another result of globalisation.

Globalisation in its contemporary form is the outcome of a technological revolution in travel and communications, including mobile telephony and the Internet that blossomed during the trans-millennium. Technology slashed the cost of transferring things – particularly information – around the world. The figures are well known. The cost of a three minute transatlantic telephone call fell from about US\$250 in 1930 to a few cents today. And the Internet brings communications costs close to zero.

One result was a huge increase in global economic interdependence. We saw the development of global supply chains in manufacturing and the explosion of trade

and foreign direct investment. Another result was the transforming cultural impact of rapid flows of news and information through the Internet and satellite television as well as the freer movement of people that cheaper transport facilitated.

The effect has been to blur distinctions between the domestic and the foreign. Whether you are talking about the economy or health or domestic security, the line between the external and the internal is far less sharp than it once was.

Another consequence of globalisation, as my Lowy Institute colleague Alan Dupont has argued persuasively, has been to give resource issues like air and water, environmental issues like climate change, and health problems such as HIV/AIDS and avian influenza, a sharper new security dimension.⁵

Structurally, the largest impact of globalisation has been to increase the impact of non-state actors on world politics. Groups such as the East India Company or the Catholic Church, or what would these days be called “epistemic communities” like the anti-slavery movement have always had an important impact on international relations. But globalisation has greatly expanded their number, as well as the number of transnational businesses, and has given them an importance they have not had before. During the 1990s the number of international non-governmental organisations quadrupled from about 6000 to 26,000. It is now easier than ever to identify like-minded people, to communicate effectively with them and to marshal them to help change state policy, as environmental groups such as Greenpeace or the WWF have done. *The Ottawa Convention on Landmines* was the first international instrument I can think of that was negotiated without the initial support of any sovereign government, except, arguably, parts of the Canadian Government. The campaign for international debt forgiveness is a more recent example.⁶

There was a dark side to the growth of transnational actors as well. Organised criminal gangs, money launderers, people smugglers and terrorist groups like Al Qaeda or Jemaah Islamiah could just as easily use the products of globalisation – ease of travel, efficient movement of capital, cheap and speedy Internet communications, effective use of satellite television – to pursue their aims. The security threat that terrorism posed was greatly magnified by the erosion of the nuclear non-proliferation regime and the emergence of new nuclear weapons states such as Pakistan, North Korea and now possibly Iran. The potential for non-state groups to secure access to weapons of mass destruction from non-, or at least quasi-, state proliferators of weapons of mass destruction like A.Q. Khan’s network, introduced an entirely new and worrying dimension to our security concerns.

Piece by piece the structure of the state-centred Westphalian system is coming under pressure. Core norms like non-interference in the internal affairs of other countries are being eroded. One of the few positive things to come out of the failed anniversary summit of the United Nations was the slow emergence of a consensus on humanitarian intervention: the responsibility to protect.

You can sense the inner tension and uncertainty among governments as they grapple with these delicate questions of sovereignty and the centrality of the state. And it applies to Australia as well. Surely one of the most striking lines from the 2005

Defence Update was the declaration that “non-state actors can, in some circumstances, constitute a strategic threat”.⁷ That is a remarkably important judgment. If it is true, profound consequences flow from it. It might still be arguable but it is not a statement that an Australian government could have made 10 years ago.

It is clear that some of the old structures of post-World War II global architecture cannot effectively survive in this new environment without wholesale change. The sheer number of new states – there are four times as many now as in 1945 – the shift in global power towards Asia, the erosion of the idea of untrammelled state sovereignty, the growth in the importance of non-state actors, the potential for some such groups to arm themselves with weapons of mass destruction, the expansion of globalisation and its blurring of distinctions between the domestic and the foreign, all combine to determine a shift in the way the world is organised.

The new model of Coalitions of the Willing that emerged first in the area of defence and security has since spread into many other areas from the Proliferation Security Initiative, to the G20 Group of Finance Ministers, to the Asia-Pacific Partnership on Clean Development and Climate. They seem likely to grow in importance.

We will need to find some way of developing multilateral forums that can effectively incorporate the views of some relevant non-state actors into the decision-making processes of states. I want to make it clear that I am not arguing for Greenpeace membership of the UN or for the proposition that News Limited or Sony do the same things as states and should be treated like them. But I am arguing for the revision of multilateral structures that are rigidly and archaically structured around the Westphalian idea of the nation state. Both sides of politics agree that something like this is coming. For the Right, as we saw a couple of weeks ago with the Asia-Pacific climate conference, it is business involvement that is particularly important; for the Left, it is the involvement of elements of civil society. But in both cases what is at issue are methods and forms of involvement rather than destinations.

Let me end by returning specifically and briefly to the implications of these developments for our defence forces and the national security agencies of government. Globalisation has changed not just the way the Australian Government thinks about security but the way it has to act to preserve it.

Over several centuries of hard-won experience we have developed a reasonably good understanding of the incentives and disincentives that will help shift state behaviour. But these incentives do not apply to non-state actors. In particular, conventional deterrence does not work against international terrorists. There is no home base against which to take reciprocal action. So the security threat such groups pose – the potential strategic threat, if the Australian Government is right – as well as the other threats that a globalised world throws up, need to be addressed in quite new ways. They need a highly integrated response that includes international policing, intelligence cooperation, public diplomacy and emergency response in with the traditional military mix. This has imposed a high premium on whole-of-government, cross-portfolio coordination. For me, Australia's effective

changes in this area have been one of the Howard Government's most significant security achievements.

Faced with new adversaries, the role of the military is changing. It would be foolish to say that war between the great powers is impossible, but the prospect is probably more remote than it has been for a hundred years. How military forces operate, what they are intended to do, the nature of the interaction between domestic and external security, the link between government forces and private provision of military services (including, I believe, a reassessment of the role of mercenary forces), all require new ways of thinking.

The Challenges Facing the Australian Defence Force

Peter Abigail

When the current Australian Defence Organisation (ADO)¹ leadership team was formed in July 2005 it took over an Australian Defence Force (ADF) that was, in the words of the new Chief of Defence Force (CDF), “in good shape”, despite an extended period of operational commitments. The state of the ADF, as measured by its preparedness in 2004-05, was better than it had been in previous years, although there was a clear need for remediation or reform in the Army.

Australia’s defence and wider national security community had been very busy for the previous six years: meeting operational commitments, reframing legislative provisions, adjusting organisations and preparedness to accommodate new tasks, rethinking future requirements, and modifying management, command and control arrangements.

The government had become very practiced and confident in its handling of security issues with the most experienced National Security Committee of Cabinet in 50 years. Operational commitments had been judged successful, the ADF had demonstrated its professionalism and earned international respect, and the security community could reasonably claim to have performed well.

The conflicts in Iraq, Afghanistan, the Solomon Islands, East Timor, and Bougainville, and recent measures in support of border security, counter-terrorism and humanitarian relief, prompted greatly varied policy and operational responses. These confronted different challenges and provided very different experiences, but they also demonstrated the inherent versatility of the force and presented insights and lessons to guide the further development of Australia’s response capabilities.

During this period, government security policy shifted in response to world events as the unholy trinity of threats posed by terrorism, weapons of mass destruction (WMD) proliferation and fragile states rose to the top of security agendas, in company with a range of non-traditional security challenges such as people smuggling and the possibility of a pandemic.

Faced with a dynamic and uncertain security environment, the government has pursued a strategy of acting to disrupt emerging threats while also exploiting and adapting to events in support of its view of Australia’s national interests. This is not new – indeed, it is what strategy is all about – and we shouldn’t be surprised that the linkages between declared policy (as expressed in public documents), capability development decisions, and financial provisions for Defence might have appeared to have loosened in the process.

Australia’s National Security: A Defence Update 2005 clarified government policy and its expectations of the ADF, and moved some way towards resolving some inconsistencies and uncertainties.² Of course, so far it is a statement of broad

intent. We will have to await the outcomes of the Budget to see the accompanying dollar and Defence Capability Plan (DCP) solutions. But this notwithstanding, *A Defence Update 2005* is a significant document for the shifts in policy it confirms and the challenges it will present to Defence and the ADF.

Of course, the ADF that the Defence leadership took stewardship of in July 2005 was not an exclusively “good news story”. The negatives included recurring adverse publicity around themes of bullying and harassment, military culture, the military justice system and Defence’s financial management. Resolving these important internal issues is a high priority for the government and the entire ADO.

But the challenges confronting the ADF go well beyond such matters, stemming as they do from the wider strategic and national environments that provide the context for Defence. Principal among these, the key enduring challenge facing the ADF, is the need to provide the widest possible range of military options for employment by the Australian Government.

That is the key challenge because neither the ADF nor the government can know all that might be required as events unfold, but there are practical limits to what can be sustained by the Australian community. Our strategic policy is therefore, necessarily, one of risk management that aims to provide the best match between desired outcomes, what is needed and what is affordable.

The Leadership’s Views

I will return to that issue later, but first it is worth noting what some of the Service Chiefs have nominated as the challenges that concern them most after a few months in their appointments.

These have been drawn from addresses given to the Australian Strategic Policy Institute (ASPI)/Australian Defence Industries (ADI) series of Dinners with the Chiefs and represent a consolidated list without too much editorial licence on my part.

There is really nothing surprising in the topics that have been nominated.

Recruitment and retention difficulties are persistent problems that threaten to undermine defence capability. Shortfalls in manning against budget are not uncommon, but the more insidious problem has been the shortfalls in numbers against unit entitlements to personnel. This is the outcome that is so debilitating for the capability of those units and the morale of those who have to carry an extra burden, including repeated operational deployments in some cases.

Recruiting and retention difficulties are not short term problems and they will not be solved with band-aid solutions. This is well known and understood within the department, and has been for some time following the many studies and enquiries conducted into the issues in the past 18 years. The ADF is part of an evolving labour market that is not going to adjust to satisfy Defence’s preferences or needs. The challenge for the ADF is to bring about systemic changes that make it more competitive in that market.

The people issue is also part of the operational tempo challenge, particularly in the critical skills sets that are in high demand for most commitments. Parts of

the ADF have been stretched in recent years, sometimes to their elastic limits, as occurred with the Army Black Hawk helicopter capability in 2000-01 when an operational pause in their deployment to the Solomon Islands had to be imposed to give the crews much needed rest. Other parts of the ADF could cite similar experiences.

But the challenge of meeting the operational tempo, including the diversity of operational demands and settings, goes beyond people. It has to do also with the widening range of possible commitments embodied in strategic policy; the balance of the force, including the depth in the force structure to provide rotation forces; and the training load that units must bear in preparing for operations. These issues were influential in Army thinking as it framed its Hardened and Networked Army (HNA) solution.³ The options appear more limited for the other two Services.

The need to revise and establish coherent top-down internal strategic guidance for consistent planning across the ADO, that draws on the lessons of recent experience and comprehends strategic possibilities, is critical to the future development of the force.

In Australia's strategic context, the ADF must adhere to a genuine joint, integrated approach and this requires that roles and missions, doctrine and concepts, modernisation investments, and personnel and training are all guided by the requirement to build ADF capability.

In recent times the single Service focus of niche contributions in Afghanistan and Iraq, and the intellectual leadership generated from emerging Service warfighting concepts (in the absence of coherent joint operations concepts), appeared to translate into a Services ascendancy in capability development processes within Defence. It should not be surprising that, to an outsider, this seemed to have occurred at the expense of central coordination and the application of a joint approach.

This will be re-established with the production of a revised military strategy, new joint operations concepts, and the next DCP. The challenge will be to produce such documents quickly and then maintain a review program that keeps them current.

Improving capability features prominently in the minds of all the Chiefs, but with various themes. The headline item is undoubtedly networking the force to gain the benefits available from advanced technologies. But other issues embrace achieving a more balanced force, improving force projection capabilities, making better use of Reservists, improving interoperability with allies and maintaining a regional capability edge in selected areas.

So, there is a mixture of organisational, doctrinal, and equipment aspects in play, but the major challenges seem to flow from the equipment arena: how the Services will handle the rate of technological change and absorb the range of new capabilities and equipments planned for delivery in the next decade; how Defence will manage the increasing real costs of procuring and operating this equipment; and, whether Australian industry and the Defence Materiel Organisation (DMO) have the capacities to deliver the DCP.

Accepting that changing environments will necessitate changed approaches to the way Defence and the ADF do business is essential, but so is the recognition that change does not come easily in a large and diverse organisation, and that the future may well demand pre-emptive rather than reactive change. The challenge is to make that shift in approach, taking a strategic stance to pursue efficiency and productivity across the entire ADF and Defence, and to adjust concepts and force structures to meet different operational environments.

This is likely to be particularly important in the context of the increasingly difficult funding environment that the Treasury and others suggest lies not too far into the future. Defence funding is currently not a major concern and there is not much incentive for Defence to pursue significant productivity improvements. But the prospects for reduced gross domestic product (GDP) growth will put increasing pressure and scrutiny on Defence's case for additional funding in coming years. The challenge in this will be developing the robust understanding of cost and capability relationships necessary to sustain a compelling justification for financial and other resources.

Challenging Problems, Challenging Solutions

These challenges are not discrete, allowing for each to be met by a singular focused plan of action. They are interconnected, not just between themselves, but also with the negatives I referred to earlier. Their management requires broader solutions that are transformational in nature. Changes of this type are, themselves, challenging both in prospect and implementation.

The ADO is embarked on two transformations that should fundamentally change the capacity of the ADF to deal with its environment. Although they have not been badged as such, each has been underway for many years. I am referring to the transformations of the ADF from:

- a Training Force, in which few members faced a real prospect of deployment on operations; to an Operational Force that is structured, prepared for and focused on the conduct of operations
- a conservative and unique employer, constrained in trying to accommodate the ever-changing labour market through piecemeal and incremental policy responses; to an adaptive, competitive employer-of-choice that is in tune with the people it wants to attract and retain.

The other thread to this discussion relates to the strategic planning equilibrium that is the holy grail of all Defence leaders. When there is broad consistency between strategic policy, the Defence capabilities sought by the government, and the finances to meet the need, then even the occasional commentator might be happy. However, like the Holy Grail, this state of affairs is elusive; but it is certainly worthy of the quest.

An Operational Force

The transformation of the ADF to an operational force commenced shortly after the Howard Government came to power in 1996 and has been reinforced by changes in strategic circumstances and the steady demand for operational commitments since 1999. The philosophical basis for the shift was evident when a Minister for Defence asked the rhetorical question: “Why have something if it is not available to be used?” The government wants an ADF that is capable, ready and available.

Beyond this, the government understands the utility of force in pursuit of national interests and is prepared to use it. Progressively, each public statement of strategic policy has broadened the range of possible tasks the ADF might be asked to fulfil, and capability decisions and financial allocations have been designed to enhance the ADF ability to conduct operations.

A Defence Update 2005 rightly characterised Australia as a global security actor with vital interests well beyond our region, including in the Middle East. It foreshadows a more capable expeditionary ADF with longer reach than previously considered necessary.

It also changed the depiction of potential Australian contributions to coalition operations from “niche” to “meaningful”, although it is not clear whether this should be interpreted as signifying an increase in scale or just the abandonment of a misunderstood word.

However, the intent to Harden and Network the Army seems to have as much to do with broadening the range of options for coalition operations, with obvious implications for force projection capabilities, as anything else. It is reasonable to conclude that *A Defence Update 2005* confirms the government’s desire to have more military options available for employment wherever Australia’s interests require.

It is policy that the ADF be capable of conducting joint operations and there is a pressing need for joint operations concepts to guide the development of the future ADF. It is gratifying to see the priority this is attracting. But there is a lot of work to be done and this begs the question of how this will be managed.

The people who can do this work are not in great supply and most are employed in the Service concept development and think tank appointments. These are the groups that have generated emerging Service concepts over recent years. One possible solution would be to aggregate the existing ADF and Service staffs to complete the task of writing joint operations concepts as a high priority project. And, perhaps it is time for a Commander Joint Training and Doctrine to be appointed to manage the project.

With such concepts in place, attention could then turn to striking the right balance both within and between the Services.

A balanced force is one that is fit for purpose for the tasks it may be required to undertake for the duration of likely campaigns and commitments. It should contain the force elements to provide joint task-groupings for employment in combat and operations other than war, and also cover the functions necessary to provide for

unilateral operations, including force projection. This might require some additional units to be raised to provide appropriate range and depth in capabilities. However, given Australia's economic realities, a balanced ADF would probably also reflect some capability trade-offs between the Services and measures to improve efficiency and effectiveness.

One example of the latter is evident in recent adjustments to the new operational command and control arrangements centred on the Bungendore complex. The move from a Service component approach to a joint staff solution is to be applauded and represents a true transformational shift in thinking. The separation of the Service Chiefs' "raise, train and sustain" functions from the new headquarters will obviously require some adjustments to their internal command arrangements, but this is worth the pain for the benefits it will provide in operational focus, opportunities for improvements in coordination with other government agencies, and the prospect of permanent assignment of ready forces to the Chief, Joint Operations Command. Ready forces need to be complemented with ready command and control arrangements, and this is an important step in the right direction.

Capability development or modernisation of the ADF to make it more potent and deployable is one of the key aspects of the transformation of the ADF to an operational force.

From a capability perspective the clear advantages in situational awareness, coordination, precision, lethality and reach that can accrue to forces employing advanced technologies are readily apparent. Such technologies are fundamental enablers of joint operations and offer the potential for improvements in the cost-effectiveness of military forces. They are also critical elements in plans to enhance the interoperability of the ADF with allied forces and maintaining, where possible, a regional capability edge.

They are costly to buy and to operate. Studies undertaken by Defence indicate that the real cost of successive generations of military equipment is rising by an average of at least 4 per cent per year. At 5 per cent compounded, the real cost effectively doubles in 15 years. Operating costs increase by something in the order of 3 per cent per year. Meeting all these increasing costs is a challenge the ADF will have to face in the future.

More immediately, Defence and the ADF will have the challenge of delivering and absorbing new equipment programmed in the DCP. The period 2008-15 is set to be particularly busy with multiple major equipment changes occurring simultaneously. The capacities of the Services to absorb so much change by having in place the required doctrine, training and management solutions, and DMO to deliver the equipment in the time frame, are open questions.

Another important aspect of the transition to an operational force has been the virtual abandonment of the mobilisation base approach that underpinned ADF force structure planning, particularly in the Army, for decades. While notions of partial mobilisation (or work-up) are still relevant in the context of providing rotation

forces, it is no longer acceptable to maintain large numbers of personnel and units at very low levels of preparedness, equipment holdings and staffing.

So, the fundamental rationale for the Reserves has changed. Increasingly, their role in the operational force will be linked directly to individual reinforcement of ready or deployed units, or to less demanding tasks that Reserves can prepare for part-time and undertake at short notice.

We have to be realistic about what can be expected of Reserves. The opportunities and obligations of Reserve service have grown in recent years; however, the realities of part-time service in the more complex national economic and military environments of the 21st century impose some important limitations on their employability.

To start with, availability for training and deployment cannot be assured. The productivity and related reforms that have deregulated and revolutionised the economy have made it more difficult for Reservists to meet their nominal obligations.

The higher the complexity of the ADF and its likely operating environments, the more difficult the task of training part-time personnel will be. The most demanding requirements will probably be unsustainable in the part-time component except for fully trained and experienced previously full-time personnel. The numbers of these people may well set the feasibility limit for ready reinforcements. It would be prudent to plan that forces destined for higher risk complex operations should be full-time.

This thinking may lie behind the increasing domestic security role allocated to the Reserves, and particularly the Army Reserves, in recent *Defence Updates*. Protective security tasks are much less demanding than manoeuvre operations and should be achievable with lesser capability requirements.

It is noteworthy that the plans for Hardening and Networking the Army will actually result in two forces with different levels of capability: a highly capable, hardened and networked, deployable, full-time force with limited reinforcements drawn from the High Readiness Reserve; and a Reserve devoid of armoured vehicles and focused on domestic security tasks.

This type of force specialisation is a pragmatic response to the needs of an operational force, a new strategic requirement and the prevailing realities of Reserve service. But its implementation will undoubtedly face some difficulties both inside and outside the Army. Nonetheless, one wonders whether this approach might set a trend for other capability areas, like border and fisheries protection.

The shift to an operational force is set to impose some other complications on the ADF, in terms of its structure and its personnel policies. An operational force is a highly demanding workplace, and this applies both before and during deployment. If the demand for operational commitments persists at current or increased levels then questions of sustainability will need to be addressed. This might lead to further force structure changes to provide more depth to capabilities.

But the more challenging requirement could be the need for revised personnel policies to provide respite and appropriate compensation for individuals. The

concept that there is nothing special about ADF employment until people deploy on operations, when they will be given extraordinary allowances and benefits, must surely come under question in a fully developed operational force.

Employer of Choice

This brings me to the second of the ADF transformations: that from a conservative and unique employer to the adaptive, competitive employer of choice that is needed to effectively meet the ADF's workforce needs both now and in the future. This transformation has much further to travel to completion than its operational companion and the complexity of the subject means that scant justice can be done to it here. Let me touch, only briefly, on a few issues.

As a volunteer force the ADF is subject to the vagaries of an evolving labour market that has experienced significant changes over the past 15 years. Deregulation and productivity reforms, combined with changing societal attitudes and individual aspirations have made it a more challenging market for the ADF.

Over the past 20 years the share of the Australian workforce applying for entry to the ADF has steadily declined, save for the dramatic shift that occurred in the early 1990s, which coincided with a recession and an 18-month freeze on recruiting following the Force Structure Review.⁴ The ADF now attracts only slightly more than 0.1 per cent of the workforce each year, but this is sufficient to meet a recruiting target of around 6000.

The problem emerges when the rates personnel leave the ADF exceed the viable recruiting uptake. When the separation rate is about 10 per cent this is manageable; when it is higher the ADF starts to lose numbers. When this persists, the ADF has a recruiting and retention crisis that is unacceptable in an operational force facing a highly demanding and uncertain strategic environment.

While linkages between economic performance and ADF staffing outcomes might not be direct and strong, as many reviews have attested, there is clearly a relationship. A combination of more people staying in education, more interesting opportunities and better paying jobs available, falling unemployment, changing career and lifestyle expectations, and adverse publicity about the ADF, make the recruiting task harder. Among these, the only factor the ADF can influence is adverse publicity and perceptions.

They also make the retention task harder, but this is compounded by the negative push factors that the experience of military service provides to its members. You know the form: long separations from family and friends, frequent geographic relocations, narrow career paths, the demanding nature of Service life, and so on.

A lot of initiatives have been introduced in recent years to improve Service life and provide incentives for people to stay in the ADF, yet separation rates for the RAN and Army remain unmanageably high.

There are no simple, silver bullets in this challenge. What seems to be needed – and this has been raised in a number of reviews, like that into Strategic Workforce

Planning in 2003, and books on the subject such as Jans and Schmidtchen's *The Real C3* – is some transformation in thinking and approach to the issue.⁵

As an example, what might the possible solutions look like if they were accepted as a planning reality that:

- the ADF is, and will remain, a high turn over workforce
- members of the ADF are a scarce and precious asset
- the basis for employment should be flexibility and returns on investments for both the ADF and the employee
- the military service experience is one stage in a life career, one that can be had at different stages of life, and should be made attractive to those the ADF wants to retain
- the government will provide special supportive policies in recognition of the value to the nation of military service?

None of us know the answer to that question but it is probable that there would be a less adverse impact on capability and the range of military options available to the government, than will occur in the absence of transformational change.

Strategic Planning Equilibrium

That takes us back to the key challenge facing the ADF and the interrelationship between strategic policy, the defence capabilities sought by the government, and the financial resources made available to Defence to meet the need.

The interaction of these factors is bound up in issues of priorities, affordability, requirements, feasibility and efficiency. A change in one factor should affect at least one other, if not all of them. The task of the strategic planners in Defence and the ADF is to maintain, in concert with the government, as close a match between the three key factors as they can.

The major reviews and force rationalisations undertaken in Defence have been prompted by shifts in either strategic policy or financial allocations. Some of the results have been dramatic in terms of their effects on ADF capability, particularly when they have been imposed on Defence by the government, and required quick results in terms of financial savings. Remember the Force Structure Review and its companions: the Defence Regional Support Review, and the Commercial Support Program?

While many of the results from these activities might now be judged to have been beneficial, the processes involved were remarkably arbitrary and the adverse impacts on Service capabilities and management persisted for many years. The lesson from this experience has to be to avoid this in the future if possible.

With the release of the *Defence Update 2005* in December, and the clear expectation that the government will extend its 3 per cent real growth program for Defence beyond 2010, the alignment between policy, capability and finance seems reasonable. There appears to be no pressing need for Defence to pursue significant efficiencies and productivity improvements.

However, there are contrary views. A recent paper by Treasury Secretary, Dr Ken Henry, laid out the prospects for reduced GDP growth and increasing societal demands for funding resulting from the impacts of expected demographic changes in Australia. He foreshadows increased scrutiny of budgets, and commented:

Resources devoted to activities or capabilities that do not meet Australia's true strategic needs do not provide value to Australians. Assessing Australia's strategic priorities correctly and managing strategic risk appropriately are therefore of fundamental importance to achieving productivity gains.⁶

So, efficiency and productivity are on the table. And how many elections are there going to be between now and 2015? It is these concerns that prompted the Australian Strategic Policy Institute (ASPI), in a paper published in 2004, to recommend making Defence efficiency an enduring goal for the entire organisation.⁷ It would be far better an approach than waiting for the next directed review.

Before setting out on that path, it might also be useful to recalibrate the ADF baseline during the next Defence White Paper process by including a detailed assessment of the required force structure and its costs. Just as the Army has adjusted and identified its needs consistent with policy and available finances in the HNA project, the remainder of the ADF should have the same opportunity. The capability choices and offsets that might be needed in a future rebalancing of strategic policy, defence capabilities and finances, could then be based on a more solid foundation.

PART 2

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Security Issues
in the Maritime
Environment

Old Roles and New Capabilities for Maritime Coalitions in the New World Order

Lee Willett

Our vision is to extend the peace through an inter-connected community of maritime nations working together.¹

Admiral Michael G. Mullen, USN

Since the end of the Cold War, unpredictability arguably has been the dominant feature of the global geostrategic security balance. In this context, the Australian Defence Force (ADF) and the Royal Australian Navy (RAN) concentrated on expanding Australia's geostrategic focus to make a more active contribution to regional security operations. But the strategic shock of the unpredicted terrorist attacks on the World Trade Center and the Pentagon on 11 September 2001, not to mention the attack on the *Arleigh Burke* class destroyer USS *Cole* on 12 October 2000 added a new dimension to the global geostrategic balance. Today, "Coalitions of the Willing" are tackling this emerging threat in the context of the Global War on Terrorism (GWOT) - or what is now termed the "Long War" by the US.² The significance of coalition partners addressing this threat has led to the emergence of the ADF and the RAN as global military players, engaged in coalitions tackling the problems of maritime security, the "Long War", and other strategic challenges.

Because of the integral presence of the sea in human endeavour, security on a global scale can only be underpinned by maritime power. Maritime power remains a vital sovereign tool in the pursuit of national policy aims.³ Given the growing significance of "coalitions of the willing" in supporting the "Long War" and promoting global security and stability, Geoffrey Till argues:

The requirements of what might be called collective system defence are particularly significant for the future composition and roles of navies ... This transformation in the context in which navies operate seems likely to lead to major shifts in what navies do and in what and who they do it with.⁴

There are challenges - both old and new - facing maritime coalitions in providing peace and security at sea in the New World Order. In the post-11 September 2001 and post-Iraq world, the enduring political and military significance of the traditional maritime core principles of the use of force at and from the sea is ever growing. What this paper will endeavour to do is to make a case for this growing significance. There is certainly a need to do this: the contribution of maritime forces to joint operations, to multinational coalitions and to global security as a whole is not well understood.

There are three key factors that underscore this significance:

- Effect from the Joint Sea Base – forces based at sea make a unique contribution to joint and multinational operations because prevailing political circumstances place strategic primacy on the ability to deliver effect ashore from a sovereign joint sea base. Such a base would be deployed in international waters and provide guaranteed access into theatre and onto target in the increasing absence of Access, Basing and Overflight (ABO) rights, rights increasingly restricted by splits in the global geopolitical fabric
- Maritime Security Operations (MSO) – forces based at sea make a unique contribution because of the increasing use of the sea by potential opponents both as a means of moving people and material, and as a target in its own right
- Presence – forces based at sea make a unique contribution to security because of their simple presence. The traditional ability of a sovereign platform to be poised and ready in international waters is bolstered today by the increasing ability of forces based at sea to translate presence at sea into effect on land. Simple presence is, arguably, the unique selling point for the role of maritime coalitions in the New World Order.

Emerging and Future Threats in the New World Order

The contemporary geostrategic environment is, potentially, more threatening than ever before.⁵ The environment is characterised by several factors:

- the enduring strategic dominance of the US
- the increasingly fluid and unstable nature of the strategic environment
- the increasing pre-eminence of non-state actors, operating in a transnational manner
- the proliferation of weapons of mass effect⁶
- a series of ongoing coalition operations, which make up the “Long War”
- the challenges presented by globalisation.

Threat is the sum of capability plus intent. Capabilities can be predicted, but intent cannot be predicted as easily and – more significantly – can change overnight. Broadly, the sources of those threats can be grouped together as follows:

- major established maritime powers – for example Russia, with capability but no intent at present
- emerging maritime powers with possible capability and intent – for example, China and India
- rogue states with possible capability and likely intent – for example, Iran and North Korea
- state-sponsored operators with possible capability and likely intent. Deterrence might not be able to deter the operators themselves, but possibly those who sponsor them
- future unknown threats with unknown capability and intent.

As Admiral Chris Barrie has argued, the future is hard to predict.⁷ However, history has shown that future strategic shocks are “a racing certainty”.⁸ Maritime coalitions must be prepared to deal with such strategic shocks when they occur.⁹

The Australian Department of Defence's *Future Warfighting Concept* argues that "our future adversaries will come in different forms, have different goals and employ different methods, but they all have a common thread: the will to fight".¹⁰ The aims and intents of established powers, rogue states – or non-state entities operating either independently or supported by rogue states – are generating threats that are global and transnational in structure and in potential effect, but also are increasingly random. This raises challenges that might be beyond local, national and current legal solutions.¹¹ The threats faced today are ever more complex, with this complexity raising fundamental questions about how maritime coalitions create, deliver and sustain effect to offset these threats.¹² Not knowing where the threat may strike means that you need to understand better where the threat may come from in the first place, and to be able to address the threat at the source. The role of maritime coalitions in dealing with such threats at the source is increasingly significant. Yet the challenges for coalitions in dealing with such threats are demanding.¹³ As Admiral Michael Mullen, the Chief of Naval Operations of the US Navy (USN), stated:

*The sea gives me access to where [the enemy] is and just as importantly to where he isn't. It gives me dominance in short order. It takes advantage of my ability to be persistent and perhaps, most critically, it allows me to influence events ashore. And [I] don't need anybody's permission to do it ... I'm not just interested in knocking the enemy to the canvas. I'll do that if I have to. I want to prevent him from even climbing into the ring.*¹⁴

Potential opponents can use the air, land and sea environments as a target and – in particular – as a means of movement. It is arguably easier to restrict movement in the air and land environments than it is at sea. In its recent publication the *Naval Amphibious Warfare Plan*, the USN's Expeditionary Warfare Division highlights the focus of Al Qaeda and other Islamic fundamentalist terrorist organisations in purging the southern and eastern Mediterranean, North Africa, the Horn of Africa, the Middle East, and central and South East Asia of Western influence, an area encompassing some of the busiest seas, oceans and sea lines of communication (SLOC) in the world.¹⁵ Hostile action against maritime targets has the potential to significantly disrupt the way in which the world operates. As the world moves itself by sea, the need to restrict the ability of potential opponents to use the sea to protect or project its own force is the fundamental challenge for maritime forces. It is also why the traditional and enduring principles of force employed at or from the sea remain increasingly vital – and unique. Today, navies themselves are realising the importance of maritime coalitions in global security perhaps even more than governments themselves.

The Role of Maritime Coalitions in the New World Order

Forces based in all three environments have unique advantages. People live on land, the traditional precepts of conflict are based on influencing events ashore,

and forces based on land are able to do one thing that forces in other environments cannot do – hold ground. Assets deployed in the air environment have broad and deep coverage of the air, land and sea environments, and the weight of numbers of air assets provides significant flexibility, firepower and repeatability. As a means of enabling the projection of coalition force and as a means of denying the use of the maritime environment to potential adversaries, maritime forces have a unique geostrategic position. It is unlikely that even the highly unpredictable nature of the global strategic environment will ever mean that the use of the sea is restricted. The same cannot be said for operations on land and in the air.

The unstable and transnational nature of potential threats “encourages a collective rather than a national response to what has to be done”.¹⁶ Moreover, the very nature of the maritime environment itself encourages cooperation: as Geoffrey Till has argued, “the sea is a truly international medium which unites, as much as it divides, separated countries and regions”.¹⁷ No one nation can secure the use of the sea itself, and individual nations need to work together to make the most of their individual contributions.¹⁸ Maritime security is an international imperative requiring an international solution.¹⁹

*For a growing number of navies, independent action against threats, especially on the high seas, appears increasingly unlikely, either because it cannot be afforded, or because it seems unnecessary, politically unwise, or all three ... One benefit of combined action against common threats ... is that it encourages [a] wider sense of maritime community.*²⁰

The UK Government sees the Royal Navy (RN) as a force for good in the world, and a key asset in the UK’s ability to conduct defence diplomacy.²¹ The RN itself sets out five core maritime roles: maritime security; flexible global reach; theatre entry; maritime force projection, including maritime strike; and Command, Control, Communications, Computers, Intelligence, Surveillance, Targeting, Acquisition and Reconnaissance (C4ISTAR).²² A key component of the evolving UK strategic posture is the emphasis on expeditionary operations. Expeditionary operations require capabilities for delivering presence, access for both maritime and other forces, and power projection at distance – roles for which maritime forces are ideally suited to deliver.

US military strategy argues that coalition warfare and multinational operations will be “fundamental features of the US national security strategy”.²³ The USN is looking to its maritime coalition partners to provide military quantity – in platform and weapons capability terms – and political presence. In his vision statements for the future of maritime operations and global security, Admiral Mullen highlights the key role of all partners in improving the interoperability, capability and political significance of maritime coalitions. Admiral Mullen’s vision is for a “1000-ship Navy ... a fleet-in-being, if you will, comprised of all freedom-loving nations, standing watch over the seas, standing watch over each other”.²⁴ This fleet-in-being should be based on what Admiral Mullen terms a global network of nations with a single

aim, but with flexibility in concepts and capabilities to accommodate and coordinate national and regional interests and differences and, thus, to generate greater-still political effect in order to more effectively confront security challenges. The vision is based on some key principles:

- national priorities come first
- nations participate as and where they can. This is a voluntary network where no one navy can – or will wish to – do everything
- national capabilities are vital as the fundamental building blocks of the global network. The size and capability does not matter: nations must do what they can
- security in the maritime domain is vital to global stability
- both naval and commercial maritime fleets are the cornerstone of the network
- coalition partners must take responsibility and share the burden. Those that can do something must do it, and nations should leverage close relationships to encourage more nations to participate
- regional maritime networks are a vital sub-component of the global network
- to be effective and efficient, the global network must do more – and do more better – in terms of the sharing of information
- strength in security is based on strength in relationships, cooperation and capability
- this is a long-term strategy, but one which must start now.²⁵

Traditional Concepts

The central role of concepts is to turn the vision of strategic requirements into the reality of equipment capability, and to provide a sound basis for long-term planning.²⁶ Crucial to the development of both effective concepts and effective operations are: the ability to identify and capture lessons learned and to adapt rapidly to change,²⁷ but perhaps more so the need to develop the right concepts to better enable the use of military force in supporting political requirements.

The key conceptual elements that underpin the unique contribution made by forces based at sea, to security in the contemporary geostrategic landscape, are both old and new. The current geostrategic environment has seen the re-emergence of traditional issues, such as: the focus on warfighting abilities; the need to improve the speed of decision to effect cycles; the uncertainty of war; the significance of effective and reliable communications; the need to deliver the right effect; the importance of coalition partners; the significance of presence; and the control and denial of the use of the sea. Only forces based at sea can control and deny the use of the sea.

The new conceptual challenges to emerge derive predominantly from the impact of technology: the emphasis on network enabled capabilities and operations; the system-of-systems approach to technology, acquisition and operations; better and faster collection, communication and use of information to improve battlespace awareness and to deliver maximum effect;²⁸ the increasing use of commercial technologies, procedures and practices; and the effect of the media

in the military world. Beyond these technological challenges, two new conceptual challenges are emerging, challenges that will fundamentally influence the nature of maritime capabilities and operations. First, the fluid nature of the threat will require forces to maintain current readiness while being able to adapt capabilities and force structures to have more relevance across a greater range of operational requirements and to be able to adapt to emerging and unknown future threats.²⁹ Second, the type of operational commitment also is changing, with far more long-term, sustained commitment to an operation required. Only forces based at sea can guarantee that kind of sustainability in the current political circumstances. Thus, the Joint Sea Base, MSO and presence are traditional concepts, but ones that now have increasing significance.

Creating Effects from the Joint Sea Base

Forces based at sea in what is termed by the RN the “Joint Sea Base” is a fundamental concept for delivering contemporary security. The ability of forward-deployed assets based at sea to tackle crises at source is a key means of offsetting threats both to the homeland and to wider national interests. According to the RAN’s *The Naval Contribution to Australian Maritime Operations*:

*In periods of tension putting a maritime force to sea can be a prudent contingency, providing a gesture of support towards allies or a threat to adversaries. Its capacity to provide sustained forward presence is a powerful diplomatic tool, while its ability to manoeuvre freely at sea can be used to escalate or defuse tensions.*³⁰

Maritime forces are always likely to be pre-deployed to or near a region of any perceived future crisis. Maritime forces also are well suited to dealing with the regular blurring of distinctions between different types of operation. Forces based at sea can create and deliver effect across the spectrum of maritime forces operations to support each of what the UK Ministry of Defence terms “strategic effects” – prevent, stabilise, contain, deter, coerce, disrupt, defeat and destroy.³¹ The Joint Sea Base itself is a significant force multiplier that provides freedom of access, movement and opportunity; politico-military choice, flexibility and leverage; and the support of policy and the protection of interests in both military and non-military cases. It provides a sovereign, autonomous, sustainable, combat-ready, task-orientated, pre-positioned and self-sustained forward joint operations base that can deploy early; seize the initiative; assure access; protect, project and sustain force; develop, sustain and dictate tempo; and deliver rapid and effective responses by reacting swiftly with massed or dispersed power to create the desired effect at the place and time of choice.

The need to deal with a wide range of threats simultaneously requires a combination of:

Dominant information and dominant manoeuvre ... A seapower or maritime strategy bases its dominant manoeuvre on the sea, because it is far easier to

*move anything heavy by sea than by land or air ... To make dominant manoeuvre possible, the force manoeuvring has to be able to secure the space in which it manoeuvres. Ideally it denies that space to the enemy.*³²

The Joint Sea Base achieves this by generating sea control and sea denial, manoeuvring its floating airfields and gunboats with a mobility that can mass or disperse assets and capability as required and – perhaps most importantly – with force deployed ready for use and not just merely transported.³³

In particular, at a time of increasing political doubt about the availability of ABO rights, forces based at sea can generate tailored packages that can deliver both political and military effect, and that put in place a political or military footprint commensurate to the circumstances. “What makes seapower so crucial in current conditions is that it can exert its influence without resorting to force.”³⁴ The significance of maritime forces in creating and sustaining effect from the sea is a vital attribute given the political complexity of ABO rights. The uncertainty of the global strategic environment requires that coalitions respond rapidly and seize the initiative, dictating the tempo, timing and direction of operations in areas of their choosing and in areas where threats are evident – in both cases, where ABO may not be guaranteed. Indeed, lessons identified from recent operations have underscored the growing political difficulties with securing ABO rights. Simply, using maritime forces is the only way to guarantee access in a hostile world.³⁵

*Without maritime access, the war [in Afghanistan] probably could not have been fought, because governments would likely have felt compelled to exercise their potential vetoes against US operations ... [Yet] Afghanistan is an unusual case. It is about as far from the sea as a potential battlefield can get yet [the] ability to reach it from the sea was probably decisive.*³⁶

*The key, it turned out, was US sea power, which provided bases near Afghanistan in international waters. Given those seagoing bases, the US could fight the war virtually without help. That removed any country's veto and, paradoxically, encouraged many governments to join the coalition against the Taliban.*³⁷

In recent operations in the “Long War”, Operation ENDURING FREEDOM (OEF) in Afghanistan and Operation IRAQI FREEDOM (OIF) in Iraq are just two of many coalition operations underway right now using a Joint Sea Base. Throughout these ongoing operations, coalition maritime forces (Coalition Task Force (CTF58) in OEF and CTF150 in OIF) have shown an inherent ability to deliver decisive effect across the spectrum of defence tasks. First, coalition maritime forces have been providing access into theatre from sovereign operating bases, often where there were significant geostrategic or political complications with ABO rights. In the case of OEF, the speed, poise, reach, flexibility and responsiveness of maritime forces was demonstrated by the fact that a coalition task force of 5000 personnel on various platforms including an aircraft carrier and a Landing Platform Helicopter (LPH) were on station from a standing start in just a week.³⁸ Second, coalition maritime forces

have provided access onto target from international waters in the form of power projection ashore from distance and, in the cases of Kosovo and Afghanistan, into land locked countries. Third, maritime forces have been able to deliver both direct and indirect effect in the crucial early phases of a crisis, thereby seizing the initiative and acting as an enabling agent in shaping the political and military battlespace. Fourth, maritime logistics and support assets have been providing support for forces ashore in combat as well as providing post-conflict reconstruction and humanitarian support.³⁹ Finally, while conducting and supporting operations ashore, forces in the Joint Sea Base have concurrently been able to conduct MSO and “Long War” operations and – in the particular case of OIF – securing the Straits of Hormuz and protecting the sea-based oil infrastructure. In all cases, the ability of maritime forces to exert presence at sea and to deliver effect ashore has proved to be vital.

Maritime Security Operations

On the other hand, potential adversaries look for weak points to exploit, and coalitions of the willing cannot let the use of force at sea be one such weak point. The globalisation of threats and the freedom of movement on the high seas – given that the sea remains the only way to move sizable amounts of people and material – mean that opponents will try to exploit the use of the sea as much as maritime coalitions will try to deny that use.

With the re-emergence of the significance of security at sea, an emerging core task for maritime coalitions is the ability to conduct effective MSO. This is an enduring role, but what is changing is how it is done and what is needed – especially in terms of international law – to help you do it. In MSO, forces based at sea are responsible for the execution of a range of operations, including high intensity combat; interdiction of commercial and military shipping; protection of maritime resources; protection of shipping and sea lines of communication (SLOC); homeland security; enforcement of sanctions and embargoes; anti-piracy and anti-arms smuggling; anti-proliferation; countering organised crime, people smuggling and narcotics trafficking; migration control; human rights protection; humanitarian support (a role in which the significance of maritime forces arguably has never been so clear as in the wake of the Asian tsunami and Hurricane Katrina); peace building or enforcement and peace support; protection of the maritime environment; and support for international law. In some cases, however, maritime coalitions need the support of legal mandates and robust rules of engagement to be able to operate more effectively in these roles, but do not have such support as yet.

Additional challenges in MSO include: increasing the use of air traffic control style “shipping plans” for commercial shipping (the effective tracking of individual items of seaborne cargo is vital);⁴⁰ learning how to work with new partners, including other maritime, cross-government and transnational agencies; and improving the use and sharing of information. The latter point is crucial. Adopting a more intelligence-led approach to MSO – with a particular emphasis on human intelligence – has seen a significant increase in the amount of useful intelligence

collated in sea-based operations and a concurrent decrease in attacks at sea in recent months.⁴¹ The maritime coalitions, however, need to be able to show that it is their work that is making the difference.

Presence

According to *Australian Maritime Doctrine*, presence is:

*The term used to describe the operations of naval forces in areas of strategic significance that are intended to convey an interest ... The influence of presence derives directly from such features as access, flexibility, poise and persistence. It depends, however, fundamentally upon credible combat power. Presence is not itself a threat of force, but a demonstration of capability that can be used to reassure, to impress and to warn.*⁴²

Indeed, as Commodore Peter Jones argued in a presentation to this conference in 2004, the success of coalition forces in maintaining security in the Gulf during OIF was based on “presence, an intimate knowledge of the operating area, and confidence to exploit this knowledge”.⁴³

Forces based at sea possess the inherent ability to deploy when and where at will; to cover almost 100 per cent of the earth’s surface from sovereign platforms in international waters; to exercise passive or active use of deterrence, coercion and sea control; and to deliver effect at sea and on land. The critical enabler for all this is presence. Presence is, arguably, the unique selling point for forces based at sea. The presence of a highly-capable warship – especially one backed up with credible capability to deliver effect ashore – can send a very clear message of intent. Perhaps most significantly, the USN is looking towards its coalition partners to take on a greater-still proportion of the presence burden.

New Capabilities?

If the significance of forces based at sea is increasing in the current strategic environment, adequate investment is required to ensure sufficient availability of – and balance in – platforms and capability. As Admiral Mullen stated, “we need to rethink both the number and the types of ships we are building”.⁴⁴

As yet, investment by coalition partners in some key future maritime programs does not reflect the increase in significance in the role of maritime forces. However, rather than focus on specific programs, this paper will look at some key capability principles that will underpin the development of effective use of force at and from the sea.

Network Enabled Operations

Networked warfare is an acquisition and operational ethos as much as it is – if not more than – a technological question. The UK response to the US and Australian focus on network centric warfare (NCW) is the concept of a network enabled capability (NEC). NEC is a philosophy designed to underpin mindsets, concepts, acquisition

and operations. While it does require a fundamental conceptual rethinking of the way the UK Armed Forces approach their business, it also generates new capability and operational opportunities that need to be exploited. The network of capabilities is designed to increase the value of information, to improve the speed of decision and response, and to improve the operational effectiveness of the use of force. Networks do not fight wars, people do: and the effect of the network is the most important factor, not the network itself.

Coalition Interoperability

The “Long War” rests very heavily on a much higher level of cooperation and integration between the US and its coalition partners, with a particular emphasis on the recruitment of regional allies through the use of economic, political, military and security means.⁴⁵ A maritime coalition itself must be able to operate seamlessly as a single force. While coalition partners can always improve interoperability with the USN in particular, some coalition assets are now almost interchangeable with USN assets in some circumstances and in some operations. Commodore Paul Robinson, formerly the UK’s Maritime Component Commander in the Gulf region, commented that “the importance of coalition forces in the Gulf is absolutely immense. On any given day, one-third to one-half of the available naval forces are non-US naval forces. And there are more nations wanting to join.”⁴⁶ Coalitions certainly bring an effect greater than the sum of the individual, national parts.⁴⁷

Maritime coalition partners will need to develop conceptual, doctrinal and technological interoperability at a variety of levels, but perhaps more importantly they will need to improve understanding of each other’s political, military and cultural structures and prerequisites.⁴⁸ Improving interoperability also is no longer a case of working to the lowest common denominator. Instead, coalition partners look to find workarounds. Maritime coalition operations are a complex business. They are about thinking as one force, as well as acting as one. Standardising – and simplifying – practices, principles and procedures as well as technology will be very difficult, but the pay-off for the capabilities of maritime coalitions will be well worth it.

Even in technological terms alone, improving interoperability is no longer about finding the lowest common denominator. For example, the Pakistani Navy can only afford a basic level of communications interoperability, but with the coalition partners working around the problem to plug any communications gaps, the Pakistani Navy shortly will be leading CTF58 – a move that will significantly enhance the profile of Pakistan in the coalition, as well as significantly strengthening both the credibility and potential cultural impact of the coalition in the “Long War”.

Coalition Partners and Niche Capabilities

One of the key questions in the interoperability debate has been whether all coalition partners should have the same capabilities, certainly in system type if not in system numbers. Back as far as John Lehman’s tour as the US Secretary of the Navy in the

Pentagon, US maritime doctrines have discussed allies providing niche capabilities that the USN would thus not need to provide.⁴⁹ Today – particularly as operational experience has shown that the most effective coalitions often are made up of a mix of units with different capabilities, rather than a combination of units of similar capabilities – there is an increasing emphasis on a “come as you are” approach to the capability requirements for maritime coalitions.

The 1000-Ship Navy initiative covers, by definition, a very broad spectrum in terms of the political interests of the nations concerned and the capabilities they may bring. The kinds of niche capabilities provided by individual nations within maritime coalitions that might be of benefit to the USN could include: C4ISTAR capabilities, to improve situational awareness and battlespace dominance; the insertion and support of amphibious or special forces; capabilities and platforms to support the sustainability of joint sea base; and land attack cruise missile platforms to deliver effect ashore. The US Quadrennial Defense Review (QDR), the latest iteration of which was released in February 2006, is focusing on a shift away from large-scale combat operations to an emphasis on the use of highly mobile, often covert, counter-terrorist forces.⁵⁰ Thus, forces based at sea that can deliver access at the place and time of choice; a combination of key C4ISTAR, land attack, amphibious/special forces insertion; and sustained logistics support at distance, have significant strategic primacy.

With reference to land attack, for example, several key RN programs – namely the future carrier, the *Astute* class nuclear-powered submarine, and the *Daring* class Type 45 destroyer (the first of which, HMS *Daring*, was launched on 1 February 2006) – will provide the backbone of the RN’s contribution to joint and combined operations and, in particular, a core land attack capability for maritime coalitions as well as just for the UK.⁵¹ The CVF program, although still only in the development phase, will provide a significant land attack capability with the Joint Combat Aircraft (JCA) – a capability requirement for which, at this stage, the Joint Strike Fighter (JSF) is the preferred solution. The UK has a long range land attack capability already, with the Tomahawk Land Attack Missile (TLAM) fitted to its SSNs. With TLAM the key capability requirement for *Astute*, all boats will to be fitted from build for TLAM. The UK has not as yet changed its stated capability requirement for the number of TLAM rounds in the inventory and the types of platform fitted for TLAM. However, it is looking at options to extend its land attack capability, which may mean changing this requirement. For *Astute*, this would mean a potential expansion of its TLAM inventory to increase the number of munitions available for the *Astute* platforms. As far as the Type 45 destroyer is concerned, the UK has been considering a TLAM fit for it. The number of hulls in the Type 45 program has been cut from twelve to eight and no decision has been taken, as yet, on a TLAM fit. However, it is understood that a land attack batch of Type 45s is being considered from hull seven onwards, and that a four-hull interim UK surface combatant solution, known as the Medium-sized Vessel Derivative (MVD), which is being considered for the middle of the next decade, is assessing a range of potential platforms (including additional Type 45

hulls, the French FREMM program and the Dutch LCF program) all of which will have a land attack option.

It is an era with a growing requirement for forces to project power to influence events ashore, with a lack of ABO, and with concerns over risks to personnel. A long range land attack cruise missile capability, which provides autonomous power and precision that gives political and military influence at distance, is an increasingly vital force element for many nations. Several other nations – including Australia, Canada, Denmark, France, Israel, Italy, Japan, Norway, South Korea and Spain – have examined a sea-based long range land attack cruise missile capability. Some argue that NATO has set out an inventory requirement of 1300 sea launched cruise missiles, with the burden to be shared out amongst its member states.⁵² The Royal Netherlands Navy shortly will have a TLAM capability with two of its *De Zeven Provinciën* LCF frigates. France is now proceeding with its own program – *Scalp Naval*, a program that will also have a considerable export market. The Australian Department of Defence has been assessing the land attack issue for some time.⁵³ A long range land attack capability for the Air Warfare Destroyer (AWD) and/or the *Collins* class submarine would significantly enhance the ability of the RAN to make a significant and still somewhat unique (in terms of the number of countries that can do it) contribution to maritime coalition operations, to maritime deterrent, strike and warfighting roles, and to the support of national interests at greater distance from the homeland, while also improving the flexibility and capability of the contribution of those platforms to coalition operations. The key question, however, should always be why you need such a capability and how does it fit with strategic priorities, rather than what capability solutions are available.

Force Levels

This is perhaps the one niche capability that is arguably of most interest to the USN: simple platform numbers.

Whether to provide political support through burden-sharing, presence at sea (in particular in geographical regions it cannot cover itself), or to deliver effect ashore, the USN is looking to its coalition partners to provide numbers of platforms – hence Admiral Mullen’s reference to a 1000-Ship Navy. Arguably, the USN does not need anything from anyone else that it does not have itself already – except numbers, and the political support that numbers bring.

While the network may deliver a greater ability to deliver effects in widely separated locations, the simple fact is a warship still cannot be in two places at once. As Admiral Sergei Gorshkov once said, quantity does have a quality all of its own. To some, navies are now about as small as we can afford for them to be. The former First Sea Lord and RN Chief of the Naval Staff, Admiral Sir Alan West, argued that current and projected surface combatant force levels for the RN – which may see numbers dip below 25 – mean that while limited resources may restrict choices, “people should be under no illusions that with only 25 destroyers and frigates we will be very close to the cusp”.⁵⁴ Furthermore, the increasing squeeze on fiscal

resources and the increasing cost of platforms has meant that, due to force level cuts and the inability to build new platforms quickly enough, RN surface combatant force levels in the middle of the next decade will dip below the prescribed minimum of 25 – hence the need for the off-the-shelf MVD capability solution to plug the gap in the short term.

There is a spectrum of ways to alleviate such problems. At the lower end, particularly with newer platforms and build techniques, platform availability can be improved. At the higher end, given the increasing significance of the use of force at and from the sea to secure interests, and the increasing reliance of governments on forces based at sea at a time of declining ABO availability, the challenge for governments is to more fully support key future maritime programs.

Platform Affordability

The key problem for maritime forces, associated industries and other stakeholders, however, is the affordability of major naval combatants.

To highlight two particular problems: first of all there is a lack of commitment to full programs because of concerns about costs creates a chicken and egg situation where the limited number of platforms that are ordered end up costing more per unit than they might do if more were built. Take the case of the RN's *Astute* class SSN. Only four boats have been ordered to date out of a planned program of at least six within a required force level of eight SSNs. Because there is no order yet for Boat 5 onwards, all through-life costs for Boat 5 onwards are being placed on the latest boat in the class, Boat 4. However, the UK Government is unlikely to order the next batch of boats (and, by definition, spread out the support costs) while Boat 4 appears to be so unaffordable.

Second is the question of whether to build single- or multi-purpose platforms. Multi-purpose platforms do cost more but, if navies are to make a case for the significance of their contribution to joint operations, can they afford to have platforms that make only a limited contribution to a limited range of operations – particularly when budget battles at home do not take account of the niche capability and “come as you are” views held within the maritime coalitions in which individual navies operate? Navies need to be able to adapt their platforms to roles that they were not designed for, and also to take an approach where an interim capability is deployed now, with something better to follow later. Yet the sheer cost of warships creates a capability conundrum in which making platforms smaller or reducing the number of platforms does not necessarily deliver cost savings, and in which reducing capability on the platforms does not save significant amounts of money but does risk the creation of a far less capable and, thus, useful platform. So the challenge is whether to invest in: high end capabilities on large platforms that cost a lot, so you cannot buy as many, so they cost even more; or in more affordable platforms that cannot do as much and may leave you short in some circumstances; or something in between.

Conclusion

The ability of maritime coalitions to deliver effect at and from the sea, in international waters and from sovereign territory, gives maritime coalitions unique political and military influence in the contemporary geostrategic environment. Maritime forces alone cannot provide the total solution to these problems. Delivering global security is very much a joint effort, and “navies are only part of the solution. [The problem] calls for an integrated and joined-up strategy”.⁵⁵ However, the maritime environment provides the only guaranteed global base from which these issues can be addressed. Maritime forces are a vital enabler in high intensity combat operations, but are ever more important in securing the peace in the first place. As the USN seeks to build a 1000-ship maritime coalition, the political and military role of key partners such as the RN and the RAN is becoming ever more significant.

Maritime “coalitions of the willing” are, on a daily basis, playing a crucial role in maintaining global geostrategic stability. The flexibility, adaptability and responsiveness of maritime forces provide a unique capability for delivering effect in coalition operations in the New World Order, as sea bases forward-deployed in international waters, bring a variety of diverse capabilities to influence the air, land and sea environments.

Many key maritime core competencies, concepts and capabilities so crucial in promoting international security in the current strategic environment, have developed out of years of international cooperation and combined operations, with growing ties from the corporate through to personal levels. It is the strength of these ties that may well be crucial. Maritime coalitions need to play to their strengths and focus on key requirements, while exploiting new technology, innovating in and adapting to roles and processes and developing new ways of operating.⁵⁶

Yet, “unfortunately, much of the benefit of maritime forces is not always apparent, and so does not feature in the public’s perception of national security”.⁵⁷ Navies, in conjunction with their own defence departments and with each other, need to improve government, media and taxpayer understanding of the significance of maritime forces in the current geostrategic environment. In so doing, navies will show their true value to the taxpayer.⁵⁸ This is vital to strengthening their hand in budget battles. With less money available, and significant risk of reallocations away from defence, the need to make the maritime case for its old and new – but still unique – contributions to international peace should be the next step forward for maritime coalitions.

Returning to the words of Admiral Mullen:

*Perhaps the most profound effect of today’s challenges is the increased value of cooperation between friends, allies, coalition partners, and like-minded nations. Despite differences in size or structure of our navies, co-operation today is more necessary than ever before. And co-operation is growing, but we need more – much more. Because today’s challenges are global in nature, we must be collective in our response. We are bound together in our dependence on the seas and in our need for security of this vast commons.*⁵⁹

How Far Can the Proliferation Security Initiative Reach at Sea?

Michael Richardson

When Al Qaeda used four hijacked civilian jet airliners to strike the US, killing nearly 3000 people from 80 nations, the shockwaves reverberated around the world. The use of civilian planes as weapons to hit New York and Washington on 11 September 2001 exposed a whole new degree of vulnerability in the global transport system. It also raised government and public anxiety about mass casualty terrorism to a new level. In the US, the Bush Administration drew up a National Strategy to Combat Weapons of Mass Destruction. Released in December 2002, it called for a comprehensive approach to prevent these weapons from getting into the hands of hostile states and terrorists. Officials and counter-terrorism experts in the US, Europe and the Asia-Pacific region have warned that the next step up in high impact terrorism may be an attack using chemical or biological agents, radiological bombs, or even a nuclear explosive device.¹

Eight countries - the US, Russia, China, Britain, France, Israel, India and Pakistan - are known to have nuclear weapons. If North Korea's claim to have them is correct, that brings the total to nine. Iran is suspected by the West of seeking nuclear arms, although Tehran denies this. However, the technology, know-how and materials for making nuclear weapons are becoming more widely accessible as many nations around the world develop their scientific and industrial capacity. Some materials that circulate quite widely in the globalised economy are dual-use items: they can be legitimate trade goods or they can be misused as weapons of mass destruction (WMD).

There is a real risk that if nuclear arms control unravels any further, other countries will also go nuclear with potentially dangerous consequences for global stability. If instead of eight or nine states with nuclear weapons, there are twenty or more, would they all have reliable command and control structures? Probably not. Having many more nuclear powers would, at the very least, heighten the risk of use by miscalculation. It would also increase the risk of rogue regimes, officials or criminals transferring nuclear explosive know-how and materials to terrorists. Mohamed Elbaradei, the head of the International Atomic Energy Agency (IAEA), the United Nations body that acts as the world's nuclear watchdog, has warned that this is the greatest proliferation risk of all.²

The Treaty on the Non-Proliferation of Nuclear Weapons 1968 (NPT) has helped to limit the number of countries that have nuclear arms since it came into force in 1970. However Israel, a US ally, has refused to sign the NPT. So have India and Pakistan, arguing that it unfairly favours the five permanent members of the United Nations Security Council (the US, Russia, China, Britain and France) that were the only countries to have nuclear weapons in 1970.

Apart from being seen as discriminatory by some states, the NPT has a number of serious defects. It gives non-nuclear signatories the right to develop atomic energy for peaceful purposes, but does not give the IAEA sufficiently intrusive powers to ensure they do not cheat. The North Korean Government ran a clandestine military weapons program for many years while in the NPT. It withdrew from the treaty in January 2003, after expelling IAEA inspectors from its declared nuclear facilities. Iran, too, has curtailed inspections after the IAEA Board decided in February 2005 to report it to the UN Security Council on suspicion of having had a secret program to develop nuclear weapons over the last 20 years. Tehran has threatened to follow North Korea and pull out of the NPT. A state that decides to renounce the treaty can do so with just 90 days notice. Another flaw in long established arms control treaties is that they predate international concerns about WMD terrorism. They were designed to halt the spread of weapons between states, not the transfer of such devices, technology and related materials to or from individuals or organisations.

Alarmed at loopholes in arms control treaties and arrangements that allow countries like North Korea and Iran to import and trade material for nuclear weapons programs, the US, Australia and other concerned nations launched the Proliferation Security Initiative (PSI) in May 2003 to deter, detect and if necessary intercept – at sea, on land or in the air – shipments of WMD, their delivery systems and related items. The sea is a major focus of the PSI because oceans cover 70 per cent of the world's surface and carry 80 per cent of its trade by volume.

The PSI cooperative partnership, or coalition of the willing, is outside the framework of the UN and the international treaty system. Nonetheless, it has been applauded by the UN Secretary-General Kofi Annan as an effort to “fill a gap in our defences” against nuclear proliferation and terrorism.³ The UN's High-Level Panel of advisors said in reference to the PSI in their report in December 2004 to Mr Annan that “all states should be encouraged to join this voluntary initiative”.

The PSI has gained increasing international political support and understanding, as well as legal authority, since it was formed. The Bush Administration says it is an example of “effective multilateralism”. The US, Australia and other leading participants have said repeatedly that PSI cooperation takes place within existing national and international law.⁴ Moreover, governments that support the aims of the PSI do so on a voluntary basis. They are not obliged to take part in any activities they oppose. As understanding of the PSI has spread, so has the number of nations willing to participate. More outreach and explanation are needed to move the PSI beyond the current level of endorsement to gain support from an overwhelming majority of states in the international community.

Before the coalition was established to coordinate the crackdown on international shipments of WMD materials, the US and other countries trying to halt them had to rely on ad hoc exchanges of intelligence, and interceptions and searches that mostly took place in ports or the territorial waters of concerned nations. The PSI is designed to:

- expand the reach and effectiveness of this effort, not only geographically, but across the diplomatic, intelligence, law enforcement and military communities, and within the private sector
- improve the quality and exchange of information related to illicit WMD shipments
- enhance practical cooperation to disrupt the shipments.

The 11 founding members of the PSI were Australia, France, Germany, Italy, Japan, the Netherlands, Poland, Portugal, Spain, the UK and the US. Australia hosted the first PSI maritime interception exercise in October 2003. Eighteen more interdiction training exercises have followed, mainly at sea or in ports, in various parts of the world.⁵ Australia will hold the 20th PSI exercise in the Darwin area in April 2006. The Netherlands will conduct a PSI port exercise in the same month. Operational experts from PSI participating countries have also held numerous meetings to plan and coordinate activities.⁶ They are to meet again in the US in April 2006.

The PSI coalition was assembled against a backdrop of international concern at signs of an increasing trade in WMD-related materials, including the temporary seizure of a North Korean freighter, *So San*, in December 2002 by Spanish and US forces operating in the Arabian Sea.⁷ The ship was found to be carrying 15 ballistic missiles, fuel and spare parts for delivery to Yemen; they were hidden under bags of cement in its hold. The boarding was permitted under international law because the vessel was flying no flag. It was released after the high seas search at the request of the Yemeni Government, an ally of the US in the war on terror.⁸

Four months later, in April 2003, French and German intelligence authorities disrupted a scheme by North Korea to use front companies to import 214 ultra-strong aluminium pipes from Germany via China. Investigators concluded that the pipes, weighing 22 metric tonnes, could have yielded as many as 3500 gas centrifuges for enriching uranium and turning it into weapons-grade fissile material for nuclear weapons. With the agreement of the French owner, the cargo ship *Ville de Virgo* carrying the pipes to Asia in a container was diverted to the Egyptian port of Alexandria, just outside the entrance to the Suez Canal. There the tubes were removed and returned to Germany, where some of those involved in the scheme were charged in court.⁹

At around the same time the *Ville de Virgo* left Hamburg for Asia, another freighter departed from Japan's Kobe harbour carrying three devices known as direct-current stabilisers, exported by a Japanese trading company. The devices can be used to regulate the flow of power to centrifuges used for enriching uranium; they can also be used in missile launchers. The shipment was destined for North Korea but was routed via Thailand and Hong Kong where it was confiscated by customs officials at the request of Japan's National Police Agency.¹⁰ In mid-May 2003, a month after the aluminium pipes were seized on the *Ville de Virgo*, North Korea nearly succeeded in acquiring 33 tonnes of sodium cyanide, a chemical used in making the deadly nerve agent tabun. The chemicals were purchased legally

from a German manufacturer who believed the buyer was a Singapore company. But in fact, a switch was planned that would have diverted them to Pyongyang.

Since 2003, many countries have tightened their export controls by expanding their lists of regulated items that companies must clear for overseas sale, by bringing the lists into conformity with multilateral export control schedules, and by checking end-user certificates more thoroughly. Despite this, the trade in prohibited items continues on a significant scale.

Amid post-11 September 2001 concerns about high-consequence terrorism, one of the things that prompted the diverse group of eleven Asia-Pacific, European and North American states to form the PSI was the worry that if the knowledge, technology and materials for making nuclear bombs spread beyond the currently declared, or known, group of nations with nuclear arms, it might well enable terrorist organisations to get and use such weapons – a catastrophe that could cause huge death and destruction. The need to act more quickly and effectively after 11 September 2001 to prevent WMD terrorism also prompted the US and its small group of like-minded partners to avoid a treaty-based approach, which would have involved long and cumbersome negotiations and yielded results only slowly, if at all, given the widely differing national interests and threat perceptions of the UN's 191 member states.¹¹

When President George Bush announced the PSI in May 2003, the US-led invasion of Iraq had been underway for several months and been trenchantly opposed by France, Germany and Russia. The criticism by France and Germany severely strained their relations with the US. Yet Paris, Berlin and Washington put aside these deep differences to form the PSI because of overriding concerns about the twin threats of WMD proliferation and terrorism and the fear that, if more effective safeguards were not put in place, these potentially interlocking threats could fuse in an extremely dangerous challenge to international security, stability and trade – and thus to the functioning of the globalised economy.

The exposure in February 2004 of an extensive and long-running nuclear black market that funnelled weapons technology to Libya, North Korea and Iran underlined the need for better international cooperation to prevent this kind of trade. The network had been set up by Pakistani scientist A.Q. Khan, initially to help Pakistan get the materials and know-how it needed to develop nuclear weapons and the missiles to carry them. By the time Mr Khan made his televised confession and was placed under house arrest by embarrassed authorities in Pakistan early in 2004, his supply network had become what the IAEA's chief, Mr Elbaradei, called "the Wal-Mart of private sector proliferation". For example, items sent by the Khan network to Libya and Iran included centrifuges for enriching uranium to weapons-grade purity and designs for making nuclear warheads or fissile cores, while North Korea received about a dozen centrifuges for North Korean scientists to copy and then build their own.¹²

Sharing similar concerns about proliferation and terrorism to those of France and Germany, Russia joined the PSI in June 2004, although, like China, it remains

wary of both preponderant US power and some other US-led initiatives to shape the post-Cold War world. In 2002, the G8 had formed a Global Partnership Against the Spread of Weapons and Materials of Mass Destruction. Moscow's decision to become a core member of the PSI brought all the G8 Group of leading industrial powers into the arrangement. Canada, another G8 member, had become a core participant by early 2004. So, too, had Denmark, Norway, Singapore and Turkey, expanding its nucleus to 17 states.¹³ By the time the PSI's Worldwide Joint Training and Scheduling Conference was convened by the US Joint Forces Command in Suffolk, Virginia, in February 2005, three additional countries were listed as being involved in operational activities and/or exercises: Greece, New Zealand and Thailand. This expanded the PSI nucleus to 20 states.

The PSI is likely to become a permanent feature of international arms control precisely because it supplements existing treaties and multilateral arrangements, as well as national laws covering the export of strategically sensitive materials. If they fail to halt clandestine WMD programs and shipments, the PSI is intended to provide a safety net. But like all safety nets, the PSI has holes. What are the major ones?

Major Weaknesses

First, the PSI has restricted authority under international law. At sea, national authority extends no more than 12 nm from the coast. Beyond this, in international waters, the state whose flag a merchant ship flies must expressly consent before foreign warships can legally halt it – except in the case of a few universal crimes such as piracy and slavery. Interceptions by PSI coastal states of vessels exercising the right of transit passage through busy shipping straits, or innocent passage through national waters, could raise contentious legal issues.¹⁴ So could interdictions in the exclusive economic zones (EEZs) of some countries, or in the archipelagic waters of island nations such as Indonesia and the Philippines, unless the governments of those countries agree. EEZs extend 200 nm from the coast.

China, for example, has indicated concern that the PSI could infringe on the right of innocent passage for Chinese ships through the territorial waters of a PSI member country and their right of transit passage through straits used for international shipping, including the Malacca and Singapore straits, other key South East Asian waterways through Indonesia, and the Taiwan Strait between the Chinese mainland and Taiwan.¹⁵

Another problem area for the PSI concerns illegal WMD trade by land and air. While the sea is a major focus of the PSI, the program is also intended to disrupt and deter air and land shipments. The former can be difficult to do if it involves forcing a suspect plane to land. North Korea, for example, is reported to have sent missile parts by air, as well as sea, to Pakistan and Iran. There are also said to have been reciprocal flights by Iran to North Korea.¹⁶ These flights are believed to have used Chinese and Central Asian airspace beyond the reach of the PSI. In addition, some

WMD overland shipments in Asia and the Middle East may pass entirely through the national territory of countries that do not support the PSI.

The US Government says that in October 2005 it secured the agreement of almost all Central Asian states to support the PSI and take action to ensure that their airspace will not be abused by proliferators.¹⁷ However, any such agreements may be easier to agree in principle than enforce in practice. The exercise to be hosted by Australia around Darwin in April 2005 will focus on testing air interdiction scenarios. It will be the first PSI air interception exercise in the Asia-Pacific region. The training will also include extensive ground-based activities.¹⁸

A second major weakness of the PSI is the legal grey area in which it may apply. Interception of ships suspected of carrying WMD delivery systems is one of these areas. The spread of nuclear weapons and related technology by states is forbidden by the NPT. Trade in substances that could be used to make chemical arms is banned or tightly regulated by the *Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction* (Chemical Weapons Treaty), while circulation of biological agents is outlawed by the *Convention on the Prohibition of the Development, Production, Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction* (Biological and Toxin Weapons Convention). There is, however, no international treaty preventing the shipment of ballistic, cruise and other missiles that could be used to deliver weapons of mass destruction.¹⁹ The Missile Technology Control Regime, for example, is a voluntary arrangement that falls well short of a mandatory international treaty.

China has expressed concern that the PSI could be used as a pretext to seize legal Chinese missile and arms exports. Missiles of various kinds are an increasingly important part of national defence systems and form a significant sector of the global arms trade. Teal Group analysts estimated recently that just over 6200 surface-to-surface missiles worth US\$9.8 billion will be built between 2006 and 2015. Their forecast also says that in the same period, over 48,000 air defence missiles will be built at a cost of just over US\$24 billion. Many of these air defence missiles will guard against incoming ballistic and cruise missiles.²⁰ Missiles will remain a problem area for PSI interceptions on the high seas at least until recent amendments to the *Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation 1988* (SUA Convention) are ratified by enough states to bring them into force.

Ironically, missile shipments are among the easiest WMD-related items to detect when they are being loaded because they are big and obvious. Bulk shipments of substances that could be used to make chemical weapons are also relatively easy to trace and track. But the clandestine trade in biological agents, or even an orb of highly enriched uranium no bigger than a soccer ball for the fissile core of a nuclear explosive device, would probably be much harder for satellites and other remote sensors to spot. Accurate and timely human intelligence is the key to detection. This would be difficult if such shipments originated from a tightly controlled autocracy like North Korea.

A third major weakness of the PSI is that membership and political support remain limited, although it has become much more extensive. The 20 core members include some of the world's leading military and economic powers. But China and India are not in this group. Nor are emerging powers like Indonesia and Brazil. Nor is Malaysia, which along with Indonesia, Singapore and Thailand flanks the Malacca and Singapore straits. However, the US and other leading PSI participants say that a total of more than 70 of the 191 UN member states have signalled that they support the aims of the PSI and are ready to take part in interdiction efforts on a case by case basis.²¹

Open support for the PSI is relatively weak in the Asia-Pacific region. Australia was an enthusiastic backer from the start; New Zealand (NZ) became an adherent somewhat later. But only two Asian countries, Japan and Singapore, have so far publicly endorsed the PSI state of principles and hosted some of its exercises. When Japan organised a PSI maritime interception exercise in October 2004, four countries (the US, Australia, France and Japan itself) contributed the ships, fixed wing aircraft and helicopters. Eighteen other countries took part as observers, including five from the Asia-Pacific region – Cambodia, NZ, the Philippines, Singapore and Thailand. Last August, when Singapore held the first PSI exercise in South East Asia, the armed forces, coastguards, customs and other agencies from 13 PSI core countries took part in the training to track, board, search and seize a freighter carrying material that could be used to make chemical weapons. Attendees from Malaysia, Pakistan, Vietnam and Brunei observed the exercise.

Many Asian countries remain reluctant to be openly associated with a US-sponsored program like the PSI either because they fear it may override national sovereignty and freedom of navigation or because they do not want to be tagged as a follower of the US. Some may also be concerned at the cost of paying for military exercises and other PSI activities. As convenor of the six-party talks on Korea, China is wary of joining the PSI because this would be taken by North Korea as a partisan and provocative move.²² However, a senior US official said in August 2005 that China now fully understood the legal basis of the PSI and was becoming more and more cooperative in responding to proliferation challenges and the WMD trade.²³

South Korea shares China's concern about not wishing to alienate North Korea by openly joining the PSI as a full member. But in an attempt to bolster its counter-proliferation policy and relations with its US ally, Seoul decided late in 2005 to give limited support to the PSI. South Korea's Minister of Foreign Affairs and Trade, Ban Ki-moon said the government's position was to "cooperate on a case by case basis". North Korea called the decision an "unforgivable anti-national crime" and warned Seoul to reverse it or be held "accountable for all the consequences".²⁴ Pyongyang sees the PSI as a hostile alliance to enforce a blockade to bring North Korea to its knees.²⁵

India, a major regional naval power, has expressed interest in joining the PSI and recent joint naval exercises with the US have included PSI-style counter-proliferation and counter-terrorist training.²⁶ However, America may not want India

to be a core PSI member until they have completed their controversial nuclear agreement. Under the deal, America would, in effect, acknowledge India as a nuclear weapons power and treat it as a strategic partner but only after an accord has been reached on separating Indian military and civilian nuclear facilities and allowing IAEA inspectors access to the civilian centres. This has proven to be a difficult and complex negotiation because India's major research facilities, including its fast breeder reactor program, straddle both fields.²⁷ India may also be wary of becoming a core member of the PSI because it might then be obliged to take action against Iran, which New Delhi regards as a key energy supplier for the future. New Delhi may also be worried about undermining ties with other oil- and gas-rich Muslim nations in the Middle East and elsewhere that do not support the PSI.

New Authority for the PSI

Despite these weaknesses, the PSI has received some significant new legal underpinning since it started work. The operation gained additional authority in April 2004, two months after the A.Q. Khan nuclear smuggling network was exposed, when the UN Security Council unanimously passed Resolution 1540 to prevent the spread of WMD and their means of delivery to non-state actors, including terrorists and black marketeers. In doing so, the Security Council – for only the second time since its founding – invoked Chapter VII of the UN Charter to require nations to act against a general, rather than specific, threat to international peace and security. Chapter VII makes it obligatory for UN member states to follow the instruction from the Security Council and could eventually involve sanctions and the use of force in cases of non-compliance.²⁸

The resolution was first proposed by the US in September 2003. As passed by the Security Council, it requested UN member states to report on their compliance within six months and established a monitoring arrangement by the Security Council for two years. The measure filled an important gap in existing non-proliferation regimes by targeting non-state actors as well as state proliferators and by making it obligatory for all 191 UN member states to have export control laws for strategically sensitive items.²⁹

The resolution requires all states to:

- pass or maintain laws to prohibit the proliferation of nuclear, chemical and biological weapons
- have effective export controls on strategically sensitive items
- cooperate, in accordance with their national legal authorities and consistent with international law, to prevent illicit trafficking in WMD materials, their means of delivery and related materials.³⁰

However, the US only managed to secure China's support for Resolution 1450 by dropping a provision in March 2004 authorising the interdiction of foreign vessels suspected of ferrying banned weapons on the high seas.³¹ China had threatened to use its veto in the UN Security Council to block the resolution, arguing that stopping ships could violate international law.³² While the resolution,

in the form eventually passed unanimously by all 15 members of the council, does not directly give authority to countries to seize WMD-related cargoes at sea, senior Bush Administration officials argued that it would make it easier to carry out such operations by making clear that WMD trafficking is illegal. Consistent with Resolution 1540, G8 leaders have subsequently called for enhanced efforts to combat proliferation through cooperation to identify, track and freeze transactions and assets associated with the spread of WMD.

In a further resolution adopted unanimously in September 2005, the 15 member states of the UN Security Council, including the five permanent members, called on states to cooperate against terrorism by strengthening their border controls and denying terrorists safe haven. At the same time, Russian President Vladimir Putin became the first big power leader to sign the *International Convention for the Suppression of Acts of Nuclear Terrorism*. The treaty, a Russian initiative, codifies definitions for trafficking in controlled nuclear materials and calls on participating states to adapt national laws to tighten controls on unsanctioned use of such materials.³³

The most recent shipping security measure was the revision in October 2005 of the SUA Convention and its related protocols. These negotiations, initiated by the US after 11 September 2001, were held at the International Maritime Organization, the UN agency responsible for safety of shipping at sea. It took about three years to reach agreement because some states argued that the amendments would weaken high seas shipping freedom and flag state authority. However, the changes have been welcomed by the US and like-minded nations as an overdue move by the world community to build more effective counter-terrorism, counter-proliferation and ship boarding procedures into existing international accords.

When they enter into force, probably later this year, the SUA amendments will provide the first global treaty framework for combating and prosecuting anyone who:

- uses a ship as a weapon or as a means to carry out a terrorist attack, or
- transports by ship terrorists or cargo destined to support WMD programs.

The strengthened SUA Convention will expand the international legal basis to impede, prosecute and punish persons or entities involved in shipping proliferation-related cargo.³⁴ Its provisions specifically include one that covers WMD delivery systems, meaning missiles among other things. The relevant clause says that it is an offence under the SUA Convention to transport by ship any equipment, materials or software or related technology that significantly contributes to the design, manufacture or delivery of a biological, chemical or nuclear weapon, with the intention that it will be used for such purposes.³⁵

Meanwhile, Washington had been negotiating bilateral deals with major flag states – the governments that make a business out of renting their national flags to ships so that they can legally operate on the world's oceans. Under the agreements, if a vessel registered in the US or the partner country is suspected of carrying proliferation-related cargo, either one of the parties can request the other to confirm the nationality of the ship in question and, if needed, authorise the boarding, search and possible detention of the vessel and its cargo.

In the first such move in February 2004, the US and Liberia announced that they had agreed to new boarding and inspection arrangements in international waters where either side has reasonable grounds to suspect that one of their ships is carrying illicit WMD cargo, delivery systems or related materials. In May 2004, the US and Panama signed a similar agreement. Three months later, the Republic of the Marshall Islands followed suit. By August 2005, three more significant flag states – Belize, Croatia and Cyprus – had signed reciprocal ship boarding accords with the US.

Panama and Liberia are, respectively, the world's largest and second largest ship registries; Cyprus is number six and the Marshall Islands number seven. The combination of the six flag states, plus ships registered in core PSI partner countries, mean that over 60 per cent of the global commercial shipping fleet, measured in deadweight tonnage, is subject to rapid action consent procedures for boarding, search and seizure by the US or a PSI member.³⁶

America can now request from these six flag states the right to board a suspect ship on their registers anywhere in international waters – and do so after waiting no more than four hours for a response from the flag state. In other words, no reply by then is to be taken as approval for boarding.³⁷ The SUA Convention amendments allow states to opt in to an identical procedure when they ratify the changes to the treaty. While some countries will decline to do so, the six flag states that have signed bilateral boarding agreements with the US can be expected to opt in. PSI partners of the US can also be expected to be quick responders to any request on reasonable grounds for a high seas search of a ship flying their flag. At least 60 per cent of the world's merchant shipping will be liable under the amended SUA Convention to rapid boarding and search procedures, as well as associated terms for extraditing and prosecuting suspects. Of course, merchant ships flying the flags of either North Korea or Iran are not liable to such searches, nor are naval vessels of these countries.

However, in evaluating the PSI, it is important to note that it is not a stand-alone weapon. The PSI is just one part of a counter-proliferation armoury with a wide array of diplomatic, intelligence, financial, law enforcement and military instruments.³⁸ It is buttressed by national export controls on strategically sensitive items and by international security checks that have gained the support of many key countries. These checks include the Container Security Initiative and the Megaports Initiative, both introduced by the US after 11 September 2001 to prevent terrorists from planting WMD in cargo containers and major shipping ports to attack America and disrupt world trade.

The US is also using its Illicit Activities Initiative, an inter-agency team formed in 2002 to halt North Korea's export of counterfeit US currency, narcotic drugs and other contraband. Washington alleges that the profits from these illegal exports, as well as missile exports, are used to pay for North Korea's WMD programs.³⁹ The PSI is also reinforced by the work of the IAEA and its inspectors, and by national and international laws to stop the financing of the WMD trade and terrorism. In July 2005,

the G8 leaders called for enhanced efforts to combat proliferation through cooperation to identify, track and freeze relevant financial transactions and assets. A final backstop will be the ballistic missile defence shield being developed under a joint program by the US, Japan, Australia and other countries. The aim is to build a layered defence against catastrophic terrorism for the US, its allies and other nations. The thinking behind the attempt to construct global layered protection against WMD terrorism is that any terrorist who must overcome multiple barriers in the course of their attack plan is more likely to be detected or deterred, or to fail during the attempt.⁴⁰

The PSI in Action

How successful has the PSI been in disrupting the spread of WMD-related material by making it increasingly difficult and costly for proliferators to ply their trade? Even some critics who support the PSI say it remains more talk than action.⁴¹ It is, of course, impossible to measure the deterrent effect of the PSI. What about its practical effect?

The US Secretary of State, Condoleezza Rice, said on the second anniversary of the PSI in May 2005 that in the previous nine months alone, the US and 10 of its PSI partners had cooperated in what she called 11 successful efforts.⁴² She provided little detail and did not say whether they were at sea, on land or in the air. Her instances of success included:

- stopping the trans-shipment of material and equipment bound for ballistic missile programs in countries of concern, including Iran. Dr Rice said that PSI partners, working at times with others, had prevented Iran from procuring goods to support its missile and WMD programs
- bilateral PSI cooperation had prevented a ballistic missile program in another region (she did not specify where) from receiving equipment used to produce propellant.

Dr Rice's predecessor, Colin Powell, said in November 2003 that Beijing had cooperated with the US to block some chemicals leaving China for North Korea's WMD programs. This was the first publicly disclosed case of such cooperation. The US Central Intelligence Agency (CIA) had told Congress in January 2003 that during 2002 North Korea continued to procure raw materials and components for its ballistic missile programs from various foreign sources, especially through North Korean firms based in China. Since the Bush Administration came into office in early 2001, the US Government has sanctioned Chinese companies more than 50 times.⁴³ Many of these entities are believed to be state owned or controlled.

One well-publicised PSI operation in a seaport was in Taiwan in August 2003. At the request of the US, Taiwanese officials in Kaohsiung prevented a cargo ship registered in North Korea from leaving port until the captain agreed to leave behind over 150 barrels of phosphorus pentasulfide, which American officials said could be converted into chemical weapons in North Korea. Phosphorus pentasulfide is one of many dual-use chemicals; it can be used to manufacture insecticide or as an additive in motor oil, and it can also be used to make nerve gas.⁴⁴

Another well publicised PSI maritime operation involved the cooperation of four core members – Germany, Italy, the UK and the US – to stop a shipment of uranium enrichment components from reaching Libya. British and US intelligence officials found out that thousands of parts for centrifuges, which can be used to enrich uranium for nuclear weapons, were being shipped in October 2003 in five containers on a German-owned and flagged freighter, *BBC China*, from the Persian Gulf port of Dubai, through the Suez Canal, to Libya. The parts had been manufactured in Malaysia. The German owners ordered the ship's captain to divert to the Italian port of Taranto where the vessel was searched and the WMD-related cargo seized.

This interdiction certainly played a significant role in the unravelling of A.Q. Khan's nuclear black market network, which stretched from Europe to Africa and across the Middle East to Asia. The seizure probably helped to convince Libya to give up its WMD and longer range missile development when it became clear that the US, Britain and their allies knew a great deal about the extent of the previously secret programs. Two months later, in December 2003, Libya formally and publicly renounced WMD and their delivery systems.

Still, officials who searched the *BBC China* in Taranto in October and confiscated the Malaysian-made centrifuge parts failed to find a container with components for enriching uranium that came from a different source, Turkey, which unlike Malaysia is a PSI core member. The container was eventually delivered to the port of Tripoli by the *BBC China* in March 2004 where it was handed over by Libya and shipped out of the country.⁴⁵ This failure to detect the additional shipment from Turkey is an illustration of how difficult it is to track all movements of WMD-related items in a globalised economy. However, it also underscores the need for an effective PSI safety net.

Among states of WMD proliferation concern, North Korea appeared to be the main focus of PSI activity until the second half of 2005. Now Iran is becoming a key target for PSI operations, including interdiction of WMD-related shipments. For example, the Turkish press reported in February 2006 that US and Turkish intelligence services conducted a joint operation that led to the confiscation of three large containers of aluminium on Turkey's border with Iran. It was suspected that the aluminium had been ordered for Iran's nuclear weapons program.⁴⁶

In October 2005, as the Bush Administration sought to persuade the IAEA Board to report Iran to the UN Security Council after the government in Tehran had decided to resume uranium conversion, the US military conducted a three-day workshop for regional navies in Baku, the capital of Azerbaijan. It addressed what to do if they were faced with a WMD proliferation threat from "Purple", a theocratic republic on the Caspian Sea that sponsors terrorism and has a covert nuclear weapons program. Although not specifically identified in the maritime exercise scenario, it was clear that Iran was the source of concern. All Caspian and Black Sea littoral states, with the exceptions of Iran and Russia, took part in the workshop. A handbook distributed to participants stated that the naval officers from Azerbaijan,

Bulgaria, Georgia, Kazakhstan, Moldova, Romania, Turkey, Turkmenistan, Ukraine and the US would explore new avenues to cooperate in preventing the spread of WMD and illicit trafficking by sea.⁴⁷ Russia may have stayed away from the meeting because it did not want to compromise its mediation role in trying to persuade Tehran to accept uranium enrichment in Russia instead of Iran – a proposal that has the backing of the US, the European Union and China. The IAEA has called on Iran to resume full cooperation with the agency and freeze all work on making its own uranium or plutonium nuclear fuel.

The US increased the pressure on Iran in December 2005 and January 2006 by imposing sanctions on companies believed to be involved in the country's suspected WMD programs. The first round of penalties in December were aimed at nine foreign firms – including six from China and two from India – that were allegedly aiding Iran's WMD or missile plans. The second round in January targeted two companies inside Iran.

The December sanctions were imposed under the *Iran Nonproliferation Act 2000*, now known as the Iran and Syria Nonproliferation Act, for transfers of materials with “the potential to make a material contribution to the development of Iran's WMD or missile programs”. Three of the Chinese firms sanctioned – China North Industries Corporation (NORINCO), LIMMT Metallurgy and Minerals Company Ltd, and Zibo Chemet Equipment Company – had been sanctioned previously by the US, most recently in December 2004. The Chinese Government said it strongly opposed the penalties, while the Indian Government said that its preliminary assessment was that the exports by the two Indian chemical companies did not violate India's obligations under the Chemical Weapons Convention. The sanctions, which will last for two years, ban US firms from acquiring export licences to sell goods to the companies in question, and prohibit those companies from doing business with the US Government.

The January sanctions were against two Iranian firms – Novin Energy Company and Mesbah Energy Company – for their alleged involvement in Iran's nuclear program. Both have ties to the Atomic Energy Organization of Iran (AEOI), which the US Government designated as an entity involved in WMD proliferation in June 2005. The actions against Novin and Mesbah were taken under Executive Order 13382. The order, issued on 29 June 2005, gives the US President power to impose financial sanctions against WMD proliferators, as well as individuals and entities providing support or services to them. Under the sanctions, US citizens are barred from any transactions with the two Iranian companies. The US Department of the Treasury also ordered domestic banks to freeze these companies' US-based financial assets.

Novin, which is a subsidiary of AEOI and has the same address as the parent company, has allegedly transferred millions of dollars on behalf of AEOI to entities associated with Iran's nuclear program. According to the US Department of the Treasury, the state-owned Mesbah has procured products for Iran's heavy water project. Heavy water can be used to produce plutonium for nuclear weapons. Iran's

civilian nuclear energy program is based on light water reactors and does not require heavy water.⁴⁸

The US says that while it has not ruled out eventual use of force against Iran, major elements of its current counter-proliferation strategy include determined diplomacy and defensive measures to delay and disrupt Tehran's attempts to achieve nuclear weapons capability. Prominent among the defensive measures is the PSI. A senior US official said in February 2006 that PSI cooperation had stopped the transshipment of material and equipment bound for Iran's ballistic missile programs. Iran is reportedly producing and deploying increasing numbers of the Shahab-3, a ballistic missile with a range of 1300 km, and is reported to be working to develop missiles with longer ranges. The US official said that PSI partners, either singly or in collaboration, had also prevented Iran from procuring goods to support its WMD programs, including its nuclear program.⁴⁹

If the PSI is to be effective as a blocking mechanism against Iran, the US and its leading partners in the group will need to gain or sustain the support of many Muslim and developing countries that share borders with Iran; are located in the same Middle East-Central Asian region; or have substantial energy, trade and commercial interests in Iran – the second biggest oil exporter in the Organization of the Petroleum Exporting Countries (OPEC) after Saudi Arabia, and the source of the largest proven reserves of natural gas in the world after Russia. Rallying and sustaining such support is likely to be more difficult than it was in the case of North Korea. Iran insists that its nuclear program is for peaceful, not military, purposes. Having quit the NPT, North Korea declared in 2005 that it had nuclear weapons. Iran is an Islamic republic that claims to be championing the right of developing nations to harness nuclear energy to generate electricity for economic growth, employment and poverty alleviation. North Korea is a non-religious Communist state with little to offer the outside world in trade or natural resources. North Korea has tenuous contacts with almost all other countries. It is a relatively uncontroversial target for the PSI. By contrast, Iran – with its Muslim and energy influence – seems certain to be a much more controversial one at a time when relations between the West and Islam, and between the wider Muslim and non-Muslim worlds, are under unprecedented stress.

Apart from improving those relations, how can the PSI be strengthened?

Conclusion

Although more than 70 of the 191 member states of the UN have reportedly endorsed the PSI Statement of Interdiction Principles, the group's counter-proliferation activities would have greater credibility, weight and effectiveness if more countries were persuaded to back the initiative. The PSI aims to develop global reach. It is a response to the growing challenge posed by the spread of WMD, their delivery systems and related materials worldwide. The PSI seeks to involve in some capacity all states that have a stake in non-proliferation and the ability and willingness to take steps to stop the flow of WMD items at sea, in the air, or on land. The PSI

seeks cooperation from any state whose vessels, shipping flags, ports, territorial waters, airspace, or land might be used for proliferation purposes by countries or non-state actors of proliferation concern. This could apply at some point in time to any UN member state, no matter how seemingly remote from the mainstream of global economic and military power. The increasingly decentralised nature of terrorist organisations and terrorist facilitation networks also requires a cooperative and worldwide response from a growing range of like-minded nations.

It is significant that as more governments have come to understand and see how the PSI works in practice, the number of countries endorsing its voluntary principles has grown. This process could be hastened: first, by intensifying efforts to explain to countries that have not joined the PSI why it was formed, its aims and the way the arrangement works in practice. This could be done through both diplomatic and military channels by active members of the PSI communicating with non-members, particularly neighbouring or regional countries. For example, in the Asia-Pacific region, it could involve further outreach by PSI members like Australia, Japan and Singapore. This would help reduce the impression that the PSI is a US-centred and dominated operation. Candidate countries could be told that if they want to influence counter-proliferation policy and constrain any unilateralist tendencies by the US, joining the PSI would be one of doing so. Non-PSI members should also be encouraged to send observers to PSI training exercises.

Joining the group involves an official communication to the US and other participating governments by the country wishing to sign on. While some states publicly endorse the PSI principles, others prefer to do so privately to avoid complicating their relations with other countries, including those that may be of proliferation concern or do not support the PSI. However, all members of the PSI undertake to review and provide information on their national laws that could enable them to intercept WMD-related items at sea, in the air or on land; to identify how they could contribute to PSI efforts; to provide points of contact for PSI interdiction requests and other operational activities; and to be ready to take part in PSI training exercises and actual operations, whether alone or in collaboration with other member states.

Such an operation would normally occur after one PSI member state provided information and sought help from others to investigate and, if warranted, stop a WMD shipment. However, PSI members have agreed that sensitive information on specific interdiction cases will ordinarily be shared only with those governments involved in the actual operation. The intent is to protect intelligence sources. The PSI activity that gets most of the publicity is interdiction training, most often at sea or in port. However, collection of reliable intelligence and sharing it promptly, wherever necessary, is critical to the success of the PSI. It is impossible to intercept something if you do not know where it is.

Second, by offering assistance to countries that need it, they can improve their capabilities to support PSI actions. The US, Japan, Western European states, Australia and Singapore are among the PSI member states that could do this. The

assistance could be in the form of training, equipment or grants, and cover the law enforcement, intelligence and military cooperation dimensions of the PSI. The US and Australia already give this kind of support to enable some countries to achieve the standards needed to participate in the Container Security Initiative.

Third, by developing a more predictable and sustainable schedule of activities, perhaps including up to a dozen training exercises per year in different parts of the world. Operational experts from PSI countries meeting in various places plan these annual schedules, currently up to 12 months in advance. Finalising the details of an exercise is left to the country hosting it. Some countries are more efficient and better at communicating and coordinating than others. Improved forward planning would widen the scope for inter-agency, inter-Service and international participation. It could also cut the cost of participation if PSI activities could be added to exercises that were already planned. Inclusion wherever possible of Special Operations Forces in interdiction exercises and related activities is important because in a real life operation to disrupt WMD trafficking, they would probably be called upon to play a critical role.

Fourth, by persuading countries that have not ratified the *United Nations Convention on the Law of the Sea 1982*, notably the US, to do so, and also persuading the many states in Asia and elsewhere that have not ratified the SUA Convention to do so. The PSI will gain in credibility and political support if it is seen to be based on lawful authority. The failure of member states to agree to be bound by relevant codes of international law weakens the PSI.

Fifth, by starting to shape the PSI for a future that includes membership by a majority of the 191 member states of the UN. Today, more than 70 governments reportedly endorse the aims of the PSI. Yet the PSI is still described as an activity, not an organisation. No secretariat has been established. No clearing house for rapid sharing of relevant intelligence has been created. No specific funding is set aside by member states to run the PSI. Each participating government is currently responsible for paying for its own efforts in support of the PSI.

As the membership expands, some mechanism – if possible, one that is acceptable to all participants – will be needed to coordinate PSI activities, otherwise they may lose focus and cease to be relevant or timely.

Challenges of Maritime Resource and Shipping Security that Face Archipelagic States

Hasjim Djalal

Indonesian National Boundaries

Under international law, the Republic of Indonesia has several boundaries, namely land, maritime – including the seabed area – and airspace. The protection of all the resources – either living or non-living, or even space for safety and security of Indonesia and for other purposes, within the national boundaries – would be within the sovereignty and sovereign rights of Indonesia, and therefore within the right and jurisdictions of the archipelagic state of Indonesia. Equally, the security of shipping (and of aviation) passing within the boundaries of the archipelagic state of Indonesia, including in and through the archipelagic sea lanes, would also be within its sovereignty and jurisdiction, taking into account Indonesian national legislations, bilateral agreements and relevant international law.

AIRSPACE

Indonesia has sovereignty over the airspace above its land, archipelagic waters and territorial sea up to the sky until the airspace meets with outer space. Up to now, there has been no international agreement on the height of the airspace to the sky, although there has been general agreement that the airspace does not include outer space. There are states that claim airspace up to the height of 100 km to the sky, and there are also theories that argued that the height of the airspace would depend on the ability of the fixed wing aircraft to fly aerodynamically. There are other theories, including those that say that the airspace extends to the area where air still exists, and those who argue that airspace extends to the limits of the earth's gravity. Indonesia, together with other tropical countries in South America and Africa, used to claim jurisdiction over the geostationary orbit (GSO) situated at about 36,000 km above the surface of the earth. This claim, it seems to me, was no longer pursued because it was difficult to maintain internationally, especially because it was difficult for Indonesia to “exercise effective occupation and control” over the GSO (it is generally understood that “effective occupation and control” would be significant elements for advancing claims over a territory). What is now recognised as the airspace of Indonesia is that above the land territory, archipelagic waters and territorial sea, and that it covers an area of airspace of about 5 million square kilometres. Vertically, therefore, the boundaries of Indonesian airspace would follow the boundaries of the land and territorial sea boundaries of Indonesia, either as determined by agreements or treaties between the governments of the Netherlands and the neighbouring countries, or as determined by Indonesian national legislation where Indonesia does not have territorial sea boundaries with its neighbours.

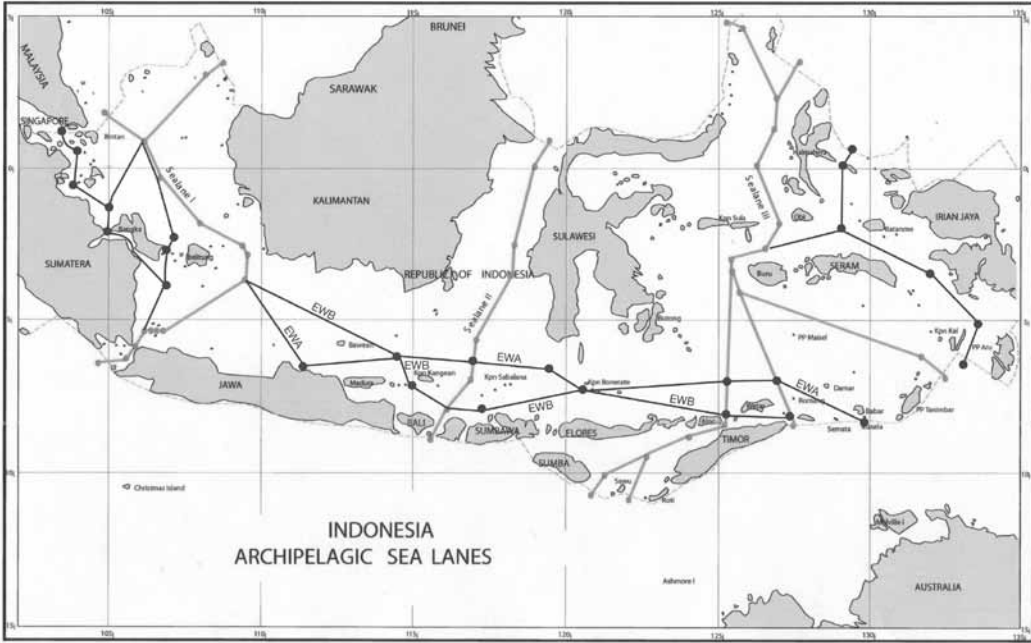


Figure 1: Indonesian Archipelagic Sea Lanes (Australian Hydrographic Office)

LAND BOUNDARIES

The land boundaries of Indonesia are basically those as agreed upon by the government of the Netherlands that colonised Indonesia; the British Government that colonised Sarawak and North Borneo (Sabah) and Papua New Guinea (PNG); and Portugal that colonised East Timor. Basically, those land boundaries, in some areas, are:

- the deepest parts or in the middle of border rivers, such as the Fly and Bensbach Rivers between Indonesian West Papua and Papua New Guinea
- those that follow watersheds, namely the top of the mountains and hills or heights that separate the flow of waters, as in the mountainous Kalimantan
- those that follow straight lines between determined points as in some parts of West Papua and PNG and in some parts in North Borneo (in Sebatik Island).

Although the stipulations in those agreements may be clear on paper, it has not been easy to determine the exact locations of those boundary lines in the field, particularly in the middle of the deep jungle, such as in Papua. The flow of rivers sometimes is not easy to determine, either because of marsh and swamp areas, or because the rivers may have changed the channel through the years and decades. It is therefore essential to have effective cooperation between the neighbouring states, to jointly conduct surveys for border mapping on land and construct markers in agreed areas and locations.

MARITIME BOUNDARIES

The maritime boundaries of Indonesia include internal waters, archipelagic waters, territorial seas, contiguous zones, exclusive economic zones (EEZs) and continental shelves. In addition to that, according to the new legislation on autonomy and devolution of powers from the central to local governments, there are also district and provincial maritime zones.

Internal Waters

According to the *United Nations Convention on the Law of the Sea 1982* (LOSC), Indonesia could determine its internal waters, whose legal status would be very similar with land territory of a state, in the sense that foreign vessels would not generally have the rights to pass even in innocent passage. However, Indonesia has not determined the boundaries of its internal waters within its archipelagic waters.

Archipelagic Waters

Archipelagic waters are those waters surrounded by “straight archipelagic baselines, joining the outermost points of the outermost islands and drying reefs” of Indonesia. The way to determine these lines is stipulated in the LOSC. By declaring Indonesian archipelagic principles on 13 December 1957, which was later strengthened by Law No. 4/PRP/1960, the outer limits of Indonesian archipelagic waters had been promulgated and registered in the United Nations. With the LOSC coming into force on 16 November 1994 (Indonesia ratified it with Law No. 17/1985), Law No. 4/PRP/60 has been replaced by Law No. 6/1996, which was heavily adjusted to meet the requirements of the LOSC. The new coordinates for the archipelagic baselines were announced in Government Regulations No. 38/2002 and No. 61/1998 (for the waters near Karimata Strait and the South China Sea).

It should be noted, however, that foreign vessels have the right of innocent passage through the archipelagic waters in accordance with Government Regulation No. 36/2002 and the rights of archipelagic sea lanes passage (ASLP) through certain archipelagic sea lanes in accordance with Government Regulation No. 37/2002. The determination of the ASLP as well as rights and obligations of passing vessels have been determined in line with the LOSC and accepted by the International Maritime Organization (IMO). In parts of the archipelagic waters, certain other countries also have certain rights, such as the right to repair their own underwater cables, or the rights of traditional fishermen of certain neighbouring countries to continue fishing in parts of the archipelagic waters. Implementation of these rights must be determined and regulated in separate bilateral agreements, such as in the Indonesian-Malaysian Treaty of February 1982, which was ratified by Indonesian Law No. 7/1983, which covers the traditional fishing rights of Malaysian fishermen using traditional methods in certain waters around the Anambas Islands in the South China Sea.

Archipelagic Sea Lanes

Indonesia has so far determined three archipelagic sea lanes (ALKI) in the north-south direction: Sea Lanes (ALKI) I through Karimata Strait, Western Java Sea, and the Sunda Strait for navigation between the South China Sea and Indian Ocean; ALKI II through the Strait of Makassar and the Strait of Lombok for navigation between the Pacific Ocean and the Sulawesi Sea to the Indian Ocean; and ALKI III from the Pacific Ocean through the Moluccas Sea, Seram Sea and Banda Sea; branching out through ALKI IIIA through Sawu Sea; ALKI IIIB to Timor Sea; and ALKI IIIC to Arafura Sea. The three ALKIs have been accepted by the international community through the IMO and are now in force. Nevertheless, Indonesia has so far not determined the east-west ALKI through the Java Sea. I understand that the absence of determination of east-west ALKI has the potential to create political sensitivities and conflicts in the Java Sea as indicated in the Bawean case in July 2003, during which some confrontation took place between Indonesian Air Force F-16 and US F-18 aircraft from the USS *Carl Vinson* which passed in the area from Singapore on the way to the Lombok Strait. The absence of clear and well-determined ALKI in this area may pose certain security problems to shipping and to Indonesia as a whole in the future. Indonesia, as I understand it, is continuing its studies and research before establishing the east-west ALKI. It should be noted, however, that Government Regulation No. 37/2003 has regulated the passage of foreign vessels through the ALKIs following many years of discussions with maritime powers, particularly with the US and Australia.

Territorial Sea

Outside the archipelagic waters, Indonesia also has sovereignty over the territorial sea up to 12 nm from the archipelagic baselines that surround all Indonesian islands and seas. In waters between Indonesia and its neighbours, whose width is less than 24 nm, the boundaries of Indonesian territorial seas would be determined by agreements between Indonesia and the neighbouring countries concerned, or the median line between Indonesian archipelagic baselines and the legitimate baselines of the territorial sea of the opposite neighbouring states. So far there have been territorial sea boundary delimitation agreements between Indonesia and Malaysia in certain parts of the Malacca Strait, and between Indonesia and Singapore in certain parts of the Singapore Strait. But the two territorial sea boundaries have not been connected one to another and therefore, so far, there is no territorial sea boundary agreement in the western part of the Singapore Strait between Indonesia, Malaysia and Singapore.

For decades Indonesia has encouraged its two good neighbours to complete the territorial sea boundary determination in that area, but so far the efforts have not met with a positive and serious response from Malaysia or Singapore – although in recent months Singapore has indicated willingness to talk about this matter. The absence of this territorial sea boundary has caused serious concerns for Indonesia, mainly

for the purposes of protecting fisheries resources and their habitats, preventing all kinds of smuggling, armed robberies, environmental protection and the prevention of pollution, and perhaps also for preventing possible maritime terrorism and the threats towards the security and safety of shipping.

On the eastern part of the Singapore Strait toward the South China Sea, there has also been no territorial sea delimitation, either between Indonesia and Singapore or between Indonesia and Malaysia (Johor). For years this matter depended on the ownership of the Horsburgh Lighthouse in the entrance to the South China Sea, which Malaysia and Singapore disputed. It seems to me, however, that the territorial sea delimitation in this area could be settled gradually, particularly in the maritime zone towards the east of Singapore lying between Indonesian islands and Johor, and completed later after the Horsburgh Lighthouse dispute has been settled. As has been the case with the Singapore Strait toward the west of Singapore, the Singapore Strait between Singapore and the South China Sea is also very sensitive for Indonesia for many reasons, such as the illegal mining of sands from the sea and their illegal export to Singapore; the rampant smuggling between Indonesia and Singapore and Malaysia; the dumping of dangerous and hazardous industrial wastes and oil pollution into the (Indonesian) waters; and problems related to the elimination of piracy and armed robbery as well as other trans-boundary crimes in the area.

It should be noted in this context that Indonesian internal waters, archipelagic waters and the territorial seas, including in the ALKIs, are part of Indonesian territory, and under the LOSC, Indonesian sovereignty of its maritime zones covers an area of about 3 million square kilometres. It is regretted, however, that Indonesian capacities to make use of the resources of those waters as well as its ability to defend its sovereignty in its maritime zones have not expanded commensurately, particularly in terms of law enforcement, defence posture, human resources development, as well as infrastructure.

Contiguous Zone

Beyond the territorial sea, Indonesia may also control up to another 12 nm in the contiguous zone to prevent infringement of its customs, fiscal, immigration or sanitary laws and regulations, including jurisdiction to control the removal of objects of historical and archaeological nature found in vessels sunk in the Indonesian waters. Up to now, Indonesia has not specifically enacted legislation on its contiguous zone. In any case, sooner or later Indonesia would also have to establish the delimitation of its contiguous zones with neighbouring countries in areas of waters of less than 48 nm, such as in the northern part of the Malacca Strait and perhaps also in some parts of the sea between North Sulawesi and Mindanao. At this moment Indonesia is preparing its own legislation on this matter.

I consider this matter very important in the protection of maritime resources and security of Indonesia in view of the rampant activities of foreigners, in some cases in collusion with Indonesian elements, searching illegally for the remnants of ancient

vessels in Indonesian waters, and later taking and selling them in foreign markets. The Department of Maritime Affairs and Fisheries indicates there are some 463 sunken vessel sites in Indonesian waters, and only 41 sites or about 10 per cent of them have been licensed for investigation and recovery.¹ Under Indonesian legislation, a sunken vessel of more than 50 years becomes a “historical and cultural object”.

Exclusive Economic Zones

Beyond the territorial sea, Indonesia has sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources of its exclusive economic zones (EEZs) up to the distance of 200 nm from its archipelagic baselines, as well as other jurisdictions to regulate and permit marine scientific research, protection and prevention of the marine environment, and the construction of artificial islands, installations and other structures in the EEZ. Indonesia has enacted EEZ legislation but has not been able to agree on delimitation with its neighbours except with Australia in the Arafura Sea, Timor Sea, south of Sumba, and between the Java and Christmas Island. However, as I understand it, this agreement has not yet been ratified by the two countries although it was concluded in 1997.

Indonesia has not been able to determine the delimitation of its EEZ boundaries with its partners in the Association of Southeast Asian Nations (ASEAN), either with Thailand and Malaysia in the northern part of the Malacca Strait, with Malaysia and Vietnam in the South China Sea, or with Malaysia and the Philippines in the Sulawesi Sea. All of Indonesia’s efforts to negotiate this matter with its neighbours have generally been in vain, mainly because of the lack of interest by its neighbours to discuss the issue. One of the reasons for the failure to negotiate these boundaries is their argument that it is not necessary because the continental shelf boundaries have already been agreed upon and could be regarded as the same as the EEZ boundaries. Indonesia disagrees with this argument because the two legal regimes, the EEZ and the continental shelf are different, in the sense that the EEZ boundary is basically for the purposes of fisheries, marine scientific research, environmental protection and is determined by distance criteria (200 nm), while the continental shelf boundaries are basically for the seabed and subsoil area, for the exploitation of oil and gas and other minerals, and therefore also dependent upon geological and geomorphologic conditions of the seabed area and its subsoil in addition to distance criteria. In fact, the *Australian-Indonesian Maritime Delimitation Treaty* of 1997 is based upon this legal understanding.

I personally regret the absence of EEZ boundaries between Indonesia and its neighbours, as this has been one of the reasons for the difficulties in managing and protecting the living marine resources in the EEZ. As it happens, there are many fisheries regulations violations in the grey area in which there is no EEZ delimitation. Mutual arrests of fishermen by neighbouring countries in South East Asia for alleged illegal fishing are increasing, and this poses increasing security problems for South East Asian countries, particularly for Indonesia, whose archipelagic

waters, territorial seas and EEZs are rampant with illegal fishing activity, either by its own nationals or by foreign fishermen, including its own neighbours. It has been estimated that Indonesia has lost more than US\$2 billion a year as the result of illegal fishing in its waters.

Continental Shelf

In the seabed area beyond the territorial sea, Indonesia also has sovereign rights to explore and exploit the natural resources found in its continental shelf, including the sedentary species on the sea floor, and oil, gas and other minerals found in the area. Previously, based on the *1958 Geneva Conventions on the Law of the Sea*, the sovereign rights over the resources of the continental shelf was generally limited to the depth of 200 metres. But now under LOSC, the sovereign rights have been extended to the outer edge of the continental margin throughout the natural prolongation of the land territory of the coastal states, including the land territories of the islands of the archipelagic states. Therefore, the continental shelf of a state could extend up to 100 nm beyond the depth of water of 2500 metres, or to the distance of 60 nm beyond the foot of the continental slope. This means that in certain cases, Indonesian sovereign rights to the natural resources on the seabed and its subsoil could extend up to 350 nm from its archipelagic straight baselines, namely to the boundary of the International Seabed Area that is managed by the International Seabed Authority in Jamaica. This depends upon the natural and geological structures of the seabed concerned. Under LOSC, Indonesia could claim the seabed area beyond 200 nm from its archipelagic baselines through the Commission on the Limits of the Continental Shelf (CSC), accompanied by proofs, research and survey results of the natural prolongation of the Indonesian islands to the seabed concerned. The claims could be submitted within 10 years after the entry into force of the Convention for Indonesia, originally until 16 November 2004, which now I understand has been extended until 16 November 2009. So far, Indonesia has not submitted such a claim because it is still conducting scientific research on the matter. As I understand it, Australia is already very advanced in this area and has carried out intensive studies on its continental margin beyond 200 nm in the Indian Ocean and in the Antarctic, and has submitted such a claim to the CSC.

Indonesia has already concluded maritime boundary delimitations of the continental shelf with some of its neighbours, namely with India between the Andaman and Nicobar Islands and Aceh; with Thailand and Malaysia in the northern parts of the Malacca Strait; with Malaysia and Vietnam in the South China Sea; with Papua New Guinea in some parts of the Pacific Ocean, north of Papua; with PNG and Australia in the Arafura Sea; and with Australia in some parts of the Timor Sea. There is no agreement between Indonesia, Malaysia and the Philippines in the Celebes Sea, or between Indonesia and East Timor in the Timor Sea.

The conclusion of this continental shelf boundary agreement is also significant for the purposes of proper exploration and exploitation of the seabed/continental shelf natural resources. The absence of the boundary agreement could cause disturbances in the relations between the neighbouring countries concerned, and could cause problems not only for the utilisation and management of the resources, but also for the maritime security in the area. The recent disagreement between Indonesia and Malaysia over the seabed resources between the two countries in Ambalat in the eastern seabed area of East Kalimantan in the Celebes Sea, during which naval forces were deployed to the area, was not a pleasant situation between the two good neighbours and members of ASEAN.

It should be noted that, strictly speaking, the contiguous zone, EEZ and continental shelf are not under Indonesian territorial sovereignty; rather they are areas where Indonesia has sovereign rights over natural resources and jurisdictions to exercise certain powers in accordance with the LOSC. Unlike in the maritime area under Indonesian sovereignty, within these maritime zones, the freedom of navigation, overflights and other freedoms continue to be respected. In any case, with the application of EEZ and continental shelf regimes, the natural resources base over which Indonesia has sovereign rights for exploration and exploitation now covers an area of about 6 million square kilometres. Indonesia has the rights to protect and to utilise the maritime resources of the area and to protect the security of the maritime resources concerned.

District and Provincial Maritime Zones

In addition to the various and complicated boundary problems between Indonesia and neighbouring countries, the challenges of managing Indonesian maritime resources and shipping security are becoming more complicated due to provincial and districts/autonomous city maritime boundaries. Law No. 22/1999, later replaced by Law No. 32/2004, stipulated that every province has a 12 nm maritime zone measured from the coastline, and every district/autonomous city that borders a coastline has a maritime zone of 4 nm measured from the coastline. This new stipulation has created sensitivities between neighbouring coastal districts and cities, between the provinces, and between the provinces and the central government regarding the maritime boundaries and their respective rights and jurisdictions to utilise and manage the natural resources in the maritime zones concerned. Although Laws No. 22/1999 and No. 32/2004 were called the Law on Regional Autonomy, many people and observers consider their provisions federalistic, which many people think is unacceptable and contradictory to the cherished form of the unitary state of Indonesia. As a consequence of the new legislation, some disagreements have arisen between local governments with regard to the ownership over remote small islands and among many Indonesian fishermen who were prevented by local fishermen from fishing in what they considered to be their own maritime zones.

With regard to shipping, more and more local governments wish greater control over their ports and facilities. It is not yet clear how these demands will affect the shipping security.

INDONESIAN INTEREST IN THE HIGH SEAS AND INTERNATIONAL SEABED AREA

Although the territorial sovereignty and jurisdictions of Indonesia have been regulated in accordance with the provisions of the LOSC, it does not mean that Indonesia does not have interests beyond the maritime areas under its sovereignty, sovereign rights and jurisdictions.

Indonesia continues to have a strong interest in the airspace above its EEZ and beyond its territorial seas, mainly because of its interests in navigation and overflight around the world over the oceans and in its defence requirements that make it important for it to be able to anticipate and face any threats that may come from beyond its own airspace.

Indonesia continues to have an interest in the management, utilisation and freedom of the high seas beyond its EEZ because of its interests in navigation and overflight, and in order to be able to protect ships navigating under its flag in the open oceans. Equally, Indonesia has an interest in the management of the living resources beyond its EEZ, particularly the highly migratory species and the “straddling fish stocks”, mainly because the utilisation and conservation of these resources are closely linked with the exploitation and conservation of its resources in its own EEZ. It is therefore important to note that Indonesia is also looking for effective cooperation with other bilateral and regional countries to deal with these problems.

Equally, Indonesia continues to pay attention to the exploration and exploitation of the natural resources in the International Seabed Area beyond its continental shelf. Indonesian interest in this matter has so far focused on the need to protect its land-based mineral resources from possible competition from sea-based mineral resources. Indonesia and Australia, as land-based producers of minerals that may also be produced from the seabed, have been cooperating to develop an acceptable legal regime on this matter through the International Seabed Authority in Jamaica. Although Indonesia is currently concentrating on the need to protect land-based producers, it does not mean that Indonesia is not interested in developing its own capacity for deep seabed mining in the future.

Indonesia remains interested in cooperating with its neighbours in managing the semi-enclosed seas around Indonesia – such as the South China Sea, the Celebes Sea, the Arafura Sea and the Timor Sea – in accordance with Article 123 of LOSC. As stipulated in Article 123, states bordering the enclosed or semi-enclosed seas are expected to cooperate on the management of the living resources, on protection and preservation of the marine environment, and on programs of scientific research in the sea. Indonesia is experienced in managing potential conflicts in the South China Sea and the move from confrontation to cooperation by developing and encouraging dialogue processes, confidence building, and designing and implementing cooperative programs.

Other Challenges

In addition to developing Indonesian concepts for and the ability to make use of its rights and jurisdictions with regard to its maritime zones, there are other practical challenges facing Indonesia.

MAINTAINING THE NATIONAL UNITY AND INTEGRITY OF INDONESIA

Throughout its history, the continuous challenge of any Indonesian government has been to maintain the national unity and integrity of Indonesia as a whole within the unitary state of Indonesia. Since its early history, Indonesia has faced problems of provincialism, religious sectarianism, ideological bigotry, ethnic jealousy, the relationship between central and regional governments, and many other problems. In some cases these problems have led to armed rebellions, and even struggles for separation, as in Aceh and West Papua.

Ideologically, Indonesia strongly believes that as an archipelagic state, the sea should not separate people who live in different islands but should unite them. This is in fact the essence of the Indonesian position on the LOSC and maritime issues for many decades. The challenge now is, as ever, how to make this belief a reality that will strengthen the fabric of the Indonesian unitary state and nationhood, and not weaken it.

What is worse is that many Indonesians still believe there are conspiracies among foreign powers, particularly the Western powers, to undermine Indonesian national unity by encouraging and exploiting local sentiments against the central government and in some cases even supporting rebellion and separation. On 16 January 2006, Metro TV, one of the most influential television channels in Indonesia, aired a 30 minute program on the “confession of a former informant” of a Central Intelligence Agency (CIA) agent in Indonesia, stating that terrorism in Indonesia had been engineered by the CIA in order to discredit Islam in Indonesia. Equally, there are still some Indonesians who believe that the separation of East Timor from Indonesia was actually encouraged or engineered by some elements in Australia, although Australia was previously one of Indonesia’s neighbours that recognised and accepted East Timor’s integration into Indonesia. At the same time, there are also perceptions that those elements in Australia may also be engineering problems for Indonesia in West Papua, despite the fact that Australian Government has consistently maintained that West Papua is an integral part of Indonesia. Unfortunately, in politics, perception sometimes can be stronger than reality.

ELIMINATING ILLEGAL FISHING

Another Indonesian concern is protecting its maritime resources and shipping to contribute to the welfare of the Indonesian people as a whole. Illegal fishing in Indonesian maritime zones either by Indonesian fishermen or by foreign fishing vessels is one of the main concerns. For years, the Indonesian Government has been dealing with practical problems such as local fishermen using bombs and cyanide to catch fish, and collusion between the foreign fishermen and the local people (and

sometimes local authorities) to catch fish illegally in Indonesian waters. Indonesia loses more than US\$2 billion a year as the result of illegal fishing in its waters,² although this figure may have been reduced recently. This is almost equal to the legal exports of Indonesian fisheries in 2005, namely US\$2.39 billion.³ Only 39 per cent of fishing vessels operating in Indonesia waters are willing to install vessel monitoring systems for control purposes. In 2005, the Indonesian Eastern Maritime Command investigated 1507 vessels for possible violations at sea: 847 were fishing vessels, 495 were carrying logging, and 165 were cargo vessels and tankers. Two hundred and sixty-four of them went to court, while 1243 were released. In the same year, the Western Maritime Command intercepted 998 vessels: 446 were fishing vessels, of which 345 were suspected in smuggling of all kinds of goods. Out of the 998 vessels intercepted and investigated, 276 of them went to court.⁴

ELIMINATING ALL KINDS OF SMUGGLING AND VIOLATIONS

Smuggling, illegal entry, intrusion of terrorist elements, the removal of border markers, and the illegal exploitation of natural resources, such as illegal logging, are rampant throughout Indonesian waters. In Riau Province alone, it is estimated that about US\$3 billion a year of illegal logging has been smuggled out of the country, primarily to Malaysia and Singapore. The destruction of tropical forest in Indonesian provinces even takes place in protected forest conservation areas. Smuggling activities involve not only the smuggling of goods but also labourers, women and even children.

Recently Singapore announced its trade statistics with Indonesia and these varied considerably with Indonesian trade statistics.⁵ For instance, Singaporean statistics indicated that its exports to Indonesia in 2004 were US\$19.7 billion, while Indonesia records imports from Singapore of only US\$6.08 billion. At the same time, Singapore registered its imports from Indonesia to the value of US\$10.08 billion, while Indonesian statistics only registered its exports to Singapore as less than US\$6 billion. Some of the discrepancies may have been caused by the transit trade of Indonesian exports and imports that pass through Singapore. This transit trade may not be registered by Indonesia as “export to Singapore” but as export to its final destination, while in Singapore it may have been registered as Singapore “import from Indonesia” to be later exported as “Singapore export” from Singapore to its final destination. While this point needs investigation and clarification, suspicions remain that some of those discrepancies may have been caused by smuggling and illegal trade. In fact, the Deputy Director of the Indonesian Export Statistics Office, while admitting that there are differences between the statistical methods between the two countries, nevertheless recognised he could not account for the difference of US\$910 million of Indonesian imports from Singapore and US\$2.79 billion of Indonesian exports to Singapore.⁶

These issues require closer cooperation between the neighbouring countries, particularly between law enforcement agencies, and the proper distribution of powers and coordination between central and local government authorities.

DETERMINATION OF CLEAR LAND AND MARITIME BOUNDARIES

It is not easy to determine the national boundaries in the field, either on land or at sea, although there may have been agreements on these matters. On land, these uncertainties may create border crossing problems between people in the border areas. Many local people may not know exactly the location of the boundary lines, especially in remote areas or in heavily forested areas. The recent case of the shooting of three Indonesian nationals within the border of East Timor by East Timor police may be indicative of this problem.

At sea, there are a number of unsettled maritime boundaries between Indonesia and its neighbours, particularly territorial seas, the EEZ and the continental shelf. Unless these boundaries are settled by agreements between the neighbouring countries concerned, difficulties and violations are bound to happen that may aggravate the challenges to be faced in managing the maritime resources and shipping security.

SHIPPING THROUGH THE ARCHIPELAGIC WATERS

The transit of foreign vessels through Indonesian archipelagic waters, either through the principle of innocent passage or the principle of archipelagic sea lanes passage is another challenge that also causes some Indonesian sensitivity, primarily due to shortcomings in monitoring, control, supervision and law enforcement at sea. The challenge is how to ensure that those vessels – especially military vessels, vessels carrying nuclear or hazardous substances, or nuclear-powered vessels – do not negatively affect Indonesian national unity, security, stability and environment. Indonesian shortcomings may cause some problems to Indonesian national security as well.

In my view the sensitivities would be increased in remote areas and in the area where ALKI has not yet been established, particularly in the east-west route through the Java Sea. It is therefore very important for Indonesia to increase its defence and law enforcement capabilities, and cooperation is needed between Indonesia and other countries, particularly with the users of Indonesian waters and with its neighbouring states.

The Problems of an Archipelagic State

With such an extensive land area and maritime zone, including the seabed area; the extensive airspace; and the complexities of its natural resources, it is not easy to protect and maintain law and order in Indonesian maritime zones, especially as Indonesia faces many other problems while having limited financial and other resources to meet the challenges. Additionally, Indonesia is a country with multiple cultures, which project their own identities to the nation, the region and to international audiences.

Being geographically, politically and legalistically an archipelagic state, Indonesia is also confronted by other various factors.

Indonesia is the crossroad between the Indian and Pacific Oceans, as well as between Asia and Australia. Indonesian maritime zones are heavily navigated by various kinds of vessels, including giant oil tankers, ships carrying nuclear and other dangerous materials, as well as military vessels, including submarines and other nuclear-powered vessels. Indonesia is also criss-crossed by international commercial and military aviation routes. These factors have made Indonesia, together with its maritime zones and airspace, a very important strategic consideration in the minds of the regional and global powers. While this strategic geographical position is very significant for other countries, it has not, however, brought significant benefits to Indonesia. In fact it has made Indonesia more sensitive to external power activities and pressures, and in some cases these have brought political instability to Indonesia as well.

While Indonesia is strategically important as the crossroad of international navigation and transportation, its geographical structure as an archipelagic state that consists of thousands of islands with very long coastlines and extensive sea areas in between, has made Indonesian maritime zones and coast lines very open and porous. It is therefore relatively easy for foreign subversion and intrusion by either smugglers or terrorists to also upset Indonesia's domestic stability.

The population dispersal in Indonesia is also very uneven with most of the people living in the western part of Indonesia, particularly in the island of Java (populated by more than half of the 230 million Indonesians). This uneven population dispersal has also brought sensitivities between the western and the eastern parts of Indonesia which feel that they have been neglected in terms of economic and social development in favour of the development in Java. In fact, some feel they are being economically exploited by Java.

Indonesia is also facing many domestic issues, including that of regional autonomy. The regional governments would like to increase their power using regional autonomy and the devolution of powers from the central government. These developments have also caused problems for the management of maritime and other resources.

While the development of regional autonomy is in itself necessary, many of its consequences need to be carefully analysed, especially where the necessary conditions for the successful autonomy do not yet exist or are lacking, in terms of human resources or material and financial capabilities. The Director-General of Regional Autonomy of the Department of Interior stated that 76 of the 104 new autonomous regions (75 per cent) cannot stand on their own and cannot support themselves for many reasons.⁷

Indonesia has just passed the stage of political transformation from authoritarian government to democracy in the last six years. Progress has been achieved but more needs to be done, particularly in terms of human capacity building. The impact of this political transformation – the shift of political power from the Executive to the Legislative, from bureaucracy to political parties, from the central government

to the regional governments through autonomy, from the government to the civil society and good governance – still have to be assessed for some years. This political transformation has affected the management of Indonesian maritime resources.

The economic and financial capacity of Indonesia to protect and to maintain law and order, to defend the archipelagic state from unwanted intrusion, and to protect the maritime resources and the shipping interests through its maritime zones is very limited. However, the pillaging of living resources is rampant in practically all parts of Indonesian maritime zones. Threats to international shipping have largely taken place in the western part of Indonesia, particularly in the Malacca and Singapore straits.

Indonesia, Malaysia and Singapore have been cooperating for 25 years to promote the safety of navigation and the protection of marine environment in the area, despite the fact that the user states, except perhaps Japan, to some extent have not shown much interest in helping coastal countries in the Straits of Malacca and Singapore to overcome the problems in accordance with their commitment under Article 43 of the LOSC.

There are also problems with the law enforcement agencies. Their capacity to act is very limited compared to the extensive maritime areas they have to protect. Despite Indonesia's current economic and financial difficulties, it is essential that the capabilities of the law enforcement and defence agencies be strengthened. It is sad to know that Indonesian defence is only 0.78 per cent of gross domestic product (GDP) or 3.79 per cent of the state budget,⁸ whereas Australia generally spends around 1.9 per cent of its GDP for defence or around \$16 billion (approximately US \$12 billion) annually, increasing by 3 per cent a year.⁹ Even the very low percentage of Indonesian defence budget compared to its GDP seems to be reducing, instead of increasing, through the years (see table 1).

Internal conflicts in Indonesia may have also caused some problems for the border area, which may be complicated by similarities of culture of communities across the border. Unless specific arrangements for cross-border relations are clearly defined, these issues would be difficult to deal with and may continue to inflict damage to neighbourly bilateral relations. All these require close cooperation between the neighbouring countries, particularly in making arrangements for border crossings, either on land or at sea and for definitive solutions of all boundaries' delimitation and demarcation issues.

Conclusion

LOSC has provided archipelagic states, such as Indonesia, with varied and extensive maritime zones either for territorial purposes or for jurisdictional and resources purposes. At the same time, the interests of shipping communities, particularly foreign shipping communities, have also been protected commensurately. Yet Indonesia is facing many challenges in utilising the opportunities provided by the LOSC, primarily due to domestic shortcomings and financial and economic constraints. Archipelagic states need cooperation and understanding from neighbours, regional

and international communities in order to implement the LOSC appropriately. What is needed, therefore, is cooperation and not confrontation, mutual understanding and not recrimination with neighbours. It should be understood that proper implementation of the LOSC and the protection, proper utilisation and sustainable development of the marine resources, as well as the security of shipping passing through Indonesian maritime zones, are in the interest of all concerned.

South East Asian Security: Indonesian Perspectives - Jakarta 25 January 2006

South East Asia Military Balance

No.	Country	Pop. (Millions)	% ASEAN Pop.	GDP (US \$millions)	% ASEAN GDP	Def Bdgt (US \$ millions)	% ASEAN Def Bdgt	% Def Bdgt of GDP
1	Vietnam	85	15.16%	\$52,000	4.77%	\$3,300	14.83%	6.35%
2	Brunei	0.37	0.07%	\$6,000	0.55%	\$360	1.62%	6.00%
3	Myanmar	48	8.56%	\$75,000	6.89%	\$4,200	18.88%	5.60%
4	Singapore	4	0.75%	\$185,000	16.99%	\$4,800	21.57%	2.59%
5	Malaysia	25	4.46%	\$125,000	11.48%	\$2,700	12.13%	2.16%
6	Thailand	65	11.59%	\$162,000	14.87%	\$3,100	13.93%	1.91%
7	Cambodia	14	2.46%	\$5,500	0.51%	\$75	0.34%	1.36%
8	Philippines	88	15.69%	\$110,000	10.10%	\$1,200	5.39%	1.09%
9	Indonesia	225	40.12%	\$365,000	33.51%	\$2,500	11.24%	0.68%
10	Laos	7	1.16%	\$3,600	0.33%	\$15	0.07%	0.42%
	TOTAL	561	100.00%	\$1,089,100	100.00%	\$22,250	100.00%	

Military Balance of Five Major Powers

No.	Country	Pop. (Millions)	% Pop. of 5 Powers	GDP (US \$millions)	% GDP of 5 Powers	Def Bdgt (US \$millions)	% Def Bdgt- GDP	% Def Bdgt of 5 Powers
1	India	1,100	36.99%	\$700,000	3.47%	\$30,000	4.29% *	4.99%
2	USA	297	9.99%	\$11,700,000	57.92%	\$442,000	3.78%	73.54%
3	China	1,300	43.71%	\$1,800,000	8.91%	\$50,000	2.78% **	8.32%
4	Russia	147	4.94%	\$1,400,000	6.93%	\$34,000	2.43%	5.66%
5	Japan	130	4.37%	\$4,600,000	22.77%	\$45,000	0.98%	7.49%
	TOTAL	2,974	100.00%	\$20,200,000	100.00%	\$601,000		100.00%

Note: * Officially the Indian defence budget is stated to be less than US \$30 billion and only 2.5% of the GDP. Yet, the Indian Ministry of Defence has not returned the unused money for the first time in five years. This may have added up to the greater percentage of the defence budget. (Political Events, New Delhi, 3 March 2005 p. 19).

** Officially China indicated that its defence budget for 2005 was only US \$29.9 billion. But the Pentagon indicated that China's defence budget was actually three times as much of that indicated, namely about US \$90 billion (Kompas, 28 January 2006). The Indonesian Department of Defence however, thought that China's defence budget was somewhere in between, namely about US \$50 billion.

Joint Development: An Ad Hoc Solution to the South China Sea Dispute

Wu Shicun

The Situation in the Disputed South China Sea

The South China Sea dispute is one of the most intricate maritime disputes in the world, and involves China, Vietnam, the Philippines, Malaysia, Indonesia, Brunei and Taiwan. The focus of the dispute concerns the Spratly Islands, which can be categorised as follows. First, in the transit from the Pacific to the Indian Ocean, the Spratly Islands are located in a strategic geopolitical position with multiple neighbouring countries around it. It also falls into military and economic interests of other maritime powers external to the region, such as the US, Japan and India. Second, with increasing populations in neighbouring areas and growing economies in the surrounding developing countries, demands for natural resources have been increasing rapidly. Thus the abundant resources in the Spratly Islands have been sought by these surrounding countries. Third, the colonial invasions of the Spratly Islands have caused major problems throughout history. Moreover, the contended hegemony, especially the development of the Cold War international relations structure, has made the Spratly Islands dispute highly sophisticated and thus something more than just a dispute over sovereignty and jurisdiction. The dispute has become a significant factor in regional stability and even the international political situation. Fourth, the attempt to judge China's traditional jurisdictional behaviour using the definition of current international laws concerning sovereignty is greatly irrational and reduces the legal significance of such behaviour. The *United Nations Convention on the Law of the Sea 1982* (LOS) is actually hastening international struggles for islands through its vague definition of historical rights. It lacks expressive and effective provisions to resolve maritime disputes among states with opposite or adjacent coasts, and allows the co-existence of various conflicting claims because of its ambiguous provisions.

Among all the listed factors leading to the South China Sea dispute, the highly expected oil and gas deposit in this area, in my view, is the key factor leading to potential conflicts. The demand for oil and gas in the South China Sea area increases sharply with the economic development in neighbouring countries. Some countries have started exploitation in the disputed areas, disregarding the objection of neighbouring countries, and some have even started joint development with foreign companies aiming to internationalise the dispute.

Resources Development in the Disputed South China Sea Area

In 1947, the then Chinese Government issued a map indicating the location of four archipelagoes in the South China Sea, namely the Spratly Islands (Nansha), the Paracel Islands (Xisha), the Pratas Islands (Dongsha) and the Macclesfield Bank

(Zhongsha), and also 11 intermittent dotted lines around the islands. These lines are known in China as the U-shape line as shown in figure 1.¹

Within the South China Sea, there are 13 large and medium sediment basins, with a total area of 619.5 thousand square kilometres, among which 417 thousand square kilometres is within China's U-shape line. This area it is estimated to contain 23.5 billion tonnes of oil and 10,000 billion cubic metres of natural gas, and there is also a large quantity of gas hydrate

(also known as flammable ice). Gas hydrate is regarded as a strategic resource with great business opportunity in the 21st century due to its high density, extensive distribution and large scale. Experts believe that gas hydrate will be developed and utilised on a large scale in 15-20 years. The National Natural Science Foundation of China conducted studies on gas hydrate in the late 1990s. In 1996, the research project "Prospect and Methodology Research on Gas Hydrate in the West Pacific" was conducted, and the "Research on Gas Hydrate Survey in China's Sea

Area" project was completed in 1998. In 1999, Guangzhou Marine Geological Survey discovered gas hydrate in the Paracel Islands and continued an earthquake survey in the same area in 2000. The initial survey shows that an area of 8000 square kilometres may contain gas hydrate, an amount equal to 80 billion tonnes of oil, covering 50 per cent of the total oil reserve in China. Nevertheless, China is still in the process of research and survey, leaving drilling, exploitation and development to be done.

In the early 1980s, China started oil surveys in the Spratly Islands, though only physical geography reconnaissance. In 1992, the China National Offshore Oil Corporation signed a contract with US Crestone Energy Corporation on joint development of gas and oil at Wan'an Tan. However, this could not be implemented due to opposition from Vietnam. So far, China has not exploited any oil in the Spratly Islands.

Ever since the 1970s, some ASEAN countries – including Vietnam, the Philippines, Malaysia, Indonesia and Brunei – have made use of their geographic advantage and hastened the exploitation of gas and oil in South China Sea by contracting foreign oil companies, specially from Western countries. Some of the exploitation areas fall within the Chinese U-shape line, where China claims historical rights including fishing and precedence over resources exploitation.



Figure 1: China's U-shape line claim in the South China Sea

Vietnam was once the poorest country in South East Asia, but has used oil revenues to alleviate some of this poverty. In order to reconstruct its economy after 30 years' civil war and the loss of oil assistance from the former Soviet Union, Vietnam has endeavoured to develop onshore and offshore oil. Vietnam has signed 33 contracts with more than 50 foreign oil companies since it opened its oil exploitation market to the world. Vietnam produced 12.1 million tonnes of oil in 1998, increasing to 20.8 million tonnes in 2004. Vietnam's annual production of natural gas was 0.9 billion cubic feet in 1998 increasing to 4.2 billion cubic feet in 2004.² In 2002, Vietnam was assessed as having produced 339,595 barrels of oil a day and 46 billion cubic feet of natural gas from the South China Sea.³

The discovery of oil in the South China Sea gives the Philippines hope to reduce its oil import proportion from 95 to 85 per cent. It started to exploit oil at Liletan with foreign oil companies in 1976 and is currently trying to develop the natural gas field located north-west of Palawan Island with the Shell Company. This natural gas field is estimated to produce 120 million barrels of oil in 20 years. In 2002, the Philippines was assessed as having produced 24,512 barrels of oil and less than one billion cubic feet of natural gas per day in the South China Sea area.⁴ It is reported the Philippines plans to extend its continental shelf from 200 nm to 350 nm, further increasing its reach into the South China Sea. The International Law Research Institute of the National University of the Philippines has requested the Senate fund the proposal in order to collect related data.

Malaysia refuses the involvement of external countries in the South China Sea region disputes and opposes the internationalisation of the dispute. However, it has also participated in oil exploitation and thus gained profits. In recent years, Malaysia has built personnel facilities in its occupied islands and reefs using the excuse of establishing facilities for scientific research purposes and has hastened oil exploitation in the South China Sea. Malaysia has developed 18 oil fields and 40 gas fields within China's U-shape line. Malaysia produced 36.9 million tonnes of oil in 1998, increasing to 40.3 million tonnes in 2004. Malaysia's annual production of natural gas was 34.6 billion cubic feet in 1998, increasing to 48.5 billion cubic feet in 2004.⁵ In 2002, Malaysia was assessed as having produced 751,973 barrels of oil a day and 1895 billion cubic feet of natural gas from the South China Sea.⁶

Indonesia, part of the Organization of the Petroleum Exporting Countries (OPEC), is one of the main oil producing and exporting countries. Energy is the leading industry of Indonesia, and has been paid great attention by both the central government and local governments. The energy and mineral resources industries covered 25-30 per cent of the total tax income for the whole country. Liquefied natural gas covers about a third of market share in the Asia-Pacific area. Indonesia has gained much profit from the exploitation of the Natuna Gas Field, which has been jointly developed by the Indonesia National Oil Corporation and the America Exxon Corporation with the available capacity of 1600 billion cubic metres. This project, with a cost of US\$40 billion, has been designed to produce six million tonnes of liquefied natural gas every year once completed. Indonesia produced 74.2 million

tonnes of oil in 1998, increasing to 55.1 million tonnes in 2004. Indonesia's annual production of natural gas was 57.8 billion cubic feet in 1998, increasing to 66.0 billion cubic feet in 2004.⁷ In 2002, Indonesia was assessed as having produced 323,000 barrels of oil a day and 50 billion cubic feet of natural gas from the South China Sea.⁸

Brunei is the main oil producing country in Asia-Pacific region and one of the largest oil exporting countries in the world. Its main exploitation area is situated at Shaba Basin. Oil and gas exploitation is the principle economic source of the Bruneian people. However, the current oil and gas field exploitation can only last 25 years. Hence, the Bruneian Government feels the urgency to develop new offshore oil fields in order to maintain its current prosperity. Swallow Reef is located within China's U-shape line. Once it occupies the Swallow Reef, Brunei has the right to develop the oil contained in its continental shelf. Brunei produced 7.6 million tonnes of oil in 1998, increasing to 10.3 million tonnes in 2004. Brunei's annual production of natural gas was 9.7 billion cubic feet in 1998, increasing to 10.9 billion cubic feet in 2004.⁹ In 2002, Brunei was assessed as having produced 189,000 barrels of oil a day and 366 billion cubic feet of natural gas from the South China Sea.¹⁰

Petroleum has been called the "blood" of industry, and is directly related to the economic development, political stability and national security of the state. One common comment among the energy experts of the world is "Petroleum remains the principal energy among all the available resources in the 21st century". Before an alternative energy is found, most countries have to face a series of urgent issues such as how to increase oil supply and assure import security in order to ensure the sustainability of its economic and social development. The competition for oil among the international community has become fiercer in the 21st century and might lead to political and/or military conflict. This is particularly true in the case of the South China Sea area.

China's Joint Development Proposal

The South China Sea abounds in gas and oil deposits, which is of great significance for the countries and regions in the South China Sea area. However, the intricate situation in the disputed South China Sea area means oil and gas exploitation will remain a sensitive issue that might not only bring about conflict, but also many problems related to investment and cooperation, such as potential risk and high cost.

The special features of the disputed area make it possible that conflict might be unavoidable when oil and gas exploitation occurs. The claiming parties may take the following actions:

- unilateral action means that the claiming party takes action alone ignoring the protest of other parties involved
- bilateral cooperation means that the two parties concerned develop cooperation in bilateral disputed area in order to avoid conflicts
- multilateral cooperation is normally taken in the multilateral disputed area

- frozen behaviour means laying aside the dispute and freezing the development activities in the disputed area.

The following are some successful cases on joint development in the disputed area:

- The continental shelf dispute between Tunisia and Libya in 1982 was caused by oil development in the Gulf of Gabes and was taken to the International Court of Justice (ICJ). A joint development proposal was recommended by the ICJ judges, and the dispute was eventually solved with an agreement between Tunis and Libya on joint development in the Gulf of Gabes.¹¹
- The joint development agreement between Iceland and Norway – on the continental shelf between Iceland and Jan Mayen Island – was signed in October 1981 as a solution to a sovereign right claims dispute related to fishery.¹² The agreement was signed after the bilateral negotiation.
- The mutual development case between Thailand and Malaysia established a very powerful Joint Authority to assume the rights and responsibilities of the parties in the described zone of cooperation. The Authority is an international organisation with legal personality, and manages the aggregate activities in the area, including the terms of contracts.¹³

No matter what model is taken toward development in the disputed area, it is regarded as a temporary interest arrangement based on existing disputes and conflicts, and is based on a compromise between political entities that have acknowledged the existence of the dispute and reached a politically negotiated agreement aimed at reaching a consensus on how to share the resources. However, these kinds of temporary arrangements can be easily influenced by various factors. For example, the Timor Agreement signed by Australia and Indonesia came to an end with the independence of East Timor. Within the framework of geopolitics and economic security, with the national interest as the priority, the temporary interest arrangement could work as safety valve, but may also lead to conflict. Multilateral development is more difficult to achieve than bilateral development where there are intricate interest divisions and political compromises. Therefore, a cooperative model can only be arranged after the parties reach an agreement on the mechanism of cooperation and conflict management with the necessary political guarantee and financial support.

After extensive negotiation, the late Chinese leader Deng Xiaoping initiated his famous proposal on the South China Sea dispute, namely “shelving disputes and going for joint development” in the region. This proposal shares the same features of the cooperation models analysed above. The proposal took into account the practical interest of the parties involved and aims to find a way to eventually resolve the South China Sea dispute. This demonstrates China’s goodwill and sincerity in this issue.

The Chinese Government has made great efforts in recent years to put Deng’s proposition into practice, frequently discussing specific issues with partners of the Association of Southeast Asian Nations (ASEAN), such as oceanic environmental protection, maritime scientific research, fishing and other relevant issues.

In November 2002, China and ASEAN adopted a Declaration on the Conduct of Parties in the South China Sea, laying a political foundation for future possible commercial cooperation between them, as well as the long-term peace and stability in the region.

The oil companies of the Philippines, China and Vietnam signed a landmark tripartite agreement in Manila on 14 March 2005 to conduct a joint seismic survey of oil potential in disputed areas of the South China Sea. The survey, which is expected to begin before the start of the typhoon season in 2006, will cover an area of about 143,000 square kilometres. In a joint statement, the three parties affirmed that the signing of the agreement was in accordance with the basic position held by their respective governments to turn the South China Sea into an area of peace, stability, cooperation and development in accordance with the LOSC and the 2002 ASEAN-China Declaration on the Conduct of Parties in the South China Sea.

The signing of the agreement was commonly regarded as “initial practice” by the Chinese side of Deng Xiaoping’s proposal. It shows the three nations are taking active measures to fulfil the 2002 ASEAN-China Declaration.

Local experts stated that China, Vietnam and the Philippines, in a spirit of mutual benefit, flexibility and pragmatism, had cut a new path to peacefully settle the South China Sea dispute, and set an example for other countries to handle such kind of issue.

It is believed that as long as countries in the region actively participate in the concrete cooperation and adhere to the principle of “putting aside the disputes and jointly exploiting” the region, the goal achieving peace, stability, friendship and cooperation in the South China Sea can definitely be reached.

Besides the efforts made on pushing the proposal of shelving disputes and going in for joint development, China has signed a series of agreements with ASEAN, such as the Joint Declaration of ASEAN-China on Cooperation in the Field of the Non-traditional Security Issues, and the Treaty of Amity and Cooperation in Southeast Asia, through which both parties have built up mutual confidence. Additionally, China and ASEAN have expanded bilateral economic development through the establishment of a free trade zone. It is believed that the proposal of shelving disputes and going for joint development will be more convincible in the international community with the promotion of such similar actions.

Conclusion

Although the joint development proposal in the disputed South China Sea area has been agreed to some extent and been pushed forward recently, many complex obstacles still exist. First, the geopolitical interests of countries on the South China Sea, and their competition for resources with economic development, have led to a more intricate situation in this area. Although consensus on cooperation, development and win-win agreements have been reached, security concerns still exist. Despite the assignment of the Declaration, issues such as deterring or arresting other countries’ fishermen on the alleged grounds of illegal fishing continue. The

strategic situation restricting China by combining internal and external force to the region remains.

Second, the involvement of major external powers has led to increased complexity and the internationalisation of the dispute, thus erecting potential obstacles for implementing joint development. The US is the most powerful player with its great strategic interest in South East Asia. After the 11 September 2001 terrorist attack, the US Government has strengthened its military interference and control in the South China Sea in the name of anti-terrorism. Because of the Right deviation of domestic politics and development of militarism, Japan has broken its commitment to its pacifist constitution and has even sent troops to Iraq, which makes it convenient for Japan to protect its economic and security interests in South East Asia. The Japanese Self Defence Forces have been stretched to the South China Sea by establishing cooperation with some ASEAN countries on non-traditional security issues. With these latest developments, South China Sea security has become more complex and led to changes in the international environment. India, as well as becoming a nuclear power, has gradually implemented its major power strategy and enhanced its influence in regional and international affairs. Using South East Asia as a breakthrough to reshape its orientation policy, India has improved its comprehensive relationship with ASEAN. In geographical politics, India is worried about China's increasing influence in South East Asia, which it considers will eventually threaten both its security and that of South Asia. Hence, India believes it is essential to prevent China from entering the Indian Ocean. While hoping to accomplish this by restricting China's role in the South China Sea, India has become one of the latest players involved in the dispute.

Thirdly, with overlapping sovereignty claims it is difficult to define the joint development area in the South China Sea. Such overlaps include territorial and jurisdictional claims and sovereignty claims for island, reef, cay and shallows. Hence, the definition of joint development areas has largely restricted its implementation in the South China Sea.

In addition to the above factors, the engagement of oil companies external to the South China Sea region also causes difficulties for joint development. So far, there are more than 200 oil companies involved in oil and gas exploitation in the South China Sea, most of which are from the US, Netherlands, Britain, Japan, France, Canada, Australia, Russia, India, Norway and South Korea. These oil companies have made considerable financial and technical investment in the South China Sea. The engagement of these oil companies will undoubtedly enhance the complexity and internationalisation of the South China Sea dispute and becomes the potential drawback for joint development.

With an aim to maintain the peace and stability in the disputed South China Sea area, other efforts should be made in addition to the joint oil and gas development. Regional cooperation by various means should be encouraged and should include cooperation on fishery development and conservation; cooperation in the fields of marine research and marine environmental protection; disaster prevention

and rescue; and cooperation in maritime transportation, etc. So far, China has worked with some countries on cooperation in oil, fishing, marine environment protection and marine climate, to help seek a resolution model with the parties involved and aimed at furthering cooperation and accumulating experiences. Each party concerned should respect the principles stipulated in the Declaration on the Conduct of Parties in the South China Sea and maintain the security of the South China Sea for establishing an advantageous international situation and improving the sustainable development of the society and regional economy.

The United States Navy Since President Ronald Reagan

Kenneth J. Hagan and Michael T. McMaster

The history of the United States Navy (USN) in the last 20 years is one of adaptation to radically changing political and technological environments. To relate the full story within a relatively short compass would be impossible, but the essential elements of its transformation can be portrayed by examining two salient features: strategic doctrine and fleet operations. This paper is therefore divided into two sections: one covering the evolution of doctrine, and the other summarising the nature of operations from the era of Ronald Reagan to the present.

The Evolution of Doctrine

The US was founded in 1787, a year before the settlement of Australia. In the intervening two centuries the American military has been characterised by intense rivalry between the Services. The parcelling out of budgetary appropriations by Congress has been the core issue, but the disputes have usually been couched in terms of finding better strategies for national defence. Twenty years ago, in the administration of Ronald Reagan (1981-89), Congress made a gallant effort to decrease the competition between the army, navy and air force and to engender a new spirit of strategic and fiscal unity, or “jointness”. The effort was a limited success. To a large extent, each Service has continued to advance itself as the best bet for victory in future wars.

The USN has faced two daunting obstacles in attempting to perpetuate the viability of its interrelated concepts of “sea power” and “command of the seas”. One impediment has been the disappearance of the Soviet Navy as a strategic target; the other has been the remarkable emergence of the quasi-autonomous US Marine Corps (USMC) as a full but competing partner in the strategy-making process.

The Age of Mahan in the USN: 1890-1990

When Captain Alfred Thayer Mahan published *The Influence of Sea Power Upon History* in 1890, he fired a strategic salvo that still reverberates.¹ The book summarised lectures he had given for the previous several years at the newly established Naval War College in Newport, Rhode Island. His purpose was to induce the USN to abandon its historic dedication to the strategy of commerce raiding and to adopt instead a variant of the British strategy of building massive fleets of battleships for engaging similarly-minded opponents – Spain, Holland, France or Germany – in climactic annihilationist battles for command of the seas.² Mahan’s model was the Battle of Trafalgar (1805), and his hero was Horatio Nelson.

By 1892 England had bestowed undreamed of honours and praise upon Mahan as a reward for summarising the Royal Navy’s history and using that saga to offer a

strategic rationale for the dawning age of steam-driven, armour-plated, heavy ships mounting large-calibre breech-loading rifled guns. The unprecedented transatlantic flattery made Mahan a major figure in the US naval renaissance.³ His friendship with sympathetic politicians, such as Theodore Roosevelt, helped transform the USN from a monument to antiquity into a major command-of-the-seas battleforce.⁴ The revolution in naval affairs was nearly completed by the time of the Russo-Japanese War (1904-05),⁵ the launching of HMS *Dreadnought* (1906),⁶ and President Roosevelt's deployment of the 16 battleships of the "Great White Fleet" on a two-year cruise around the world (1907-09).⁷

In World War I the USN demonstrated that convoys and the destruction of German U-boat commerce raiders were far more important to the outcome of the war than were fleet engagements. Nonetheless, the post-war USN stuck to Mahan's all-big-gun ships until the Japanese sank them at Pearl Harbor, Hawaii, on 7 December 1941. When the Pacific battlefleet was demolished the USN instantly adopted the aircraft carrier as its new Mahanian weapon for destroying enemy fleets and for winning command of the seas. With the battles of the Coral Sea (May 1942), Midway (June 1942) and the Philippine Sea (June 1944) in mind, Secretary of the Navy James V. Forrestal in 1945 explicitly acknowledged this transformation of the carrier's role from auxiliary to centrepiece of the battlefleet.⁸ Eight years later, by the end of the Korean War (1950-53), the USN was building the world's first supercarrier, the USS *Forrestal*. That massive weapons system remained the backbone of the US fleet throughout the Cold War and into the 21st century.

Mahan Reincarnated: John Lehman and the Maritime Strategy, 1984-91

The Cold War USN received an enormous boost from President Ronald Reagan's first Secretary of the Navy, John F. Lehman, Jr (January 1981 - April 1987). Lehman must rank among the half-dozen most visionary and powerful Secretaries of the Navy in US history.⁹ Entranced with naval aviation since childhood, Lehman said, "I always felt more at home with naval aviators than with any other peer group."¹⁰ Functioning under a president whose first term (1981-85) was characterised by implacable hostility to the Soviet Union - the so-called "evil empire" - Lehman articulated and fashioned a remarkably coherent maritime strategy.

The concept was based on a planned fleet of 600 ships, a size he described as "prudent" because it reflected "geographic realities, alliance commitments and dependencies, and the Soviet fleet that threatens them".¹¹ On 19 January 1984 he formally presented the Maritime Strategy to the Secretary of Defense. The Chief of Naval Operations (CNO) approved a sanitised and truncated version for public release on 4 May 1984.¹²

Lehman was Mahan in modern garb, and the super carrier was the *Dreadnought* of the space age. He saw aircraft carriers as a vital part of the US nuclear deterrent force directed against the Soviet Union. If deterrence failed and a Soviet-American war threatened to erupt, Lehman proposed to send the carriers into "the North Sea and the Baltic throat" to attack the Soviet Navy in its homeports and bases. He

dismissed the previous strategy of keeping them south of the Greenland-Iceland-United Kingdom gap as “a childish concept of creating a watery Maginot Line”.¹³ Subsidiary to deterrence – but an essential part of it – was the aircraft carrier’s role in fighting limited wars or launching intimidating strikes against small powers that had outraged the Americans.

The most notable punitive spasm was the attack against the Libyan capital of Tripoli on 15 April 1986, made in retaliation for a terrorist attack against US military personnel in West Berlin.¹⁴ The strike – a prototype for post-Cold War operations – was Lehman’s last hurrah. A year later, frustrated by congressional refusal to fund his fleet of 600 ships and by Reagan’s turn toward accommodation with Soviet President Mikhail Gorbachev, Lehman resigned his office.¹⁵

For all of Lehman’s lucidity, his maritime strategy was anachronistic on two counts. First, the antagonist at which it was aimed, the Soviet Union, was a hollow shell that would implode within five years, much as the influential political theorist George F. Kennan had predicted when prescribing a policy of “containment” in 1946.¹⁶ Second, and of equal importance, Lehman was sponsoring an independent naval strategy at precisely the moment when the Reagan administration and Congress were emphasising joint – that is, inter-Service – planning and operations. Reagan’s first Secretary of Defense Caspar Weinberger (21 January 1981 – 23 November 1986) and Army General Colin Powell articulated the Weinberger or Powell Doctrine, which would become the guiding principle of American national strategy for 20 years. Shaped by the ghosts of the Vietnam War, the doctrine restricted the belligerent use of the American military to cases involving vital national interests. Furthermore, it demanded that the force applied must be overwhelming.¹⁷

While Weinberger and Powell were formulating their strategy, Congress was passing the *Goldwater-Nichols Department of Defense Reorganization Act* (signed 1 October 1986). The intention was to enforce greater cooperation (jointness) between the military Services in the areas of procurement, planning and operations. President Reagan praised the act as a milestone.¹⁸ Undeniably the most significant legislation of its kind to be passed since the *National Security Act 1947*, Goldwater-Nichols soon would be tested and found somewhat wanting.¹⁹

Operation DESERT STORM: 1990-91 Gulf War

The test of both Goldwater-Nichols and the Powell Doctrine came in early 1991 with Operation DESERT STORM, more popularly known as the 1990-91 Gulf War. In a torrential onslaught of overwhelming power, only lasting from 24-28 February, the Americans, together with their European, Arab and Australian allies, summarily drove Iraqi occupiers from Kuwait.²⁰ In the process the coalition forces devastated Sadaam Hussein’s army as it fled toward Baghdad. Upon the recommendation of General Colin Powell, then Chairman of the Joint Chiefs of Staff, President George H.W. Bush stopped the war without invading and conquering Iraq. Oil-rich Kuwait’s autonomy had been deemed vital to the US national interest, overwhelming military force had been applied, and the goal of liberation was achieved in 100 hours of

combat.²¹ The prescriptions of the Weinberger or Powell Doctrine had been met perfectly.

The survival of Saddam Hussein and the consequent 10 years of US surveillance and suppression flights over Iraq were regrettable outcomes attributable at least indirectly to the influence of General Powell and his doctrine. Two other defects of the war reflect the persistence of inter-Service rivalry despite the strictures of Goldwater-Nichols. As retired Marine Lieutenant General Bernard Trainor has made abundantly clear, the US Navy and the Air Force differed philosophically over the nature and proper employment of air power. He writes, “the Air Force thought in terms of campaigns, extended air operations to defeat an adversary”. The USN’s view of its naval aviation did not encompass decisively “winning a large conventional conflict”. The USN’s perspective was, in a way, strangely polarised: “Before the Gulf [War], Navy planners had, in effect, two models of conflict: the short, one-day attacks off the coast of Libya or an all-out war with the Soviet Union”.²²

Trainor articulates another inter-Service complaint, one that almost immediately had far-reaching consequences for strategic doctrine: the rejection of the Marine Corps’ desire and plans for an amphibious assault against Kuwait. An assault from the sea is something to which Marines are culturally addicted, and the USMC had been planning for months to execute one in the 1990-91 Gulf War. Trainor blames the negative decision largely on General Powell and the war’s overall commander, Army General Norman Schwarzkopf. He alleges that they harboured fears of inordinate casualties of Marines and Kuwaitis.²³ However, the USN was also culpable:

*The Navy was oriented around the aircraft carrier and had little interest in planning amphibious operations. The Marines had to dispatch a special team of amphibious planners from the US to get the Navy to think seriously about attacks from the sea.*²⁴

Owing to a peculiar set of circumstances, “from the sea” would very soon become the mantra of the USN as well as the USMC.

The End of the Cold War and New Naval Strategy: ... *From the Sea* and Forward ... *From the Sea*

The Cold War came to an abrupt end in a two-year period lasting from the dismantling of the Berlin Wall in November 1989 to the implosion of the Soviet Union on Christmas Day, 1991.²⁵ The last of the 20th century’s significant great power naval rivals – Germany, Japan and the Soviet Union – no longer posed a threat to the USN. Mahan’s precepts were suddenly outmoded, and the USN reformulated its strategic doctrine with remarkable alacrity. In doing so, it de-emphasised blue water operations dedicated to maintaining command of the sea. It also elevated the USMC to a position of near-equality with the USN in the American maritime arsenal.

In September 1992, during the final months of the presidency of George H.W. Bush, the Department of the Navy promulgated a new statement of doctrine entitled ... *From the Sea: Preparing the Naval Service for the 21st Century*.²⁶ Describing

itself as “a Navy and Marine Corps White Paper”, the document noted that in the previous two years the world had dramatically changed, and so had America’s national security policy. The new doctrine stressed the demise of the Soviet Union. It bragged “the free nations of the world claim pre-eminent control of the seas”, and they enjoyed unfettered global “freedom of maritime passage”.²⁷ The consequent shift “from a Cold War, open ocean, blue water naval strategy to a regional, littoral and expeditionary focus” meant that the USN’s organisation and force structure had to be changed, although the submarine ballistic-missile (SSBN) force would remain an unaltered “robust strategic deterrent” directed against some unspecified foe.²⁸

In November 1994, the top leadership updated and expanded “the strategic concept articulated in our 1992 paper”.²⁹ The new document, *Forward... From the Sea*, revisited many of the unresolved “issues raised about peacetime use of naval forces” that the 1992 paper had not fully digested.³⁰ Like its predecessor, *Forward... From the Sea* was issued by the Secretary of the Navy, the Chief of Naval Operations (CNO) and the Commandant of the Marine Corps. They paid only cursory obeisance to Goldwater-Nichols and jointness. They briefly conceded that “a massing of naval units can be complemented by the deployment of Army and Air Force units to provide a joint force...”.³¹ Nowhere did they say the Army and Air Force were necessary complements to the USN and USMC. By contrast, they were more definite and enthusiastic about international “interoperability – the capacity to operate in concert with friendly and allied forces”. Their examples included North Atlantic Treaty Organisation (NATO) and “coalition partners around the Pacific Rim, Norwegian Sea, Arabian Gulf and Mediterranean Basin”.³² This explicit deference to allied navies rests in part on the USN’s admitted reliance on foreign allies for very small combatants, such as minesweepers, a cost-cutting dependency that frees up money for construction of the more popular larger warships.³³

Forward... From the Sea placed overwhelming stress on the historic shift “in priorities for the Naval Service away from operations on the sea toward power projection and the employment of naval forces from the sea to influence the littoral regions of the world”.³⁴ A burst of “forward presence and power projection from sea to land” might be made for purposes of humanitarian relief, or it might seek more politically motivated and military objectives. But there was no longer any uncertainty about the composition of the forces to be employed, as there had been in 1992. Now, in each and every instance, the basic building blocks consisted of “Aircraft Carrier Battlegroups – with versatile, multipurpose, naval tactical aviation wings – and Amphibious Ready Groups – with special operations-capable Marine Expeditionary Units”.³⁵ This explicit and far-reaching partnership, this equality, between the USN and the USMC was without historical precedent.

Accounting for the Change in Strategy: Two Viewpoints

The official interpretation of the origins of the radical change in strategy marked by ... *From the Sea* concludes that the source lay in brilliant and congenial staff work in the “E-Ring” of the Pentagon. According to one sympathetic specialist:

*the Naval Service reinvented itself in the early 1990s. ...The picture which emerges from this history of that process is that, while the end of the Cold War dictated a change in strategic direction for the Naval Service, the determination of what that direction would be was the product of self-conscious, self-examination by that service.*³⁶

This orthodox analysis further asserts that the “white paper process and debates” of the 1990s constitute “a far-reaching strategic adjustment parallel to those undertaken by the Naval Service in the 1890s and the interwar years [1919-1939]”.³⁷

This very rosy and reassuring picture of how one American institution always recreates itself in a way that is most suitable to a new strategic age has several serious shortcomings.³⁸ For our purposes, the most fundamental failing of the official summary of the authorship of ... *From the Sea* is its failure to name the signatories of the documents and to assess their historical importance.

The identity of the three approving officials of the two documents is most revealing. The name of the Secretary of the Navy who initiated the strategic revision, Henry L. Garrett III, is not on the document. He had resigned on 26 June 1992 and was replaced by the career politician Sean O’Keefe, who signed ... *From the Sea*. The 1994 publication was signed by Secretary of the Navy John H. Dalton, a Democrat in the new Clinton Administration. This major change of the Navy’s upper civilian leadership suggests a power vacuum and a lack of firm guidance at the top. The notorious reciprocal hostility of the US military and the senior staff members of the first Clinton Administration (1993-97) also suggest weakness at the top of the Navy’s civilian hierarchy.

The Office of the CNO was itself in some disarray in 1992 and 1994. Admiral Frank B. Kelso II, who signed ... *From the Sea*, was bedevilled by the “Tailhook” scandal. This notorious public and political upheaval emanated from the outrageous behaviour of naval aviators attending their annual Tailhook convention in Las Vegas, Nevada, in September 1991. The drunken and sexually lewd behaviour led to widespread coverage in the media and political inquiries by congressmen and senators. The result was that Admiral Kelso had to spend a great deal of his time trying to defuse the adverse publicity and trying to save the careers of many of his aviators, the group that has dominated the Navy since the Eisenhower presidency (1953-61).

Admiral Kelso’s successor, Admiral J.M. Boorda, signed *Forward...From the Sea* in 1994. He was even less powerful than his predecessor. The first CNO not to have graduated from the US Naval Academy, Admiral Boorda had come up from the enlisted ranks to the uniformed Navy’s top job. He owed his appointment to President Clinton, a fact that weakened Boorda within the prevailing anti-Clinton ranks of the US military. Furthermore, he was not an aviator and in fact sponsored radical new weapons systems such as the Arsenal Ship, the adoption of which would have fundamentally restructured the composition of the fleet. He also fell victim to two scandals, one resulting from wearing a ribbon to which he was allegedly not entitled and the other from failing to sponsor fully the appointment of Admiral Stanley Arthur – a popular naval aviator – as the Commander in Chief, Pacific

Command.³⁹ The tragic upshot was that Admiral Boorda committed suicide outside his quarters in Washington, DC, on 16 May 1996.⁴⁰

The signatures on ... *From the Sea* and *Forward... From the Sea* reveal consistency only with regard to the Marine Corps. General Carl E. Mundy, Jr signed both documents. Therein lies a graphic explanation for the shift of strategy away from commanding the oceanic blue water to littoral operations or a war against the shore. At the opening of Operation DESERT STORM, the USMC had been ready to showcase the robustness of amphibious assault, but as Trainor observed they were denied their chance to demonstrate their techniques in combat. They then looked for the opportunity to make a move within the naval bureaucracy. That moment came in 1991-94, when General Mundy and the USMC rewrote US maritime strategic doctrine. The effect has been lasting.

The USN, the USMC and the War Against the Shore: Today and Tomorrow

For the USN the past 12 years have been characterised by consistency and conformity with the strategic principles formulated in ... *From the Sea* and *Forward... From the Sea*.⁴¹ They have not been altered fundamentally by the terrorist attacks on 11 September 2001 or by the wars in Afghanistan and Iraq. The current CNO, Admiral Michael G. Mullen, confirmed the continuing dominance of those two papers during remarks made at the National Defense Industrial Association (NDIA) Expeditionary Warfare Conference in October 2005.⁴² Mullen said:

*We are moving out in the green and brown water areas and because many operations are looking as an extension of what we talked about in the last few years in terms of the littoral, many operations are focused in the shallows.*⁴³

In August he had proposed that in the future the Navy should go well inland:

*We cannot sit out in the deep blue, waiting for the enemy to come to us. He will not. We must go to him. I want the ability to go close in and stay there. I believe our Navy is missing a great opportunity to influence events by not having a riverine force. We're going to have one.*⁴⁴

In January 2006, Admiral Mullen repeated these themes in the US Naval Institute journal *Proceedings*.⁴⁵ Unfortunately, the same issue of *Proceedings* ran an article insisting on the maintenance of a fleet of 12 supercarriers, a very expensive proposition that if adhered to will of necessity reduce funding for other programs.⁴⁶

In yet another article following Admiral Mullen's, two authors praise the CNO for "his vision for a green and brown water joint operating capability" but they warn darkly that "implementing this concept presents many challenges to Navy planners". They then summarise and regret the legacy of the Lehman era:

*During the Cold War, the Navy focused on building a blue water naval force - a force that faces no real threat in today's global security environment and detracts from its rightful role on the waterways of Iraq.*⁴⁷

No matter how forward-looking he may be, Admiral Mullen has not earned the international cachet of Alfred Thayer Mahan, and he does not have the domestic American political prominence enjoyed by John Lehman. Realisation of his vision of a brown water navy therefore must be considered to be somewhat problematic.

And the USMC? They have further consolidated their position within the uppermost reaches of the US Defense establishment. The process began when one of their most talented and sophisticated generals, Anthony Zinni, served as the Commander in Chief, Central Command from 13 August 1997 to 5 July 2000.⁴⁸ Another Marine, General James L. Jones, currently serves as the Supreme Allied Commander Europe, the senior military position in NATO.⁴⁹ Most significantly of all, the current Chairman of the Joint Chiefs of Staff – the most powerful military position within the US – is Marine General Peter Pace. There remains only one very high command yet to be claimed by the Marines: the US Pacific Command. The countries bordering the Pacific Rim ought not to be surprised if a marine general occupies that position in the near future. Even if that does not happen, they ought to be aware that today the USMC is the equal of the USN in determining strategy. The Mahan of the future, if there is one, may wear the Marine Corps eagle, globe and anchor rather than Navy blue and gold.

The Evolution of Operations

This section summarises typical US naval operations from the mid 1980s to the present. It does not include every US naval operation during that period, but uses selected operations as examples of the extraordinary breadth of missions conducted from the sea to the shore by American naval forces. The geographic breadth and the frequency of these operations serve as illustrations of the new strategic concepts discussed in the previous section.

US NAVAL OPERATIONS: “THE MARITIME STRATEGY” TO 1991

From the publication of the maritime strategy in 1984 to Operation DESERT STORM in 1991 US naval operations were primarily focused on crisis response missions of a short duration and on maintaining a peacetime overseas presence in regions of interest such as the Persian Gulf.⁵⁰ Operations generally ensured freedom of the seas, while at the same time providing forward deployed forces that were capable of quickly responding to crises to include humanitarian assistance and disaster relief. Additionally, US naval forces conducted small-scale combat operations such as strike missions from the sea. This type of mission was illustrated in April 1986 in Operation EL DORADO CANYON, in which US Navy and Air Force bombers launched strike missions against targets in Libya in retaliation for terrorist attacks against US military personnel in Germany.⁵¹

The US naval presence in the Persian Gulf increased significantly during this period. The necessity to keep resources – principally oil – flowing from the region during the Iran-Iraq War (1980-88) resulted in Operation EARNEST WILL (1987-88) in which USN warships ensured the safe transit of shipping through the Persian

Gulf. Kuwaiti tankers were reflagged as American ships, allowing the USN to escort them safely through the Gulf.⁵²

On 18 April 1988 the USN carried out Operation PRAYING MANTIS. The mission was to strike at Iranian gas and oil separation platforms in retaliation for the mining of the Persian Gulf that caused severe damage to the USS *Samuel B. Roberts*.⁵³ The forces conducting the operation were granted the authority to engage any Iranian naval combatant that attempted to defend the platforms. In all, three USN surface action groups and carrier-based aircraft engaged and destroyed three oil platforms, sank two Iranian warships, damaged a third, and destroyed or damaged a number of Iranian Boghammar gunboats.⁵⁴ This engagement has been described as the largest purely naval action fought by the USN since World War II.⁵⁵ It is significant to note that this noteworthy surface engagement came against an adversary that had a significant disadvantage in relative combat power and was only able to launch one attack, a US-made Harpoon anti-ship missile that narrowly missed striking a US cruiser.⁵⁶

In August 1988 a cease-fire was declared in the Iran-Iraq war. But the increased US naval presence in the Persian Gulf had become a permanent part of USN deployments and would remain so indefinitely in an effort to maintain regional stability.

Naval operations in 1989 consisted largely of maintaining an overseas presence around the world in support of regional stability. In November 1989 the USS *Enterprise* and USS *Midway* Carrier Battlegroups as well as an Amphibious Ready Group with an embarked Marine Expeditionary Unit, participated in Operation CLASSIC RESOLVE in response to Philippine President Corazon Aquino's request for air support during a rebel coup attempt.⁵⁷ *Enterprise* and her escort ships remained on station in the waters outside of Manila Bay conducting flight operations during this crisis. US Air Force and USN aircraft from Clark Air Base in Luzon and from *Enterprise* operated in the skies over Manila to hold down any attempt by the Philippine military air forces to participate in the attempted coup. Additionally, US Marines reinforced the US Embassy in Manila.⁵⁸

Secretary of the Navy Henry Garrett would later observe that the end of the Cold War in 1989-91 had not affected all categories of US naval operations. "For instance", he wrote, "there has been no increase in regional stability to accompany the positive trend in superpower relations".⁵⁹ Naval operations in 1989 reflected this continued instability. Military operations other than war dominated the operations assigned to the USN. The remarkably vast range of operations included rescue of refugees at sea in South East Asia, drug interdiction patrols off South America, and the stationing of ships intermittently off the coast of Haiti, Lebanon and the Philippines in response to regional instability. Other missions included environmental clean-up in Alaska following a huge oil spill, historically significant port visits to Shanghai, China, and Sevastopol, USSR, and domestic humanitarian assistance following the 1989 earthquake in California and Hurricane Hugo in South Carolina.⁶⁰

The CNO also reflected upon naval operations in 1989. Admiral Carlisle A.H. Trost wrote:

In the majority of contingencies naval forces were called upon to represent national interests, Western resolve, democratic principles and regional stability in areas far removed from the US, overseas bases or traditional European locations.

He went on to discuss the unparalleled ability of US naval forces to respond to crises, “moreover, many of these contingencies were not anticipated. Nonetheless, because of the forward presence of our naval forces in unstable regions, we have been able to provide the President a range of policy options for virtually every contingency.”⁶¹

Although much of the strategic attention and focus during this time was on the Persian Gulf, there were contingencies elsewhere that demanded a US naval response. In 1990 in Liberia internal unrest threatened US diplomats and civilians. Ordered to conduct non-combatant evacuation operations, USS *Saipan* and elements of her embarked Marine Expeditionary Unit conducted Operation SHARP EDGE. They evacuated over 2000 people between August 1990 and January 1991.⁶²

OPERATION DESERT STORM: THE 1990-91 GULF WAR

Iraqi forces invaded Kuwait in August 1990. In a defensive operation to protect Saudi Arabia and the rest of the Gulf against an Iraqi invasion, Operation DESERT SHIELD was initiated. In what was also referred to as “phase one”, the US and Saudi Arabia rushed to build up defensive forces and the United Nations used economic sanctions in an attempt to force Iraq to leave Kuwait.⁶³ At the time of the Iraqi invasion, the USN’s Middle East Force, part of the existing Joint Task Force Middle East, had a total of eight ships assigned.⁶⁴ Additional US naval forces were dispatched to the region to further deter Iraqi aggression. Two aircraft carrier battlegroups were deployed: one to the northern Arabian Sea and the second to the eastern Mediterranean. During Operation DESERT SHIELD (August 1990-January 1991) in support of the UN economic sanctions against Iraq, US naval forces challenged and intercepted ships in the Persian Gulf, establishing sea supremacy with one of the largest and most successful maritime interdiction operations ever undertaken by the US.⁶⁵

Operation DESERT STORM was the second phase of the 1990-91 Gulf War with the primary objective being the liberation of Kuwait. This operation was executed in January 1991 with strike missions initiated by means of a Tomahawk cruise missile attack from a USN cruiser. Over 110 US naval vessels were deployed to the region for this operation. These ships provided a significant land-strike capability with Tomahawk land-attack cruise missiles. The armada included six aircraft carrier battlegroups, four operating in the Persian Gulf and two operating in the Red Sea, with their carrier-based aircraft providing about one third of the sorties during the air war. A significant amphibious capability was also available to operational

planners. Thirty-one amphibious ships and 17,000 embarked Marines were prepared to conduct amphibious landings in Kuwait in order to expel the invaders. A heavily reinforced Marine Expeditionary Force with an additional 68,000 marines was ashore in the theatre. US naval surface ships continued maritime interception throughout this phase of the war.⁶⁶

Control of the sea in the theatre of operations established by the USN and coalition maritime force allowed the land and sea-based air forces to successfully project power ashore during the air war that began on 17 January 1991. US forces halted military operations on the morning of 28 February 1991.

Operations in the Post-Cold War: ... *From the Sea*

Operation DESERT STORM was scarcely finished before the USN and USMC team mounted another operation employing expeditionary forces operating from the sea. Operation SEA ANGEL was a disaster relief operation in Bangladesh following a tropical cyclone that left close to 150,000 dead and millions homeless. For approximately one month beginning 10 May 1991, an amphibious group of 15 ships and a Marine Expeditionary Brigade working with joint and coalition forces, provided food, water and medical care to those stricken by the disaster.⁶⁷ This operation was originally named Operation PRODUCTIVE EFFORT. When it was reported that the Bangladeshis who saw the Marines coming in from the sea in helicopters and landing craft said “Look! Look! Angels! From the sea!”, the operation was renamed Operation SEA ANGEL.⁶⁸

Operation SOUTHERN WATCH began in August 1992. As part of an international response to Iraqi non-compliance with UN Security Council Resolutions a no-fly zone was established south of the 32nd parallel. For over a decade following the 1990-91 Gulf War, US naval, joint and coalition forces would be tied to this operation. Missions enforcing no-fly zones involved carrier-based aircraft. These aircraft carriers were viewed as critical assets by the regional combatant commander, US Central Command. In 2000 General Tommy Franks wrote:

One of the problems I had inherited had to do with our naval forces. The Pentagon was considering reducing the full-time aircraft carrier battle group presence in the northern Arabian Gulf to part-time: only three-quarters of any given year. But Willie Moore [commander of the Naval Component in Central Command] and I agreed that we must have a carrier on hand twelve months of every year to support Operation SOUTHERN WATCH in Iraq's southern no-fly zone.⁶⁹

Outside the Persian Gulf, in late 1992, US naval forces became involved in the largest humanitarian relief operations of their kind,⁷⁰ in Operation PROVIDE RELIEF and Operation RESTORE HOPE in Somalia. Marine Expeditionary Units from amphibious ready groups were lead forces in these two operations. Additionally, in 1992 and 1993, US naval forces were tasked with domestic disaster relief in Hawaii, Florida and Guam; search and rescue in the Adriatic Sea; continued maritime

interception operations in the Persian Gulf by USN surface combatants; humanitarian relief efforts in Operation PROVIDE COMFORT in Turkey and Iraq; Operation SAFE HARBOR in support of Haitian refugees; and UN blockade operations conducted by surface action groups, amphibious ready groups and maritime patrol aircraft in Haiti in support of Operation SUPPORT DEMOCRACY.⁷¹

... From the Sea to Forward ... From the Sea

By 1994, the number of USN ships had declined from nearly 600 in 1990 to about 400. This reduction in force was not accompanied by a decline in the regions and contingencies that the USN would cover. Naval operations in 1994 continued to enforce the sanctions in Iraq, moderate the instability in the Balkans, extend humanitarian assistance to Somalia in Operation SUSTAIN HOPE, provide humanitarian assistance and evacuation of non-combatants in Rwanda, mount counter-drug operations in the Caribbean, and intervene for the sake of nation-building in Haiti. During Operation UPHOLD DEMOCRACY in Haiti (1994-95) the aircraft carriers USS *Dwight D. Eisenhower* and USS *America* were creatively used as floating special operations bases.⁷²

In late 1993 Secretary of Defense, Les Aspin, completed a bottom-up review with the purpose of defining the strategy, force structure, modernisation programs, industrial base and infrastructure needed to meet new dangers and seize new opportunities. One significant outcome of this review was the frightening scenario of having to fight in two near simultaneous major regional conflicts. The most discussed regions for these potential conflicts were the Korean peninsula and South West Asia. In 1994, during a continuing drawdown of forces, military planners were forced to confront this scenario.

In 1994, events in Korea raised strategically grave questions. Diplomatic discussions had failed to resolve the issue of North Korean possession of nuclear weapons, and the UN Security Council had been discussing sanctions against North Korea. On 8 July 1994, the North Korean leader Kim Il Sung died and the resulting uncertainty about the succession process created additional tension between North and South Korea. In a show of force, two US carrier battlegroups deployed to the waters off Korea to complement the other forward-deployed forces already in the region.⁷³ The goal was simple: keep the peace in the highly volatile peninsula, where a war between North and South Korea would lead to American military participation and the danger of direct confrontation with China.

In late 1994, Iraq again proved especially troublesome by making threats to Kuwait. As a show of force and to create power projection capabilities for any contingency, a carrier battle group was positioned in the Red Sea and an amphibious ready group deployed off the coast of Kuwait during Operation VIGILANT WARRIOR.⁷⁴

Throughout the entire year many of the forward-deployed US naval forces remained focused on Iraq and the Persian Gulf in order to maintain regional stability. As a consequence of the continued naval missions in the Gulf, in July 1995 the US Fifth Fleet was activated.⁷⁵ As the naval component commander for

Commander US Central Command, Fifth Fleet was charged with keeping the choke points open, serving as a primary contingency force for the combatant commander, conducting maritime interception operations and supporting coalition partners through peacetime engagement.⁷⁶

In early 1995, the USMC provided direct support to the UN forces that had been involved in the humanitarian operations in Somalia since 1992. The military objective of the Marines was to provide security to the international forces that were ending their mission and were withdrawing from Somalia.⁷⁷ In Operation UNITED SHIELD, US Marines from the USS *Belleau Wood* and USS *Essex* Amphibious Ready Groups assisted in the withdrawal providing protection for the departing peacekeeping forces.⁷⁸

Increased military exercises by China in the vicinity of Taiwan and the Taiwan Strait prompted the US to deploy naval forces to the region in 1996. The US showed its determination to deter an attempted military seizure of Taiwan “by dispatching an armada that included two carriers, the USS *Independence* and the USS *Nimitz*, in the most significant naval display in the area since the 1950s”.⁷⁹ These operations, with the Seventh Fleet being placed on alert for possible action in the Taiwan Strait against a major power and a formidable foe, was not typical of other US naval operations in the remainder of the 1990s.

From 1996 through 1999, operations continued in many of the same regions with which the USN had become highly familiar through years of post-Cold War operations:

- in the Balkans: presence, operational deterrence, strike, peace enforcement, and combat search and rescue
- in the Persian Gulf and Iraq: enforcement of United Nations sanctions, support of weapons inspections, deterrence against potential aggression from Iraq, support to Kuwait, and strike against Iraqi air defences
- in the Adriatic, Liberia, the Central African Republic and Eritrea: non-combatant evacuation operations
- in Honduras, Turkey, and along the US Atlantic coast: humanitarian assistance and disaster relief
- in East Timor: peacekeeping, and
- in the Caribbean Sea and eastern Pacific Ocean: counter-drug operations.

These operations all focused on the missions of peacetime presence and crisis response through projection of power from sea to land as articulated in *Forward... From the Sea*.

In 1998, US naval forces projected lethal power ashore by conducting cruise missile strikes against terrorist targets in Sudan and Afghanistan in response to US embassy bombings in Kenya and Tanzania. Also in 1998, Operation DESERT FOX was initiated. The mission was to strike targets within Iraq that contributed to Iraq’s program of developing weapons of mass destruction. USN and USMC aircraft operating from *Enterprise*, along with joint and coalition air forces, and Tomahawk cruise missiles from surface ships struck over 75 military targets in two days.⁸⁰

In his review of the very busy year, Secretary of Defense William S. Cohen called notice to the operational manifestations of the strategic principles of ... *From the Sea* and *Forward... From the Sea*. He stated:

*The Navy-Marine Corps Team responded to national tasking, on average, at least once every three weeks during 1998. This is a five-fold increase from that experienced during the Cold War. Navy forces were called upon to demonstrate their multipurpose capabilities in myriad assignments, ranging from combat operations to humanitarian assistance commitments.*⁸¹

The pace did not slacken. Throughout 1999 and 2000, missions of peacekeeping, search and rescue, and humanitarian assistance dominated US naval operations. In August 1999 an amphibious ready group conducted Operation AVID RESPONSE, an extension of humanitarian relief to earthquake victims in Turkey. In the following month, an aircraft carrier provided assistance to victims of Hurricane Floyd on the US Atlantic coast. Across the ocean, Operation ALLIED FORCE in Kosovo involved the *Enterprise* and USS *Theodore Roosevelt* Battlegroups and the USS *Kearsarge* Amphibious Ready Group and its embarked Marine Expeditionary Unit. ALLIED FORCE was conducted to ensure a Yugoslav withdrawal from Kosovo and to assist in the safe return of displaced persons. In October 1999, US naval units were called upon to participate in search and rescue operations off the Atlantic coast following the crash of Egypt Air flight 990 as it took off from John F. Kennedy Airport, New York.

Throughout the 1990s, in response to the disappearance of the Soviet naval threat, the USN had been changing its doctrinal strategic focus, and its worldwide operations reflected this shift of focus. This change from preoccupation with blue water operations and maintaining command of the sea to an emphasis on operating from the seas into and beyond the littorals was validated following the events of 11 September 2001. Immediately following the terrorist attacks on the US, forward-deployed US naval forces responded in a great surge of power. The best succinct summary of the US naval reaction to these attacks appeared in testimony before the Senate Armed Services Committee in March 2002 by the CNO Admiral Vern Clark. He stated:

On 11 September 2001, USS Enterprise was returning from deployment when satellite television provided tragic images of deadly attacks at home half a world away. Within moments, the Enterprise's rudder swept over and, using the forward presence and mobility unique to naval forces, headed for the Arabian Sea. By the next morning, Enterprise was within reach of Afghanistan, ready to launch and sustain precision strikes against dispersed enemies hundreds of miles from the sea.

Enterprise was not alone in taking prompt action. USS *Carl Vinson* steamed at high-speed to join her on station while surface combatants and submarines prepared Tomahawk missiles for long range strikes. USS *Peleliu's* Amphibious Ready Group

cut short a port visit to Australia and sailed toward the Arabian Sea. USS *Kitty Hawk* prepared to leave its homeport in Japan to serve as an innovative special operations support platform.

At home, shipmates saved shipmates in the Pentagon and swiftly re-established command and control. USS *George Washington* and USS *John C. Stennis* took station off the east and west coasts of the US along with more than a dozen cruisers and destroyers, guarding the air and sea approaches to US shores. Shortly thereafter, the hospital ship USNS *Comfort* arrived in New York City, joining the Military Sealift Command Ship USNS *Denebola* in providing food, berthing and medical support to firefighters and recovery workers toiling in the ruins of the World Trade Center.

Less than one month later, on 7 October 2001, Operation ENDURING FREEDOM was launched into Afghanistan to destroy the Taliban Government and defeat Al Qaeda terrorists. During this operation naval forces conducted strike and combat operations against targets far inland. The USS *Peleliu* and USS *Bataan* Amphibious Ready Groups, operating from the Arabian Sea, deployed Marines from their embarked Marine Expeditionary Units more than 450 miles inland to seize an Afghan airfield as a forward operating base. This long range expeditionary seizure of an airfield was historic. US Marines deploying this far inland directly from amphibious ships at sea was unprecedented. It was textbook operational manoeuvre from the sea, but at a range that had not been previously anticipated. At the same time, the carrier USS *Kitty Hawk* served as an afloat forward staging base for joint special operations forces.⁸² This was an unusual configuration for a carrier, but it was not the first time that aircraft carriers had been used for this purpose: in 1994 the carriers *Eisenhower* and *America* had been used as floating special operations bases for operations in Haiti.⁸³

Operation ENDURING FREEDOM was an early 21st century capstone to the strategic reorientation of the USN articulated in ... *From the Sea* and *Forward... From the Sea*. In February 2003 CNO Clark proudly described the Navy's new national role as:

*an agile, connected fleet that enhances deterrence, sustains our access, conducts precision strikes, exercises joint command and control, enhances knowledge superiority, responds to crises, projects, sustains and operates with the joint force ashore, and leverages the priceless advantage of our command of the seas.*⁸⁴

The CNO significantly placed command of the seas last on his list, considering it to be the unquestioned bedrock upon which all of the Navy's missions rested. In the age of Mahan, from the 1890s through the Cold War, gaining command of the seas would have been listed first and the other functions would have received scant attention.

In March 2003, Operation IRAQI FREEDOM (OIF) began. General Tommy Franks, the Commander of US Central Command, laid out the military objectives in a briefing on 22 March on military operations in Iraq. Of primary importance were

the objectives of ending the regime of Saddam Hussein and to identify, isolate and eliminate Iraq's weapons of mass destruction.⁸⁵

Secretary of the Navy, Gordon England, later summarised the naval role in this operation as:

Projecting power and influence from the sea is the enduring and unique contribution of the Navy and Marine Corps to national security. Operation IRAQI FREEDOM demonstrated the strategic agility and operational flexibility that forward deployed naval expeditionary forces provide.

In this summary the civilian head of the Navy took cognisance of the historic shift of the USN's strategic centre from blue water operations to the war against the shore and to the equally monumental emergence of the USMC as the USN's equal in maritime operations. He was re-articulating the strategic concepts laid down in ... *From the Sea* and *Forward ... From the Sea* a decade earlier.

Operation IRAQI FREEDOM was the largest combatant undertaking of the US since the Vietnam War (1964-73). It placed a heavy strain on all US military resources, including the USN and USMC. During the first year of OIF more than 50 per cent of the US naval force was forward deployed proving the ability of the USN to be both a surge and a rotational force.⁸⁶

In 2003, US naval forces continued missions in Operation IRAQI FREEDOM, ensuring that the sea lanes of communication remained open for military and commercial shipping. The accomplishment of this objective ensured the uninterrupted flow of logistics for US and Allied troops on the ground and allowed the commerce required to rebuild Iraq and its economy. Monitoring of shipping and ship protection in key strategic straits continued to be an important mission of the USN. In 2003 alone, coalition maritime navies queried over 6000 vessels, boarded close to 3500 and diverted approximately 430.⁸⁷

The shift of strategy from battles at sea to missions from the sea – which was almost complete when Operation IRAQI FREEDOM began – was not checked or reversed by the major new war, and the naval operations conducted reflected this fundamental conceptual reorientation. “Winning the GWOT [Global War on Terror] is our number one priority”, Secretary of the Navy England stated in testimony before the Senate Armed Services Committee in March 2005. He elaborated “We continue to support the GWOT through naval combat forces that are capable and relevant to the missions assigned”. In 2004 the USN contributed to Operation IRAQI FREEDOM and in the fight in Afghanistan with sea basing, naval aircraft striking targets ashore, and with naval coastal warfare forces providing security for Iraqi oil terminals. In 2004 US naval combatants also conducted over 2200 boardings of merchant ships.⁸⁸

Naval forces continued to fight in Afghanistan and Iraq as well as in other areas of the world where the war on terrorism was being fought. Nonetheless, as the principal forward-deployed elements of the US, the USN and USMC demonstrated that responsive force in military operations other than war – the

so-called MOOTW – still dominated the operating tempo of naval forces at sea. In December 2004 and into 2005, the USS *Abraham Lincoln* Carrier Strike Group and the USS *Bon Homme Richard* Expeditionary Strike Group provided humanitarian assistance to victims of a devastating earthquake and tsunami in Indonesia, Sri Lanka, and Thailand.⁸⁹ In Pakistan, following a major earthquake, US naval forces including units from Expeditionary Strike Group One supported disaster relief efforts.⁹⁰ Much closer to home, along the southern coast of the US, naval assets provided humanitarian assistance and disaster relief for the victims of Hurricane Katrina.

Looking Forward: Operations in the Littorals

As this paper has shown, there has not been a major battle between surface warships since Operation PRAYING MANTIS in 1988. And it could be argued that the conflict on that day in April 1988 was minor when assessing the threat that the Iranian Navy actually posed to the USN. The operations that the USN conducts today are expeditionary in nature in support of Army and USMC forces ashore. This is reflected in “Sea Power 21”. Naval operations such as non-combatant evacuation, humanitarian assistance, disaster relief, arms control, combating terrorism, support to counter-drug operations, enforcement of sanctions/maritime intercept operations, ensuring freedom of navigation, peace operations, protection of shipping, recovery operations, show of force operations, and strikes and raids are all in US joint doctrine as military operations other than war.⁹¹ The USN believes that command of the seas is a prerequisite to the successful conduct of these operations, but since the end of the Cold War it has not had to prepare to fight against a major hostile nation’s navy for that command of the seas. Throughout the 20th century, until the implosion of the Soviet Union in 1991, the preparation for such a Mahanian fight was the USN’s principal purpose and mission.

The historically new orientation of the USN has been acknowledged by the current CNO, Admiral Mullen, in numerous speeches since he was appointed to that position in July 2005. A concrete signal of the USN’s commitment to naval forces operating in the littorals occurred in September 2005 when he approved the establishment of a new expeditionary command.⁹² On 13 January 2006 the Navy Expeditionary Combat Command (NECC) was established in Little Creek, Virginia. This command will form a new river combat force to conduct maritime security operations in the Iraqi waterways, assuming a role currently being performed by the USMC. The command will eventually form three squadrons of 12 boats each, with the first squadron becoming operational in early 2007.⁹³ The NECC will maintain oversight and control of Anti-Terrorism Force Protection and expeditionary-type forces within the USN. In addition to the naval coastal warfare groups, the NECC will oversee units such as bomb-disposal crews, expeditionary logistics specialists and the master-at-arms force and is expected to grow to between 40,000 and 50,000 sailors over the next few years, showing the USN commitment to the changing operational requirements.⁹⁴

This significant shift of focus towards littoral operations was summed up by Admiral Mullen in January 2006 at the 18th Annual Surface Navy Association Symposium. “I believe sea power as a notion has become way too narrowly defined,” Mullen said. “For far too long it’s been centered in my view on one of two things – programs and blue water, building big things and putting them to sea.” Referring to the growing missions in the littorals he continued, “This is not the way we have traditionally thought of sea power, but it is sea power for this new century and we are going to harness it”.⁹⁵

Conclusion

Admiral Mullen’s emphasis on planning and conducting littoral operations constitutes a historic shift in the USN’s emphasis away from fighting for global command of the seas. That mission had been accomplished by the end of the Cold War, but the conversion to a new strategy reflecting new kinds of operations has taken most of the intervening years. That conversion – or transformation – has been the subject of this paper.

PART 3

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Science, Technology
and Support

Technology Revolution and Challenges for the Future Maritime Force Capability Edge

Doraisamy "Nanda" Nandagopal

The US Chief of Naval Operations, Admiral Mike Mullen, has defined sea power as the “power of the sea to share and unite, to defeat and deter, to protect and endure”. Certainly, the role of sea power is multifaceted and an integral part of any operation; more so now given the added range and increased capability of naval systems, and the need for interoperability, both between the Services and with coalition partners.

To achieve “sea power”, Australia requires a naval capacity to operate effectively and in an integrated manner within its own complex, challenging environment. However, to complicate matters further, we are in a period of significant technological advancement, which has a direct and significant impact on the defence domain.

With this in mind, and from my perspective in the defence science community, I ask the question: “What are the science and technology (S&T) implications of sea power given Australia’s challenging maritime environment?” Before focusing on this question, it is useful to look at some of the challenges that will drive S&T.

Strategic Drivers for the Future Maritime Environment

At the strategic level, we can say that defending Australia at home or abroad is a strategy-led enterprise, and our ultimate goal is to achieve the desired end state of reducing the strategic risk to Australia. This requires the Australian Defence Force (ADF) to continue to be required to run a full spectrum of missions, and to operate in a coalition setting to project its military power in and beyond our immediate environment.

Internationally, the strategic outlook remains fluid without a single dominating theme. Issues such as the many stresses to the international relations system, regional tensions, globalisation, the emerging Asian economies, terrorism, demographic shifts, natural resource competition, and environment degradation are all likely to influence, in a significant way, the evolution of geostrategic environment over the next decade or more. Certainly, one could argue that uncertainty is the defining characteristic of this strategic environment, where we are faced with an array of diverse, disparate and diffused emerging threats with the capability to easily access and use technologies in ways we might not have expected or planned. Therefore, it is essential to understand how we can achieve the underlying robustness, adaptiveness and flexibility necessary for capability to operate in such a complex, dynamic and challenging environment.

Operational and Technological Challenges

As a consequence of this dynamic strategic environment, we are faced with particular operational challenges. Future forces are expected to be more expeditionary, networked, precise, persistent in the collection and dissemination of information at a distance, more responsive to opportunities as they arise, use information superiority better, and to apply autonomous and semi-autonomous systems.

Of course, Australia's relative size, our low population density and consequent limitations in terms of personnel and financial resources, means that this will not be easy, given the range of activities for which we must be ready with what is a relatively small navy. On the other hand the ADF, along with defence forces worldwide, faces an increasing number of technologically savvy potential threats.

Furthermore, Australia's regional area of interest, the South East Asian archipelago, is largely a littoral environment. This creates a unique set of challenges for Defence, and particularly the maritime community: the nature of the water itself (clarity, density, flow), its depth (or lack of), and the capacity to transport and land personnel and their equipment.

It poses a significant challenge for the future ADF, and the proliferation of threats and technologies means it may not be enough for us to simply adapt current practices and technologies to stay apace of evolving threats and changing tactics. We need to do better to sharpen the technology edge, so that we can continue to be at the forefront.

These requirements will continue to be the key drivers for the future maritime force structure and defence technology development. However, from the technological viewpoint, the reality is that meeting these requirements will challenge our capacity to effectively integrate technologies into an operational environment. Certainly interoperability, integrating platforms and systems at various levels, and effectively embedding humans within such systems presents some very complex challenges.

Technology challenges also arise from how they might be employed against us. Possible adversaries we face are technologically savvy, and have been shown to be very capable of maintaining low-end technological parity and using these technologies to their advantage. In addition, while we will always maintain a significant advantage at the high-end of technology, many such advanced technologies are expensive to acquire and maintain, and we must reconcile conflicting demands to innovate and exploit such technologies while operating within tightly constrained budgets.

Realising Opportunities Through Technology

Advances in technology are progressing rapidly and continually challenge the way in which society operates. By way of a simple example, if we apply Moore's Law - that computer processing power doubles every 18 months - to the Defence Capability Plan (DCP) time frame, we see a 100-fold increase in processing power over that decade. Developing current and planning future capability in a way that is sufficiently adaptive to this order of change is a critical issue to be addressed.

In the field of information and communication technology, three “laws” that exemplify the technology challenges faced within what is largely an incremental, linear capability development and acquisition process are:

- “Moore’s Law” (computing power doubling every 18 months)
- the “Fibre Law” (communication capacity doubles every 9 months)
- the “Storage Law” (storage capacity doubles every 12 months).

Technological development is, of course, only half the story. Technology uptake is another key component. Indeed, with the rapid growth in technology profusion and dissemination across the globe, relative advantage in technological terms can quickly evaporate. For instance, China and India both ranked within the top five Internet-using countries in 2005, while Indonesia has already surpassed Australia in terms of the number of Internet users. Given market penetration for all these countries is currently quite low, relative to the developed world, any advantages to be gained from these sorts of information and communication technologies may well be better realised by the developing nations.

Identifying, selecting and harnessing these is a major challenge for the Defence Science and Technology Organisation (DSTO). However, understanding customer requirements has allowed us to focus on those technologies we believe have practical utility. For example:

- semi and fully autonomous vehicle systems, such as robotics – DSTO recently created a centre of expertise in this area in conjunction with the Australian Centre for Field Robotics at the University of Sydney
- sensor technologies – provide the capacity to “see” within a complex, cluttered and unpredictable background, using acoustic, thermal and electromagnetic properties and at a range of scales and distance
- miniaturisation – provides the increased capacity to shrink macro-scale systems into functional micro-scale ones. This allows for more efficient, more compact systems, and opens up opportunities not possible with macro-scale systems
- signal processing – provides the ability to capture, analyse and discern important features from cluttered surroundings
- decision support tools – use intelligent and semi-intelligent systems to identify, shape and provide information in a timely and focused manner.

Disruptive Technologies

While the majority of our focus is on those technologies that will impact in the short to medium term, some consideration must also be given to those technologies that have the potential to change the way we live and work virtually overnight. These are called disruptive technologies, because they have a capacity to fundamentally change the environment, shifting the balance from one group to another. Perhaps the most appropriate definition is that disruptive technologies are “unforeseen and dramatic technologies that bring changes in doctrine and rules of engagement”.¹ Certainly from a defence perspective it is the consequences of the employment of these technologies that will be the decisive factor – not necessarily the technology itself.

There appears to be a consensus that a particular set of rapidly maturing scientific domains has the potential to create those disruptive technologies that will emerge in the next decade or two, including:

- nanotechnology – the science of the very small, which can take miniaturisation to unprecedented levels but also create fundamentally new applications, such as self-propagating machines
- biotechnology – is a field that has been around for a while, but advances in DNA testing and increased capacity to manipulate elements at the sub-cellular level provides the capability to fundamentally alter all living things or, indeed, create new ones
- quantum computing – using fundamental properties of nature at the quantum level makes parallel computing at an unprecedented level possible. Certainly one potential application, particularly relevant to defence, is that any functional quantum computer is likely to render encryption techniques obsolete
- alternative power systems – with their ability to power systems large or small in a more efficient manner continues to be a significant driver. This ranges from alternative energy sources to new mechanisms to drive systems.

Achieving Capability Through Integration

While technologies provide many opportunities, the real value is not in individual technologies themselves but in their integration, whether they are emerging or disruptive, or whether that integration occurs at the technical, system, platform and task force level. Certainly, capability is about seamlessly integrating systems (human and otherwise) together. However, previous experience has shown us that when it comes to cutting-edge technology, if this integration is not done holistically and as a fundamental and enduring element of the process, then problems emerge and cost and schedule overruns emerge.

It is essential that this array of complex technical systems operates seamlessly, or we run the risk of these very technologies becoming millstones that can undermine and substantially reduce our warfighting capability. Of course, understanding the systems integration issues surrounding emerging (and disruptive) technologies, whose potential applications are still in the conceptual stage, is not a trivial exercise but an essential one as we are designing capability to be operationally effective well into the next decade.

It is my belief that systems integration has the potential to be the Achilles heel for any future networked force. Without the ability to operate the individual systems and their subsystems as a complete scheme, the very large investments the government is now making in defence capability will not be optimised. For example, it is essential that we seamlessly and fully exploit the individual as well as the technical capabilities of, for example, Airborne Early Warning and Control, Air Warfare Destroyers and Joint Strike Fighter. With the Australian Defence Organisation spending over \$50 billion across the DCP on new, often technically

complex systems, it is essential that integration be considered at the earliest possible stages, and across the DCP, not solely on a project-by-project basis.

We need to be able to assess capabilities and minimise technical risk through a collaborative environment that can evaluate options and risks within and between platforms.

Some Technology and Systems Integration Activities in DSTO

DSTO puts significant effort into technology and systems integration, usually in conjunction with academia and industry, to provide Defence with some unique capabilities. Examples that have taken a technology focus include:

Automation of the Battlespace Strategic Initiative (ABSI) focuses on developing technologies that increase the autonomy, performance, and affordability of uninhabited vehicle systems within the Defence context. ABSI aims to explore concepts for injecting and integrating autonomous and semi-autonomous systems within an operational environment. Recently DSTO, the Royal Australian Navy (RAN) and industry partners participated in a trial in Port Phillip Bay in Melbourne (see figure 1). The primary aim was to realistically demonstrate interoperability between inhabited platforms, uninhabited underwater vehicles and uninhabited aerial vehicles.

The outcomes of the trial were impressive. Uninhabited vehicles gathered intelligence, surveillance and reconnaissance (ISR)/rapid environmental assessment (REA) data from both above and below the surface of the water simultaneously while their location was constantly monitored by the RAN command vessel. When required, the uninhabited underwater vehicle (UUV) surfaced and uploaded information on UUV telemetry, roll, pitch, speed of sound, three-dimensional velocity over ground and buoy locations. The UUV then submerged and undertook a mine countermeasure survey mission. When a significant (i.e. mine-like) contact was identified, the location was recorded onboard the UUV, which then covertly navigated to a designated location and communicated its position to the command vessel. There it surfaced and uploaded its mission log and mine location data.

Rapid Environmental Assessment (REA) – the littoral maritime environment within which Australia is most likely to operate requires timely knowledge of local conditions. While the RAN has articulated specific requirements, such as water depth, wave information, water clarity, survey of key land and sea features, and meteorological conditions, no single package currently exists that can deliver this.

The challenge that DSTO is taking up – in conjunction with the RAN and in collaboration with our allies – is to enable rapid assessment of environmental parameters of military value in a potentially hostile environment. Significantly, any system would need to be easily deployable, low cost, expendable, capable of operating covertly and able to provide information in near real-time. REA technologies fall into three inter-related categories: the platforms to support the deployment of systems and possibly as nodes for transmission of data; sensors to capture and transmit data; and techniques for employing systems, integrating their

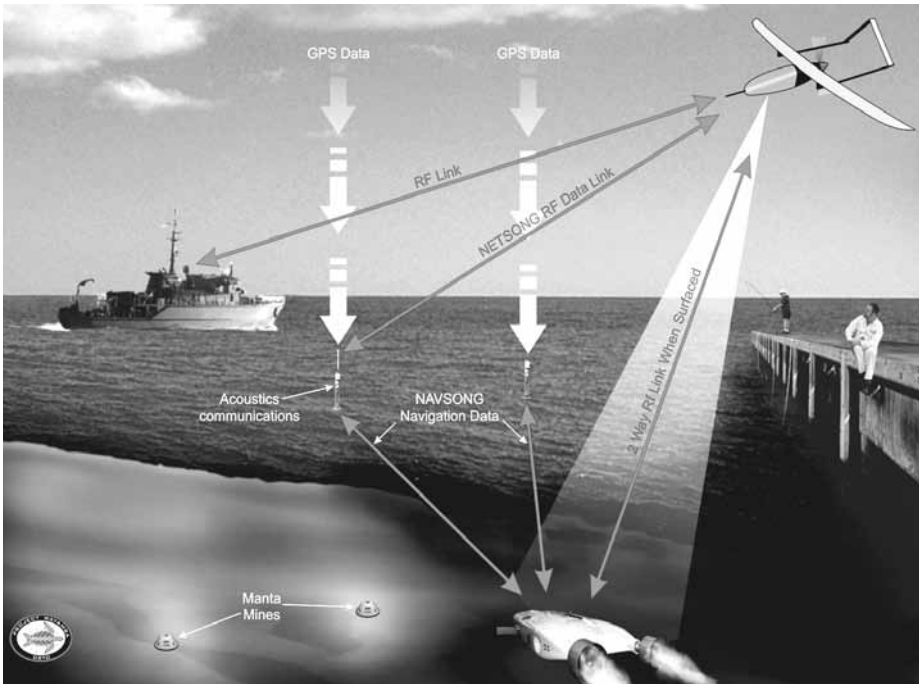


Figure 1: Air-Sea Integration

operation, and synthesising and managing data they capture. DSTO is looking at various aspects of this, including:

- development of expendable sensor packages
- sensor assessment
- deployment on unmanned vehicles
- data extraction from satellite imagery
- near shore wave and surf measurement and prediction
- sediment classification.

REA is an emerging capability requirement and S&T is one of the key enablers. Anti-submarine warfare capability is a critical element that underpins the Amphibious Task Group Concept. In order to deliver this, a number of technologies and capabilities need to be considered and integrated, including torpedo self-defence, long range detection and cueing, and networking of undersea warfare sensors to protect against any submarine threat. Networking undersea warfare sensors also enables lower-risk, “arms-length” undersea surveillance and cued response. It also assists in reducing the number of manned anti-submarine warfare platforms, which in itself is an emerging worldwide trend.

In addition, DSTO has put considerable effort into systems integration at the platform level in areas such as the *Hobart* class Air Warfare Destroyer, the *Anzac* frigate anti-ship missile defence systems, and the *Collins* class submarine combat system. The use of virtual environments, such as battle laboratories like the Maritime Experimentation Laboratory, is central to this.

Conclusion

Capability development will always be a challenging endeavour. Defence faces some significant technology challenges in some of the complexities described, such as length of the acquisition and in-service cycle, the increasing complexity (and hence cost) of military platforms, the rate of technology change and effectively managing the human-system interface.

There are many technologies on the horizon that are likely to have significant implications for the nature of future warfighting and the future shape of maritime capability. Of course, we must ensure that the complex technical systems that combine to make up a warfighting capability are seamlessly integrated, as well as being flexible enough to allow the integration of evolving technologies and being adaptable to meet emerging threats. There is no silver bullet. However, it is my belief that systems integration must be managed throughout the capability lifecycle and across the capability development spectrum.

Therefore, enabling the ADF to maintain a technology edge is the fundamental challenge for DSTO: a challenge that I am confident we – in partnership with the Services, our colleagues in defence industry, our international partners and the academic community – can meet.

Coalition Interoperability: How Much is Enough and How to Quantify It

George Galdorisi and Darren Sutton

Countering global terrorism and providing humanitarian relief for natural disasters is a tall order. It will take many ships and no single nation can do it all.¹

Vice Admiral John Morgan, USN and
Rear Admiral Charles Martoglio, USN

The Importance of Coalition Interoperability

Much has been written and spoken about coalition interoperability, but the quotation above captures the essence of the challenge. Like-minded nations must work together to deal with a host of challenges. Since oceans cover 70 per cent of the globe, much of the focus on accomplishing these missions will be at sea. To ignore the challenge of coalition networking, especially at sea, is to court disaster.

Some think of coalition warfare as something new, an artefact of the 20th century, when nations banded together twice to fight aggression and totalitarianism. But this is decidedly not the case. Coalition warfare goes back over two millennia. The Peloponnesian War pitted a coalition built around Sparta against one built around Athens in a duel for mastery of what was essentially the known world at that time, and much of this coalition warfare occurred at sea.²

The importance of coalition interoperability has recently been addressed by Dr David Alberts, who said that, “In today’s world, it is *inconceivable* that *anything* could be accomplished outside of coalition operations.”³ This theme is well understood within the US Navy (USN) as it increasingly recognises the importance of coalition operations. At a conference in late 2005, US Chief of Naval Operations (CNO), Admiral Michael Mullen, noted: “The essence of the 1000-Ship Navy is how do we marry with our coalition partners on the global commons”, while US Commandant of the Marine Corps, General Michael Hagee, reflected: “The most significant challenge to joint and coalition operations is the ability to communicate and exchange data. We shouldn’t be fixing this on the fly when we cross the line of departure.”⁴

From the perspective of the USN, coalition operations are an increasingly important consideration. Each year, the five numbered fleet commanders in the USN 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. They 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 USN is stretched increasingly thin to carry out its myriad missions.

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 when he noted: “the significant involvement of coalition forces in Operation ENDURING FREEDOM (OEF) – including over 100 ships deployed in Central Asia for an extended period – has re-emphasised the requirement for improved Internet protocol data systems interoperability with allied and coalition forces”.⁵

A snapshot of ships deployed to the US Central Command’s area of responsibility during Operation 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 USN, one indicator of how heavily the US depends on its coalition partners, especially in the maritime domain.⁶ More recently, US Marine Corps (USMC) Lieutenant General Michael Mattis referenced this major coalition operation when he pointedly noted:

*You cannot do anything today without being part of a coalition. In OEF the majority of forces were coalition forces. This is a military consideration, not a political one. Coalition warfare is a reality and a fact.*⁷

Networking Coalitions is an Operational Challenge in Need of a Solution

Clearly, the available evidence suggests that like-minded nations recognise the importance of coalition networking and that naval operators of all nations 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.*⁸

But how important is coalition networking and what is the state of play of this networking today, especially when USN combat formations attempt to communicate and share data with coalition partners and achieve this shared situational awareness?⁹ Some would say that it is not yet where it should be. Writing in the *Naval War College Review*, Paul Mitchell 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.*¹⁰

He did not ask this question off-handedly. For a number of years the Canadian Navy has deployed a surface combatant with USN 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, Dr Mitchell interviewed the commanding officers of seven Canadian ships that deployed with USN CSGs to determine how effectively they were able to communicate with their USN partners. The results indicated that while significant progress has been made, more work needs to be done.

The experience of these Canadian commanding officers, as well as the experience of others working with US naval forces in North Atlantic Treaty Organisation (NATO) exercises or operations, was that the need for speed in network centric operations may result in the exclusion of even close allies. Thus, he notes, while the guiding principle of network centric warfare (NCW) is to increase the speed and efficiency of operations, coalitions are rarely concerned about combat efficiency. Rather, they are always about scarcity in terms of operational resources, 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 without enlightened efforts by all governments concerned.¹¹

At a 2002 symposium, he 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 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.*¹²

The situation Dr Mitchell describes represents the reality of current coalition operations at sea and indicates that there is important work yet to be done. In a capstone publication of the Department of Defense Office of Force Transformation, Vice Admiral Arthur Cebrowski said:

*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.*¹³

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 lies in the relative success that navies have had networking at sea. Even in the days of signal flags, ships at sea found a way to communicate to some degree. As technology advanced from flashing lights, to radio Morse code, to tactical radio voice circuits, to the initial tactical data links, 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.

Work is underway to quantify the degree of benefit delivered by effective coalition networking. These efforts have not received much visibility outside the communities working the issue, but work is underway in a number of venues, primarily among five English-speaking nations: Australia, Canada, New Zealand, the UK and the US. While a full description of the work of these groups is beyond the scope of this paper, a listing of these groups is provided below, and the link to *The Beginners Guide to the Technical Cooperation Program* provides further links that explains the purpose and construct of each of these organisations in more detail:¹⁴

- ASIC – Air and Space Interoperability Council (Australia, Canada, NZ, UK, US) focused on aerospace interoperability
- ABCA – American, British, Canadian and Australian armies (Australia, Canada, UK, US) focused on army interoperability
- AUSCANNZUKUS – (Australia, Canada, NZ, UK, US) focused on naval command, control, communications and computers
- CCEB – Combined Communications Electronics Board (Australia, Canada, NZ, UK, US) focused on military command, control and communications
- MIC – Multinational Interoperability Council (Australia, Canada, NZ, UK, US) focused on military interoperability
- MIP – Multilateral Interoperability Program (Australia, Canada, UK, US) focused on command, control interoperability
- TTCP – The Technical Cooperation Program (Australia, Canada, NZ, UK, US) focused on military science and technology.

Much of the work of these groups deals with near-term solutions to emergent operational interoperability issues, and many of the groups are populated by uniformed professionals from all of the nations involved. However, there is one group that is chartered to look for longer term solutions to interoperability among the military forces of Australia, Canada, NZ, the UK and the US, and one that is populated by scientists and engineers with an understanding of the science and technology issues that need to be addressed in order to achieve the desired level of interoperability. That organisation is The Technical Cooperation Program. The remainder of this paper will illuminate these TTCP 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 existed in various forms for almost 50 years, TTCP is not well known, and some background is in order to explain how this program facilitates the current efforts to address coalition interoperability.

TTCP is a forum for defence science and technology (S&T) collaboration between Australia, Canada, NZ, the UK and the US. It is probably the largest collaborative defence science and technology activity in the world. The statistics alone give some indication of the scope of this effort involving 5 nations, 11 technology and systems groups formed, 80 technical panels and action groups, 170 organisations, and 1200 scientists and engineers directly accessed. By any measure, TTCP is a broad based effort that facilitates S&T cooperation among the five member nations.

The aim of TTCP is to foster cooperation within the S&T areas needed for conventional, that is, non-atomic national defence. The purpose is to enhance national defence and reduce costs. To do this, TTCP provides a formal framework that scientists and technologists can use to share information among one another in a quick and easy fashion.

Collaboration within TTCP provides a means of acquainting the participating nations with each other's defence research and development (R&D) programs so that each national program may be adjusted and planned in cognisance of the efforts of the other nations. This process avoids unnecessary duplication among the national programs, promotes concerted action and joint research to identify and close important gaps in the collective technology base, and provides nations with the best technical information available.

TTCP has its centre of gravity in the applied research domain, but it also encompasses basic research and technology development activities. The scope includes the exploration of alternative concepts prior to development of specific weapon systems, collaborative research, sharing of data, equipment, material and facilities, joint trials and exercises, and advanced technology demonstrations. Cooperation within TTCP often acts as the catalyst for project-specific collaborations further down the equipment acquisition path.

TTCP consists of three levels and thus has a streamlined hierarchy that promotes five-nation cooperation. Level 1 is the strategic policy level and comprises three groups of personnel: the Principals, the Deputies and the Secretariat.

Level 2 is the program planning and oversight level and currently contains 11 groups, each focused on a particular technology or systems area: 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.

Level 3 contains bodies that sit under each group and actually perform the collaborative activities. There are three types: 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. Technical panels and action groups have a chair, plus national leaders for each participating nation and a varying number of team members. Not all nations participate in all technical panels or action groups.

TTCP operates by sharing the output from existing national S&T programs for the greater benefit of the participating nations. It is therefore fundamentally a bottom-up organisation, with collaborations occurring only where national programs and a willingness to cooperate already exist.¹⁵

Today, TTCP operates under an updated Declaration of Common Purpose that informs the efforts of the organisation's technical panels and action groups. This declaration states:

No member nation possesses the total resources to provide for its own defence research and development (R&D) needs. Each must assist the others by sharing resources and tasks in many fields so that all can find progress and security. The aim of TTCP then is to foster such cooperation in the science and technology (S&T) needed for conventional national defence. The purpose is to enhance national defence at reduced cost.

With this description of TTCP 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) Network Centric Maritime Warfare Study and Action Group 6 (AG-6) FORCENet Implications for Coalitions. This paper reports on the past four-plus years of activities and the way ahead for the ongoing research of this group.

AG-1/AG-6 Work as a Model for International Defence Cooperation

ACTION GROUP 1 (AG-1) NET-CENTRIC MARITIME WARFARE STUDY (COMPLETED)

Much has been written, primarily from a qualitative perspective, about the perceived benefits to the military of transforming from a platform to a network centric force structure.¹⁶ However, few such studies have taken an analytic view and produced quantitative results, and fewer still have done so in the context of broadly based coalition operations.¹⁷ In response to a mutually perceived need, the five allied countries of TTCP Maritime Systems Group established an Action Group One (AG-1) in 2001 to conduct a three-year (October 2001 to September 2004) Network Centric Maritime Warfare (NCMW) collaborative study. The objectives of this study were to provide TTCP MAR Group, as well as national military customers, with guidance and analysis on the implications of NCMW for coalition maritime force capabilities, C4I interoperability, and to help shape national acquisition strategies.

The Terms of Reference (TOR) for AG-1 charged the group to examine and help establish the foundational first principles of force netting from a coalition and distributed systems perspective, and to research the analysis methods needed to quantify the benefits of netting in coalition operations. Armed with the TOR, as part of its study definition, AG-1 members consulted with national and international military staffs to determine a priority list of issues to address. Ultimately, the group decided to analyse and quantify the military utility of selected parametric levels of network centric capabilities by addressing tactical information exchange, in rigorous analytical detail, for three selected tactical situations associated with coalition maritime littoral warfare: Maritime Interception Operations (MIO), Anti-Submarine Warfare (ASW), and Anti-Surface Warfare/Swarm Attack (ASuW-Swarm).

AG-1 first met in October 2001 to review and understand the TOR and to map out a methodology to address the MAR guidance. The group decided that to address the issue of NCMW properly, two studies were needed: Study A, a broadly based higher level study addressing overarching NCMW analytical issues and first principles of force networking from a coalition and distributed systems perspective; and Study B, an in-depth focus on the three tactical situations noted above that, together, represented a spectrum of different types of coalition-force maritime tactical situations of high interest to the TTCP nations.

Armed with an agreement regarding the studies to be conducted and in possession of a number of analytic techniques that might be appropriate to apply to both Study A and Study B, MAR AG-1 set about addressing the MAR direction expressed in the TOR and conducted the two major studies in parallel. Within Study B, MIO, ASW and ASuW were addressed in that order.

The results of Study A were significant and important to the overall conduct of NCMW and stemmed from the hypothesis that NCW is the core concept for enabling a new revolution in military affairs for the information age. This concept postulated that greatly increased combat power derives from the ability of highly connected system of entities, widely distributed throughout the battlespace dimensions of space, time, force, information and cognition, to rapidly concentrate influences to deliver decisive effects on an enemy while minimising the exposure of friendly entities.

Study A was also based on the proposition that the complexity of the netted force will demand a co-evolution of systems, technology and doctrine. It also notes that while force experimentation has been adopted as a co-evolution mechanism, it is not feasible to explore the requisite paths by experimentation because attempts to do so yield heuristics that create a risk of misunderstanding the gap between experiment-observed and battlespace-realised capability. Study A showed that appropriate analytical methods need to be applied to adequately explore the problem space in a timely, tractable and affordable manner. Further, it showed that these may be based on systems engineering techniques, but the conceptual description of distributed networked systems and their behaviour requires further development before systems engineering principles can be applied.

Study A mapped the broad parameters and issues that are addressed in quantitative modelling of NCW. It also showed that conceptualising NCW requires paying much more attention than heretofore to the information and cognitive domains of warfighting – domains that have always been important – but have not had much analytical attention to date. Study A further noted that models of NCW must include representations of information, the manner in which it arises from data generated in the physical domain and its flow around the information domain.¹⁸

With Study A providing the broad, overarching underpinnings of the work of AG-1, the remainder of this section of this paper will discuss the three tactical situations (TACSITs) agreed upon by the TTCP principals. These TACSITs were each carefully designed to strike a balance to enable them to be generic enough to be of general relevance but also specific enough to support and inform each nation's requirements-generation process and acquisition programs. This careful sculpting and dimensioning of each TACSIT was a key factor that enhanced Study B's utility to each nation in particular and to the analytical community in general.

A. MARITIME INTERCEPTION OPERATIONS TACSIT

The first tactical situation examined was MIO. This represented a tactical scenario familiar to all the member nations, and one that all believed they would be involved with in the future. Additionally, the member nations recognised that the results of this study would also be important to each nation in the Global War on Terrorism (GWOT) since the operational experience of all navies was increasingly focused on an a particular aspect of MIO, Leadership Interception Operations (LIO). Thus, MIO provided an excellent first study for the participants.¹⁹

From AG-1's initial investigations a number of hypotheses about tactical NCMW applications were developed to address a variety of tactical level warfighting scenarios. The hypothesis for MIO was:

In coalition force MIO operations, network enabled collaborative planning/re-planning increases the probability of intercepting a contraband vessel.

The associated null hypothesis is that network enabled collaborative planning/re-planning does not increase the probability of intercepting contraband vessels.

MIO operations can form a large part of both peacetime and wartime naval operations, particularly for mid-size and smaller combatants. Since MIO-type operations are so broadly applicable, they provided a good initial area for the study of NCMW effects. In addition, MIO operations are more critically dependent on information and command and control (C2) than on specific weapon systems, which simplify the problem space and analysis.

MIO operations consist of a set of naval forces trying to find and apprehend (possibly deter) targets of interest (TOI) carrying contraband (goods or people). The TOI may be mixed in with legitimate vessels. Typically, the TOI must be identified and apprehended in some specific area so that it cannot pass through that zone and evade the blockade. The required criteria for apprehending vessels can vary, but typically

determining whether the criteria are met requires close examination by the interdicting force. These identification processes may require several levels of examination by different units, and may be applied to all vessels or just a sample of them. The task of the TOI is to escape the interdicting force through manoeuvre or deceit.

In MIO, the vessels of interest (or targets) may be regarded as waiting in a queue to be served (or queried, and perhaps inspected and boarded) by warships on patrol. This service also takes time. No two operations are identical, but they are characterised by a sequence of actions starting with a query into the vessel's intent, often followed by a search for contraband by a boarding party, and end in a decision to either apprehend the vessel or allow it to continue.

Collaborative planning and re-planning assumes that dispersed individual commanders, subject to a general commander's intent, can make use of networked communications to develop plans in collaboration as if they were a collocated command. Thus, an MIO force would develop and coordinate their initial plans over the network. The commanders can then make joint decisions on changes to an existing plan as circumstances change. The difference between planning and re-planning is really only one of timing, since few plans exist in a vacuum. Planning, however, is often thought of as an operational level task performed by dedicated command staff, while re-planning in this context is a tactical task.

In both cases, the NCMW application involves doing the normal command staff jobs (for tactical or real-time planning) in a distributed fashion. Thus, while units are dispersed and in the midst of operations, their views and inputs can be obtained in planning or adjusting the operations to adapt to unforeseen circumstances. In a coalition operation, there is a further benefit that all nations and their particular requirements can be included in the plans. Coalition operations are fraught with possibilities for misunderstanding, and require that significant effort be put into maintaining relations between the partners. Collaborative planning may provide an additional channel for these efforts, hence the reason for the AG-1 hypothesis.

The expected outputs and results of the use of collaborative planning and re-planning are:

- Improved synchronisation between units as unit commanders understand their partners' parts in the plan and their concerns about the plan
- Increased flexibility in operations because the overall force is able to respond in an adaptive manner to new circumstances
- Improved use and understanding of sensor and intelligence data
- Better matching of force to threat as units can redeploy to match a threat
- "Deconflicted" battlespace with fewer problems of waterspace or airspace management as everyone participates in the re-planning
- Decreased HQ workload as virtual command teams can be formed outside the operational level command
- Increased ownership of plans by all units or nations involved as everyone has been involved in the plan development
- Increased speed and quality of command.

The focus of this effort was to investigate the usefulness of applying a queuing model to MIO within the context of the NCMW concept of tactical collaborative planning. Both analytical and simulation-based queuing models were examined, and the theoretical model was applied parametrically to two MIO scenarios.

Using the steady-state probability of target vessel interception (or service) as the primary measure of effectiveness, AG-1 was able to demonstrate the usefulness of queuing theory to relate NCMW application measures to force effectiveness. In addition, the queuing models provided valuable insight into the aspects of the MIO task where NCMW concepts might be applied. Thus, the group demonstrated that queuing theory is directly applicable to the second stage of analysis for operations that can be viewed as a demand for service, and provides direction in the process of refining NCMW concepts into testable applications. The parametric results obtained provided general bounds on expected improvements in effectiveness; specific results, however, will depend upon the particular NCMW applications and how they are used.

The analysis by AG-1 demonstrated that queuing theory provides a good model for a class of maritime operations that are expected to benefit from NCMW concepts and applications. Specifically, those operations characterised by a demand for (or avoidance of) service can often be adequately modelled and analysed by applying queuing theory. This fills one of the necessary stages in a quantitative analysis of NCMW concepts – that of linking application measures of performance (MOPs) to force measures of effectiveness (MOEs).

The examination of engagement level models and the variation of MOE with the parametric study of input MOPs is an important part of the process of refining NCMW concepts to the point where they can be tested. The two applications of the NCMW concept of network-based collaborative planning and re-planning that were analysed by AG-1 using a queuing model, highlight the capabilities and shortfalls of the methodology. For aggregate steady-state systems, queuing theory provides a rich source of insight. The analyst must keep in mind, however, that, in reality, service time and service accuracy often are not stationary processes and interesting phenomena will occur outside steady-state situations.

The quantitative results obtained from running the MIO queuing models supported the group's hypothesis that in coalition-force MIO operations, network enabled collaboration planning/re-planning could significantly improve the probability of intercepting a contraband vessel in many cases. For example, in a scenario with an overall arrival rate of 25 targets per day, there is a 20 per cent improvement in interception probability simply by providing some mutual coordination within the force, and a 50 per cent increase in capability through dynamic, collaborative re-planning of the force response.²⁰

These results confirmed these authors' anecdotal experience from interaction with operators who have participated in MIO operations in the Arabian Gulf, and thus this study of coalition MIO operations provides general evidence to support the continued development of collaborative planning and re-planning

applications. Given that the former Commander in Chief, US Pacific Fleet noted that MIO is another maritime centric effort in our contribution to the GWOT and forms perhaps our greatest growth opportunity in our fight against global terrorism, the MIO modelling work conducted by AG-1 should inform coalition partner navies of the substantial benefits of networked operations.²¹

B. ANTI-SUBMARINE WARFARE TACSIT

The second tactical situation examined was anti-submarine warfare (ASW). Like MIO, it too represented a tactical scenario familiar to all the member nations and one that all believed they would be involved with in the future.²²

With significant experience in ASW analysis, AG-1 was able to define the operational and tactical issues at hand and approached the complex issues involved in ASW from a multinational and multilateral perspective with a sound understanding of the challenges and opportunities associated with ASW operations in a coalition environment. The AG-1 team members were armed with literally decades of collective experience in ASW operations gleaned from coalition ASW exercises in various venues, including NATO and the US Pacific Command's Rim of the Pacific (RIMPAC) exercises. Several of the AG-1 participants were members of the science and engineering staff at the Naval Undersea Warfare Center Division, where they had carefully analysed ASW exercises as part of their ongoing work.

With a far greater background and experience in ASW analysis than with MIO, AG-1 was able to quickly refine the options for this TTCP study and define the way ahead for the study. The group decided to analyse two hypotheses:

In coalition force ASW, network enabled shared situational awareness (SSA) can reduce false contact loading, by means of data correlation and fusion of the information obtained and provided by individual search elements, and thereby improves search effectiveness.

Sensor operators in a collaborative information environment (CIE) can reach back to ASW experts to improve classification performance against both target and non-target contacts.

AG-1 used two queuing models that incorporate reneging (leaving a queue after entry) and balking (inability to enter a queue) to execute the computations needed to quantitatively analyse these hypotheses.

The rationale for picking these two hypotheses was a desire to move beyond the strong results of the MIO TACSIT and to deal with actions the coalition force might take once it was robustly networked. Thus, while the study did not wave away the issue of robustly linked, networked operations, it attempted to take the analysis to the next level and examine what specific actions would most benefit the force if they were, in fact, robustly networked. After much deliberation, it was determined that shared situational awareness (SSA) and a collaborative information environment (CIE) were two major expected benefits of networking the maritime force. Thus, the ability to support SSA and CIE provided the optimum measures of effectiveness for

this analysis. Some of these benefits were expected to be important in improving the effectiveness of networked coalition ASW and thus were the focus of this study.

Situational awareness means, in essence, knowing what is going on within a volume of space and time. Then, SSA means that two or more individuals understand a situation in the same way.²³ In this study AG-1 examined the possibility of using network enabled SSA to reduce false contact loading in ASW to increase ASW effectiveness.

A CIE is the aggregation of infrastructure, capabilities, people, procedures and information to create and share the data, information and knowledge that enables collaboration among a selected group of individuals or organisations.²³ In this study, AG-1 examined the possibility of using a CIE to connect individual forward-deployed ASW sensor operators with an ASW expert, such as an ashore acoustic intelligence (ACINT) expert, in order to augment operator expertise, enhance operator performance, and mitigate the relatively poor target versus non-target classification performance of some afloat sonar operators.

The AG-1 team found that the aspects of SSA and CIE as just described, could be analysed using queuing theory. The team did not suggest that queuing theory was the only effective methodology for examining SSA and CIE, but rather that for the purposes of this study, queuing theory provided an effective methodology. The group validated the MIO experience that any demand-for-service system, or any system with a waiting line for service that can experience congestion, can be analysed using queuing theory.

The two queuing model tools, called QDET and QSIM were used to conduct quantitative parametric analyses of the SSA and CIE ASW concepts.²⁴ A number of general conclusions were drawn from the analysis that provided evidence of the value of networking ASW forces, and also provided some indication of where network centric applications might be focused.

The SSA and CIE ASW concepts were conceived, in part, through extensive discussion with others in the USN ASW community, particularly with representatives of the Naval Warfare Development Command and the Program Executive Office – Integrated Warfare Systems. The latter is developing, among other things, a common undersea picture capability for US and coalition ASW forces.

The Shared Situational Awareness Analysis

SSA means that two or more individuals understand a particular circumstance in the same way. First and foremost, connectivity between distributed systems is needed to achieve this. AG-1 examined the possibility of using network enabled SSA to reduce false contact loading in ASW, and thereby increase ASW effectiveness. The hypothesis was:

In coalition force ASW, network enabled SSA can reduce false contact loading by means of data correlation and fusion of the information obtained and provided by individual search elements, and thereby improve search effectiveness.

Submarines, particularly diesel submarines operating on battery in a complex littoral environment, are difficult to detect, in part because both their passive and active signatures are low. In addition, if contact is gained, it is often held only intermittently. Further compounding the ASW problem is the fact that littoral regions of interest generally contain many false contacts. Thus, false contacts can substantially interfere with the detection of the TOI. More powerful sensors can exacerbate the false contact problem because the number of contacts detected increases approximately as the square of detection range.

There are several costs associated with reacting to false contacts:

- reactive forces may be diverted or employed unnecessarily
- fuel, sonobuoys and weapons may be expended unnecessarily
- reactive forces may not be available when needed
- prosecution of real TOI may be delayed or missed.

These adverse events are often observed in real-world exercises. One might ask: to what extent can network enabled SSA mitigate some of these problems? In order to explore the false contact problem and test the above SSA hypothesis, an ASW TACSIT was developed. In the case with limited SSA, a Blue forward barrier submarine detects and misclassifies a surface vessel as a TOI and diverts from its planned search track to investigate. This diversion can cause detection of the TOI to be delayed or missed entirely.

In the case with network enabled SSA, it is assumed that an air platform can provide surveillance of the region of interest and transmit an accurate surface picture to an assumed Contact Refinement Node (CRN). It is also assumed that the Blue submarine also transmits information about the suspected TOI to the CRN. The network allows the CRN to be forward or on land. The task of the CRN is to assist with or conduct data alignment, correlation, localisation, and target motion analysis, and classification across sensor contacts and tracks. The CRN shares this information in near real-time with all Blue ASW forces, including the submarine. The result of these activities is that the Blue submarine stays on its intended search track and does not become diverted by the non-TOI, as is the case without network enabled SSA.

In the model selected, AG-1 needed a realistic estimate of the number of TOIs and non-TOIs that would produce sensor contacts. This number can be considerably larger than the actual number of objects. For given sensor and contact properties and dynamics, we can then calculate the arrival rate of contacts (customers) to the sensors. The arrival rate (AR) is thus comprised of the sum of TOI and non-TOI arrival rates.

Some of the TOIs and non-TOIs are detected by sonar and must be classified. Most of the arrivals are classified easily and are quickly identified as being non-TOIs. A portion of the arrivals may be difficult and time consuming to classify as a non-TOI, however, due to the overlap with selected submarine attributes. As a result, detection and classification queues can form in highly cluttered regions.

Balking and reneging add to the complexities. Contacts pass into and out of sensor coverage or have some finite lifetime that is often exponentially distributed.

If such a loss happens within a queue or within service, then the contact is said to have reneged. If it occurs before entry to the detection and classification processing queues, then the contact is said to have balked.

All of these factors are incorporated in AG-1's multi-contact queuing model. The primary output needed is the probability that an arbitrary contact is acquired and completes detection and classification processing. The probabilities of calling a target a target (a hit or correct classification) and calling a non-target a target (a false alarm or incorrect classification), were then multipliers to the probability of acquisition.

AG-1 analysis of the ASW TACSIT showed that the probability of acquiring a target was a function of contact arrival rate (AR). In the model run, contact AR for the combination of TOI and non-TOI varied from zero to 10 contacts per hour. In this model, mean time to renege (hold contact) was assumed to be 15 minutes. Curves were produced for mean service times of 15, 30, 60 and 120 minutes, providing a parametric sweep of time to classify a contact by whatever process.

For the SSA ASW TACSIT, this led to the result that as contact AR increases the probability of acquisition decreases. This occurs because as the AR increases, balking and reneging increase. As the queue size grows, some of the possible contacts balk because they cannot enter the queue, and some of the contacts in the queue renege because they take too long to be serviced.

One effect of SSA is to decrease the AR of non-TOI to the classification system. There are a number of possible ways this can occur within SSA, for example, by surveillance of a portion of the non-TOI field, as previously described. It can also occur with sophisticated tactical decision aids (TDAs) that can correlate some sensor contacts with non-TOI objects or phenomena (such as reverberation prediction with active sonar).

Thus, the AG-1 modelling showed that the decrease in the AR of non-TOI does result in a higher probability of acquisition against the TOI. This effect of improved SSA, yielding a higher probability of acquisition can be parametrically analysed. This exemplifies the value-added of SSA on reducing contact AR, and in turn, increasing ASW effectiveness.

The principal findings of this study of SSA on false contact loading in ASW:

- queuing theory can provide a framework for the analysis of the SSA ASW concept, because SSA is a demand for service process
- improving classification performance against both benign contacts and targets of interest can increase ASW effectiveness. In effect, this reduces the arrival rate of benign contacts, thereby increasing the probability of acquiring targets of interest
- an accurate surface picture, shared among the ASW units, could improve ASW effectiveness. Networking the force for information transfer is a key enabler of this aspect of SSA. Real-time connectivity is needed
- an alternative method for increasing ASW effectiveness is to employ more ASW units; that is, increase the number of servers

- the queuing theory framework can be used to analyse the trade-off in benefits between shared information and force size, that is, “bits” versus “bangs”.

In this section, we examined the possibility of using network enabled SSA to reduce false contact loading in ASW to increase ASW effectiveness. The AG-1 hypothesis was:

In coalition force ASW, network enabled SSA can reduce false contact loading by means of data correlation and fusion of the information obtained and provided by individual search elements and thereby improves search effectiveness.

AG-1’s findings provide quantitative evidence that supports this hypothesis.²⁵

The Collaborative Information Environment Analysis

A CIE was defined above as the aggregation of infrastructure, capabilities, people, procedures and information to create and share the data, information and knowledge that enables collaboration among a selected group of individuals or organisations.²⁶

AG-1 examined the possibility of using a CIE to connect individual forward-deployed ASW sensor operators with an ASW expert, such as an ashore ACINT expert, in order to mitigate the relatively poor target versus non-target classification performance of some sonar operators. The team also examined the possibility of using network enabled CIE to improve the overall ASW classification performance and effectiveness of forward-deployed force elements. The hypothesis was:

Sensor operators who did not have the requisite expertise to succeed at this target classification challenge in a CIE can reach back to ASW experts to improve classification performance against both target and non-target contacts.

Once sensor contact is made on an object or phenomenon, the detection and classification problem is, in essence, an analysis and decision-making problem. There are many determinants of decision-making behaviour, including: problem complexity, time available, number/quality of alternatives, perceived risks, information presentation rate, individual differences in cognitive and decision styles, and level of expertise.

A small percentage of sonar operators have great expertise and are considered experts at what they do, for example, ACINT riders on ASW platforms. Therefore, it might be possible to use the network, with additional infrastructure, to link sensors, operators, experts (not collocated with forward operators), and TDAs to improve ASW performance. This concept is an extension of the reach back cell (RBC) concept. The RBC normally provides:

- environmental assessment
- sensor performance predictions
- red-cell wargaming
- initial ASW battlespace assessment
- initial plans, including unit stationing, tactics and sensor employment
- submarine contact database management

- submarine contact information fusion
- ongoing analyses and assessments of mission execution
- can provide sensor/threat experts to advise forward operators.

With robustly networked coalition forces, forward sensor operators *can* be linked to an ASW expert. In fact, multiple operators are forward and linked by means of a connectivity infrastructure to an expert threat analyst and sensor operator. The operators and expert can be considered as being embedded in a CIE. The expert would usually respond to requests for assistance by the operators. Due to the nature of ASW, including the problem that holding time may be short; the CIE requires synchronous tools to allow collaboration between simultaneously engaged participants. In addition, the expert will need to be aware of the ASW context and history experienced by each operator. This amount of information can be used to define the network architecture and the characteristics of network infrastructure.

Utilising some of the same parameters of the SSA case above, AG-1 determined quantitatively that the probability of acquisition of a contact was enhanced when the forward-deployed sonar operators were able to operate in a CIE. The group found that, as might be expected, from the larger number of variables in the equation (expertise of the individual sonar operators, expertise of the ACINT expert, type of target submarine, type of shipboard and/or aircraft equipment, etc.) definitive numerical results were not as readily available as in the SSA case. Nevertheless, the available evidence and the analysis showed a strong correlation between the degree of CIE established and ASW success suggesting that more detailed analysis in this area.

The principal findings of this study of CIE on ASW effectiveness are as follows:

- queuing theory can provide a framework for the analysis of the value of the operator-expert CIE because this collaboration is a demand for service process
- networking the force can enable a CIE that, through improved classification performance, might increase ASW effectiveness
- synchronous collaborative tools are needed to enable this collaboration
- expert workload may need to be controlled to avoid missing requests for assistance.

In this work, AG-1 examined the possibility of using network enabled CIE to support operator-expert collaboration in order to improve ASW classification performance and effectiveness. The hypothesis was:

Sensor operators in a CIE can reach back to ASW experts to improve classification performance against both target and non-target contacts. The findings provide evidence that supports this hypothesis.

Summary of the ASW Analysis

In this study, AG-1 showed, through the analysis of two ASW TACSITs, that network centric concepts can enable SSA and a CIE. Both SSA and operator-expert

collaboration in a CIE were shown to improve ASW performance and effectiveness. Specific warfighting findings included:

- ASW effectiveness can be increased by improving classification performance against both benign contacts and targets of interest. In effect, this reduces the arrival rate of benign contacts, which thereby increases the probability of acquiring targets of interest
- an accurate surface picture, shared among the ASW units, could improve ASW effectiveness. Networking the force for information transfer is a key enabler of this aspect of SSA. Real-time connectivity is needed
- networking the force can enable a CIE that, through the increase of classification performance, might increase ASW effectiveness. Synchronous collaborative tools are needed to enable this collaboration.

The results from this analytic effort indicated that selected NCMW ASW concepts, if implemented, should have positive effects on ASW effectiveness. For example, NCMW applications that decrease the mean time to service contacts, in general, improve effectiveness. Furthermore, applications that decrease the arrival rate of unwanted contacts can improve the detection and classification of ASW targets of interest.

C. ANTI-SURFACE WARFARE/SWARM

The third and final TACSIT examined was that of anti-surface warfare (ASuW) operations, specifically that of “Swarm” attack against coalition naval units. In many ways, this TACSIT represented the most interesting (and challenging) case studied by AG-1 for a number of reasons. First, for the MIO and ASW cases, the coalition force would be primarily on the offensive in either ships with contraband or hunting enemy submarines (although there clearly is a strong defensive component to many ASW operations), while in the Swarm case, the coalition naval force would definitely be on the defensive. Second, in the MIO and ASW cases, there was typically a slow-moving tactical problem, while in the Swarm case, the tactical situation was one that moved rapidly. Finally, this Swarm case was one that lent itself to the use of a completely different model than those used in the MIO and ASW TACSITS, thus ploughing new ground for analysis.

The results of this study reported in this paper were extracted primarily from the report of the ASuW/Swarm TACSIT Group at the 10th International Command and Control Research and Technology Symposium.²⁸ Because this warfare area is relatively new, some additional background explanation of the nature of the challenge is in order.

In the ASuW problem in general and Swarm attacks in particular, battlespace control near land is essential to ensure prompt access and freedom of manoeuvre for coalition forces moving from the sea to objectives in the near shore area. As coalition naval forces operate in littoral areas, potential adversaries respond with innovative, often asymmetric approaches to coastal naval warfare. A number of coastal nations – several of which border strategically important waterways – are

exploiting small boat warfare and integrated coastal defences to blunt, neutralise or defeat larger navies operating in the near shore area.

The tactic that appears to have the most traction with these nations is that of swarming attacks by large numbers of fast inshore attack craft (FIAC). There is no simple definition for these craft – they can be as small as recreational vehicles such as jet skis or as large as naval or coastal fast-patrol boats. Also swarming attacks can come from multiple axes and use various attack formations. The navies of coalition nations have conducted numerous studies and analyses in an attempt to come to grips with the threat of swarming small boat attacks. In one study for the USN, an industry team found that different types of threat platforms had different effective weapons ranges. The study grouped these into two general categories; small threat platforms (cigarette boats, Boghammars and others) with a maximum effective weapon range from 0.1 to 0.5 nautical miles and larger naval vessels, such as advanced patrol boats carrying short range guided missiles.

While a number of studies did not discount swarming attacks by larger vessels, such as advanced patrol boats, the studies focused heavily on swarming attacks by very small craft as the predominant scenario likely to be faced by coalition navies operating in littoral waters. The consensus of a number of studies and the opinions of serving naval officers appear to converge and focus on a primary massed, small boat threat consisting of 10 to 20 high-speed manoeuvring boats attacking over a 20 to 60 degree azimuth sector. The boats have a simultaneous arrival time with closing speeds of up to 35 knots. Their manoeuvre is typically in a sinusoidal path. The small boats are considered to be commercial types with no obvious distinguishing feature to support easy classification. Identification of the attack results from the characteristic behaviour of a large number of high-speed inbound boats.

The threat of swarming small boats is not a new one. For a number of years, work in naval laboratories focused on the small, fast, manoeuvrable boats as primary threat elements. The operational experience of serving naval officers in AUSCANNZUKUS nations indicated that naval forces must be capable of engaging small coastal naval combatants such as patrol boats and guided-missile corvettes or other smaller boats. Several reports noted that boats could be operated in an unpredictable manner and under unexpected conditions. These reports concluded that these craft may appear as part of the normal friendly or neutral traffic in the area, making them all the more difficult to counter. In addition, industry reports provide numerous examples of observed and reported naval exercises by rogue nations that demonstrate their willingness and ability to surreptitiously get inside the effective maximum range of the surface weapon systems of a larger naval force.

The nature and the magnitude of this threat have riveted the attention of coalition navies who recognise, in general, that a coordinated response from networked coalition naval assets is the optimal way to defeat this threat. In an article in *Proceedings*, the current US Chief of Naval Operations said:

*Small, fast enemy surface combatants represent another threat to operations in geographically confined areas, where their size and the surrounding clutter of geography and traffic make long range detection difficult ... A diverse force, networked with distributed sensors, offers promising response capabilities once enemy vessels are under way.*²⁹

While this swarming small-boat attack threat has been discussed in professional journals and reviewed in depth in various studies, there has been, to date, little quantitative analysis to determine the extent to which networking coalition naval platforms can help to deal with such a threat. Therefore, it was determined that this was a particularly fruitful area for AG-1 analysis.

The AG-1 ASuW/Swarm study characterised the degree of networking between members of a maritime force, and used the map-aware non-uniform automata (MANA) intelligent-agent-based distillation model to represent the C2 and sensor interactions between allied units, and separately between the units of the attacking force. The study sought to determine what degree of improvement was possible via surveillance and targeting, and indicated the point at which the battle must be moved offshore using either helicopter or uninhabited combat air vehicle (UCAV).

The AG-1 challenge was to investigate possible network centric measures to overcome the Swarm threat, using operational analysis to quantify the outcome. The problem was defined by very short surveillance (detection) ranges due to the small size of Type 1 FIAC, and even shorter identification (ID)/classification range.³⁰ These factors are very scenario/environment dependent, and ducting conditions may hamper ship-mounted sensors. Such factors, plus current rules of engagement (ROE), ensure that engagements are now conducted at “whites of the eyes” ranges well inside potential enemy weapon launch range.

The FIAC/Swarm study was initiated in early 2003 (and completed the following year), and AG-1 took a broad three-level modelling approach using the following tools:

- simple spreadsheet, plus the Queuing Theory (QT) models
- MANA model
- “Threedim” model.

The platforms likely to be involved in the modelling included some-high value units; their escorts, typically one or two destroyers or frigates; some airborne assets (helicopter or uninhabited aerial vehicle (UAV)); the opposing forces; and background or neutral shipping. The “three-tier” approach was to provide depth and a degree of validation and verification; it was not clear at the outset whether the spreadsheet and queuing theory models might (through meta-modelling) oversimplify the problem. However, there was some confidence in MANA’s strengths as an intelligent agent model to represent swarming aspects, while Threedim (as a fully featured battle model) had the ability to model at greater fidelity, including weapon system arcs, but with a simpler (i.e. “dumb”) target set.

A modelling workshop was held in late 2003. The characteristics of FIAC and defensive systems were presented and discussed along with the operational realities of Swarm engagement, using experts from the UK Maritime Warfare Centre at HMS *Dryad*. The study hypothesis was reviewed and it was agreed that it captured the essence of the analysis problem:

In an ASuW Swarm attack, Blue shared situational awareness and an associated sensor-to-effector capability reduces the number of leakers against Blue assets.

The NCMW options for the FIAC/Swarm study include the following cases, with varying degrees of networking:

- baseline – no communications or networking between units. This is not realistic, but sets the base case for proper comparison between options, by reducing the force to a collection of “singleton” ships that cannot act in a coordinated manner
- low – shared situational awareness but with organic targeting
- intermediate – shared situational awareness and organic targeting (as for low case), plus reach back to intelligence information
- high – shared situational awareness, organic targeting and reach back to intelligence information (as for intermediate case) plus inorganic (i.e. off-board) targeting.

Regarding metrics and presentation of results, it is important to define suitable measures of effectiveness for the purpose of determining the effect NCW has when it is used in the Swarm attack scenarios. The following MOEs were adopted:

- the fraction of Red threats that come within their weapons range of the high-value unit (HVV)
- the probability of at least one Red threat reaching its weapons range of the HVV
- the number of naval vessels that suffer defence capability-kill while defending the force
- the number of neutrals inadvertently destroyed (only relevant when inorganic weapons targeting is used).

The results were generally presented as graphs of the probability or number of leakers versus the weight of attack. Where available, the standard errors in the average MOE value were used to provide uncertainty estimates for them.

During the initial modelling work, the base case results with point defence and improved target indication for a single-sector attack (using close range guns and various permutations of gun range and slew times), showed that:

- current point defence systems can be overwhelmed by a relatively small number of FIAC
- the key drivers are FIAC speed, rate of Blue weapon fire determining the number of shots before Red fires, and the effective range difference of Red and Blue weapons.

The results of the three models were in substantial agreement and AG-1 decided to use MANA as the principal model to analyse Swarm attacks for the remainder of the study. The full results of this MANA model work is classified due

to the sensitivity of the models and the work involved, therefore, this paper will move directly to the general results of the analysis.

The analysis pointed to a number of operational benefits derived from robust networking. The broad classes of operational gain from network enabling forces, when compared to the baseline singleton case are:

- better use of close range guns – achieved by meeting the ROE criteria for opening fire at the maximum useful weapon range, rather than a shorter range, once decisions have been made by each weapon crew and ship command team. This applies to manually aimed (crew served) weapons like the M-60 machine gun or 40mm grenade launcher, and 20mm and 30mm cannon, as well as autonomous weapons like Phalanx Block 1B
- use of medium-calibre gun to maximum range – (a US 5-inch/54 or the UK 4.5-inch Mk 8) will typically fire 20 to 25 rounds per minute out to about 26 km, with either direct action fusing (exploding on impact with the sea or a target), or via a variable time proximity fuse for airburst over the target, which is attacked by the shell fragments
- move the battle outwards – by using helicopter or UCAV. This class of benefit applies to all classes of FIAC and provides either ISR/ID information about the target – thus achieving engagement criteria for ship mounted weapons – or the helicopter or UCAV can also be armed and then used to reduce the incoming FIAC raid. The differences are that the crewed helicopter can be autonomous, while the UCAV relies on good networking back to the controlling ship.

The results of the analysis using the MANA model clearly showed the need to do something. Present ships' defences are sensor limited by short detection and ID ranges, and are sometimes hampered by restrictive ROE. Saturation therefore can occur at relatively low weights of attack by Type 1 FIAC.

An ASuW Swarm could be countered by networking between escorts, helicopters/UAVs/UCAVs and the merchant ships. Improvements come in three broad bands:

- use of existing close range guns (machine guns, 20/30mm, Phalanx 1B) to maximum range, to defeat Type 1 threats
- use of existing medium range weapons to medium range bracket to attack Type 2 FIAC, plus use of smart rounds (laser designator in helicopter/UAV) to maximum range
- maximum use of armed helicopters/UCAV to reduce raids further out. This is the only counter to a longer range Type 3 attack, but the trade-off between helicopter and UAV/UCAV depends on the scenario.

The results of the AG-1 MANA analysis showed that for the smallest Type 1 FIAC, intermediate and high levels of networking could increase Force survivability substantially. Countering the larger Type 2-3 FIAC could be achieved with networked air ISR.

The trade-off between helicopter and UCAV depends on whether the threat adopts a single sector or widespread (i.e. isotropic) attack. Armed airborne assets

will always improve the survivability of the force, but the number of airframes required are driven by the finite weapon payload and space/time considerations caused by the target spread.

In summary, the third and final MAR AG-1 TACSIT showed, as its two predecessors did, that robust coalition networking could provide substantial benefits. In this case, it increased the probability of success when a naval force is attacked by a FIAC Swarm attack. The nature of the study organisation and the fidelity of the MANA model also informed the study team of specific tactics that could aid the defending force in fighting off such an attack. Accordingly, the ASuW/Swarm TACSIT was an important outcome of AG-1's work and a valued input for the work of AG-6.

D. TRANSITION FROM AG-1 TO AG-6

AG-1 was chartered for a defined period of time from October 2001 to September 2004. The TTCP methodology and "rules of the road" are for an action group to complete its work in two to three years, report out to its governing body (in this case, the MAR leadership), and then dissolve. AG-1 completed its work on schedule and passed its body of work on to the MAR and TTCP leadership.

When the AG-1 Chairman reported on the group's work to the MAR leadership, that leadership team determined that the issue of coalition networking was so important that it wanted this work to continue. The MAR leadership decided that the best way to leverage the work of AG-1 and to explore new challenges was to charter a new group, AG-6, and direct this group to extend the work of AG-1 to a greater degree of specificity with respect to systems and processes required to implement network centric maritime warfare. The approach being taken by the USN and USMC is known as FORCENet, and the new action group was tasked to study FORCENet Implications for Coalitions. A Terms of Reference (TOR) was quickly issued and the work of AG-6 began.

Action Group 6 (AG-6) FORCENet Implications for Coalitions (Ongoing)

Based on a strong recommendation by the MAR leadership for a seamless transition from AG-1 to AG-6, the two teams met together in the late 2004. This was a close-out meeting for AG-1 and a start-up meeting for AG-6. Three AG-1 National Leaders transitioned from AG-1 to AG-6, ensuring much of the continuity and leveraging of effort that the MAR leadership sought. Additionally, there were select members of other delegations who continued from AG-1 to AG-6. The result was a team ready to undertake new challenges, but one that had the collective benefit of first-person, detailed knowledge of the AG-1 studies, as well as the experience of working in an intense coalition environment.

Based on the knowledge that AG-6 would not take long to get up to speed, the MAR leadership set in place an aggressive timeline to complete the work. The MAR TOR directed:

Building on the results and findings of AG-1, MAR initiated plans for a follow-on FORCEnet Implications for Coalition Study (AG-6) to examine the implications and way ahead for realising coalition capabilities that are compatible with both the functionality and timeline of the USN's FORCEnet initiative. [MAR leadership seeks to] define in functional terms various levels of coalition interoperability with FORCEnet; to assess the incremental value of higher levels of interoperability; to make appropriate use of USN FORCEnet and other TTCP nations' systems engineering effort, of TTCP nations' modelling capability, of interactions with Trident Warrior and other exercises, and with other TTCP Group efforts; and provide input to a national balance of investment studies.

AG-6 set to work immediately to carry out the mandate of the TOR and to "bound the problem space" to work through the issues of coalition interoperability in general and the issues of coalition nations complying with the USN's FORCEnet capabilities with the goal of zeroing in on the TOR remit and "harmonising national coalition C4I interoperability strategies and development plans". Since AG-6's work is ongoing, this paper will not attempt to report definitive results of this team's efforts (since those results will take time to reach fruition), but rather will provide a window on the work to be accomplished as an example of what coalition partners can accomplish if a long-term relationship of dedicated naval professionals is supported and nurtured.

Building on the evidence obtained by AG-1 that networking coalition ships at sea confers substantial benefits to the combined naval force, AG-6 will investigate the extent to which a coalition force built around a FORCEnet-capable US naval battle formation can be more effective if all the ships in the group are able to participate in the USN/USMC FORCEnet and Global Information Grid (GIG) infrastructure in the conduct of a realistic tactical scenario.

The US has committed to an enormous investment in the GIG and in FORCEnet. Those systems will connect the US military as no military has ever been connected before. There may be some incremental cost on the part of the USN in designing FORCEnet to be completely coalition capable and there may be some attendant cost on the part of coalition nations to comply with the USN's FORCEnet in the same fashion that the international business community complied with Singapore's excellent infrastructure. AG-6's goal is to quantify – with as much specificity as possible – how much more combat-capable a FORCEnet-centric coalition battle formation will be than one that is not connected. This analysis will then assist the leadership of the five TTCP nations in determining whether the investment brings the concomitant return in warfighting effectiveness.

AG-6 deliberated for some time in order to find a scenario that represented a realistic naval challenge and would lend itself to the kind of detailed analysis necessary to address both the TOR requirements and the overarching goals of the group. AG-6 ultimately determined that a scenario that caused a coalition naval force to conduct not just one – but multiple, cascading missions – would both mimic real-world conditions and present robust possibilities for analysis.

The scenario selected involved coalition naval operations in and around the South China and Philippine Seas. In this notional scenario, a coalition naval force initially is tasked to provide humanitarian support and disaster relief in a South East Asian nation. When indigenous separatist groups use the opportunity afforded by this chaos to foment trouble, the humanitarian support and disaster relief mission quickly morphs into peacemaking/peace enforcement. As the scenario evolves, the coalition naval force ultimately faces a challenge from a neighbouring nation unhappy that this force is on scene, and the coalition naval force ultimately must deal with surface and submarine threats.

The group determined that selecting the right mix of naval vessels to undertake these missions was as important as picking the right scenario. After extensive dialogue with naval professionals in all five nations, a decision was made that a naval force built around a US Expeditionary Strike Group (ESG) with supporting ships and aircraft from all five nations, would represent the most realistic coalition battle formation sent to undertake this mission.³¹

AG-6 will analyse the extent that coalition networking built around leveraging the USN's FORCENet (Fn) capability will enhance the chances of mission success. The levels of interoperability selected for analysis are:

- option 0 (do nothing) – small size (all US) ESG force, fully Fn capable
- option 1 (do minimum) – added coalition ships, but not Fn capable (larger overall force)
- option 2 – intermediate Fn capability to the additional coalition ships
- option 3 – full Fn capability to entire force – robust networking.

The central question posed by the AG-6 TOR was to determine the price of admission for the other four coalition partners to operate effectively with the USN/USMC FORCENet-capable battle formation. One proposed solution to minimise this price of admission is discussed in the next section of this paper.

The Global Information Grid and FORCENet Can Provide the Right Infrastructure

When the MAR leadership stood up AG-6 and directed it to leverage the work of AG-1, there was a built-in mandate for continuity and, as mentioned above, some AG-1 members, including three National Leaders, transitioned from AG-1 to AG-6. However, on the US team, there was an almost complete turnover of personnel. This was done for a compelling reason, for with the shift in the new group's focus to FORCENet, there was a concomitant mandate for change in order to bring sufficient subject-matter expertise to the team. Accordingly, the new US National Leader and several team members were drawn from the Space and Naval Warfare Command (SPAWAR) in San Diego (the USN's FORCENet Chief Engineering entity) and from that Command's principal laboratory, SPAWAR Systems Center, San Diego (SSC San Diego).

The SPAWAR enterprise has been at the forefront of FORCENet development since this concept evolved from the work of the CNO's Strategic Studies Group

a number of years ago. Soon after Admiral Vern Clark took over as the CNO, he articulated the USN's vision as "Sea Power 21" based on the four pillars of Sea Strike, Sea Shield, Sea Basing and FORCENet.³² While some critics dubbed the first three pillars "old wine in new bottles", most seasoned naval observers recognised that FORCENet was indeed something new and exciting that could fundamentally alter the way naval warfare was conducted.

The detailed vision for FORCENet was set forth in *FORCENet: A Functional Concept for the 21st Century*. Signed by the CNO and the Commandant of the Marine Corps, this short document defines the importance and essence of FORCENet and explains where FORCENet will fit in the overarching context of military command and control. Importantly, this publication provides the USN's working definition of FORCENet:

*FORCENet is the operational construct and architectural framework for naval warfare in the Information Age, integrating warriors, sensors, command and control, platforms, and weapons into a networked, distributed combat force.*³³

In straightforward terms, FORCENet refers to the systems and processes for providing fully networked naval command and control in 2015 to 2020. The objective of FORCENet is to provide commanders the means to make better, timelier decisions than they currently can and to allow the effective execution of those decisions. It envisions extensive connectivity among network elements – greater by orders of magnitude than previously achieved. Since most headquarters are already well connected, the real power of FORCENet is in connecting the extremities of the force – people, weapons, sensors, platforms and other entities, ultimately extending visibility and empowerment to the extremities.³⁴ The development of FORCENet, like the development of the GIG itself, follows the precepts of the Command and Control Research Program, making FORCENet the *naval* portion of the GIG.³⁵

This document goes on to describe 15 required FORCENet capabilities. They are capabilities that will guide the technical community to design FORCENet to enable warfighters to achieve the maximum utility from this system.³⁶ Importantly, AG-6 examined this publication and determined that these attributes were consistent with the kind of naval command and control that all nations desired.

Within SSC San Diego, scientists and engineers had been working on FORCENet since its inception, and they soon discovered the FORCENet design parameters enabled them to do some interesting things. They learned that the totality of the USN's higher level guidance on FORCENet – ranging from the initial concept documents produced by the CNO Strategic Studies Group to SPAWAR Headquarters' FORCENet Architecture and Standards document³⁷ – allowed them a wide range of ways to actually design FORCENet as it would be represented in the USN fleet.³⁸

Based on its extensive background in navy networking at sea, command and control, knowledge management, human systems integration and other disciplines, this SPAWAR Headquarters and SSC San Diego team devised an approach to the design of FORCENet that SSC San Diego has dubbed "Composeable FORCENet".³⁹

The SSC San Diego scientists and engineers designed the Composeable FORCENet in a way that would enable it to be used by the widest range of users. They set out to build a working model of Composeable FORCENet based on open architecture and open standards, a system that would be the antithesis of current closed systems or systems of systems. The fact that coalition forces could be some of these users was a beneficial by-product of this unique design.

SSC San Diego hosted the first fully-fledged meeting of AG-6 and the group was able to see an extensive demonstration of Composeable FORCENet to determine if it was, in fact, a suitable framework for its study. As a result, AG-6 adapted the Composeable FORCENet methodology for its purposes and, for that reason, a short description of this FORCENet prototype is provided below.

The intent of Composeable FORCENet is to fundamentally alter the way in which military decision-makers view, manage and understand the information environment. Composeable FORCENet supports shared situational awareness across strategic, operational and tactical levels to enable superior decision-making. Composeable FORCENet tools enable the warfighter to compose C4ISR constructs “on the fly” to build the right bundle of capabilities to deal with the current tactical and operational situation.

Technically, rather than building turnkey systems that require large investments in integration, Composeable FORCENet represents a transformation toward providing seamless, open, object-based architectures that permit “composeable” information services, hardware and applications. Composeable FORCENet provides a new conceptual framework for distributing and sharing information, and eliminating information stovepipes. It has the potential to dramatically change C4ISR operations by providing the means to achieve shared situational awareness through a tailored and intuitive human-computer interface. Composeable FORCENet supports shared situational awareness across strategic, operational and tactical levels to enable decision-making that vastly exceeds that of any potential adversary.

Composeable FORCENet has two primary goals. The first goal is to deliver a composeable framework that enables the discovery and utilisation of Web-based services and sources of Web-enabled data (or information) as well as to “plug-and-play” new hardware and software. By composing various data sources, hardware, software and services, including sensors and weapons, communications, computing, applications, collaboration and human-computer interaction components, new functional capabilities can be created that meet emergent warfighting requirements. The framework for Composeable FORCENet is based on open, public, distributed Web services, specifications and standards. These new functional capabilities lead to the inherent ability to create new organisational structures and even permit the development of new and innovative tactics and doctrine without re-engineering supporting systems.

The second Composeable FORCENet goal is to provide mechanisms to transform fused data of known pedigree into information and then into knowledge in a manner that directly supports decision-making at all levels of command. This

is accomplished through customisable (composeable) geospatial, functional and temporal views of an operational situation, where the full spectrum of warfighting plans, issues, concerns and status can be tailored, assimilated and understood by commanders and their battle staffs.

SSC San Diego developed a demonstration of the Composeable FORCENet concept based on a straightforward, intuitive framework of a three-tiered architecture and uses the process of publication and subscription services. AG-6 observed the Composeable FORCENet demonstration operating on an IP network, which meant that the demonstration could be run from any location with an Internet connection. Data is published from Web sources, which is straightforward, as well as from legacy sources, simply by tagging the data with XML.

Data is published into a translation server that objectifies it and georeferences it using publicly available Open Geospatial Consortium standards. The information in this layer can be subscribed to by any visualisation client that is compliant with these standards. The demonstration that AG-6 observed employed several of these visualisation applications to represent the complex information that FORCENet will make available. The Composeable FORCENet concept for managing this complex data is based on the use of three interface metaphors. One metaphor is based on the recognition that warfighters think primarily in terms of geospace (where am I, where is the enemy, etc.), so the map metaphor is used to represent the world, but it has been expanded considerably compared to what electronic maps can do. The second metaphor is the interface to functional information such as documents and images. For this information, the browser metaphor applies. The third metaphor is the interface to temporal information, such as schedules and plans. For that, a VCR or DVR metaphor is used, where historical information can be re-played, and the future, especially simulations and predictive modelling, can be fast-forwarded. These metaphors are seamless so that information in one domain can be dragged into another. For example, an image found through the browser could be dragged onto the map and ortho-rectified if it has latitude/longitude information within it. Finally, there is a robust collaboration capability so everything can be seen as a shared workspace. All of this functionality is the result of selecting applications, services and tools that are compliant with open standards. No specific tools, or applications, or services, or data are mandatory in this system. Rather, the best technologies can be composed to deliver the final product.

Providing these kinds of capabilities to the warfighter has been the domain of the Composeable FORCENet effort since its inception. Composeable FORCENet provides the capability to demonstrate and evaluate the operational meaning of FORCENet to the warfighter. In the conventional military sense, the operational construct of Composeable FORCENet provides the ability to conduct and coordinate naval FORCE operations efficiently and effectively. This means:

- a warfighter, or organisation, can collaborate with anyone, anywhere, anytime
- warfighters can allocate bandwidth and priorities for applications and individuals

- warfighters define their own quality of service standard
- warfighters can get sensor coverage when and where they need it
- warfighters can tailor their information requirements to support their missions
- warfighters can put the right weapon on the right target with speed and precision.

The Composeable FORCENet technical concept is based on a fundamental departure from the legacy notion of system-centric application development and deployment. Decades of naval operational and technical experience have shown that interoperability cannot be achieved through the development of stovepipe applications and systems. Yet neither can interoperability be achieved solely through systems integration, or even a system-of-systems concept – a set of systems that has been integrated via a layer of blanketing middleware code (another, larger stovepipe). Interoperability is likely to require the adoption of a service-oriented approach rather than a system-oriented one. Composeable FORCENet adopts such an approach. A service-oriented architecture delineates the roles of service provider and service consumer in network centric operations, and emphasises the benefits of this modular approach. Focusing component definition on providing or consuming a defined service simplifies design and greatly eases the burden of integration, deployment and maintenance.

Composeable FORCENet rests solidly on the foundations of open industry standards for interoperability and the ideas of modular Web services. Composeable FORCENet combines a unified objectified view of all relevant data with a new geospatial metaphor for information understanding to bring shared situational awareness across the battlespace. To this end, Composeable FORCENet couples a powerful information representation, management and domain engineering methodology with emerging industry standards for information exchange and understanding.

As defined at the outset of this section, composeability – in the sense that it is used in the context of FORCENet – has a broader definition than merely the Web services, the data sources and the applications. Composeable FORCENet is meant to convey the idea that, by virtue of the ability to compose these components, it should become possible to compose organisations because they are inherently interoperable through composeable services. This is the essence of what makes Composeable FORCENet attractive as a coalition command and control tool and why AG-6 has adopted it to inform its work.

Summary and Conclusions

The combination of determining the parameters of coalition interoperability and particularly understanding how much is enough and how to quantify it is a large subject and has taken a “long paper” to properly address the issue. A long paper might imply there will be an extensive summary and conclusions – but this is not the case.

What this paper has demonstrated can adequately be summed up in just six points:

- the importance of coalition operations is strong, and growing, and coalition operations already represent the norm for any significant operation
- one of the most important pillars of coalition interoperability – and arguably the most critical one – is C4ISR
- the technical details of enabling coalition partners to achieve C4ISR interoperability are not trivial and must be worked at by all coalition partners
- TTCP offers an extant vehicle to continue to analyse the value-added of enhanced coalition C4ISR interoperability
- the TTCP MAR AG-1 and AG-6 groups have done – and continue to do – significant work to examine the effectiveness of coalition interoperability
- composable FORCEnet offers one methodology to ensure FORCEnet is coalition capable and provides seamless interoperability at sea.

While these are only interim results, since AG-6 has two years of dedicated work ahead, the prospects for demonstrating the manifest benefits of robust coalition interoperability through ongoing, focused analysis appear to be excellent.

Netting and Navies: Achieving a Balance

Norman Friedman

As navies become more expensive and as the demands on them increase, there is considerable hope that a revolution in military affairs, in the form of network centric warfare (NCW), will help solve their problems. The premise is that the cost of sea power can be reduced by making smaller numbers of ships, often of lesser size or cost, as effective as larger conventional fleets. This paper considers how that may or may not quite be true. Clearly no short paper can develop a full analysis of the proper size and cost of fleets, but it can lay out the meaning of networking in a clearer form than is common, and it can lay out the trade-offs involved.

The most basic meaning of networking is that connections between the elements of an organisation can be made very flexibly, bypassing the usual stovepipe hierarchy. That means not only skipping echelons but also connecting elements of one stovepipe with those of another. This is similar to social networking, in which connections are forged outside one's own family or organisation. The result can be viewed as either helpful or anarchic. A current example of military networking might be the use, at present in Iraq, of US Navy SEAL officers onboard EA-6B Prowler aircraft, to provide command and control to ground units entering villages with which they normally would not be associated. The aeroplane offers the officers a better view of the situation, and the officers' expertise is available to many small ground units rather than to a single SEAL unit.

Advocates would say that networking makes for a much more task-oriented organisation than that of the past. Critics would say that such organisations often avoid assigning responsibility. The model for networking is often the e-business of the late 1990s, which seemed to achieve unprecedented rates of growth due to their enormous flexibility and efficiency. Decisions could be made very quickly at low levels, rather than always referring them up the line to a few overburdened senior managers. The same businesses later often went bankrupt because they lacked internal financial control - which had been the point of the hierarchies and stovepiping. Which is more important: flexibility or control? Is individual initiative always what is wanted? It can be argued that in a military context much depends on the density of forces. If different units operate cheek-by-jowl, then there must be sufficient control, either by doctrine or by direct command, to keep them coordinated. If they are more dispersed, then errors due to limited control may not be particularly destructive. In the past, naval forces have operated in a very dispersed fashion, and their organisation has often been quite flexible. Their actual operation may well have followed something not too different from the networked business model. Ground forces, by way of contrast, have been tightly concentrated not least because that is the only way they could develop massed power. Although air forces are dispersed, their command culture has generally followed the army

model of tight control through doctrine (although individual pilots have been much more independent once airborne).

Since the term was first used about a decade ago, NCW has had two distinct meanings. The simplest is the exploitation of modern means of communication, such as those that characterise the Internet. Examples would be the use of chat rooms for group command (as used very successfully in the Gulf) and the widespread use of naval email. The prerequisites for such use are powerful onboard computers and, usually, satellite modems (except for line-of-sight radio, naval radios lack the requisite bandwidth). This meaning of network centric is associated with the hope that modern communications in effect abolish distance. For example, US Central Command managed the war in Afghanistan from its base in Florida. It turned out, incidentally, that distance had not quite been abolished. Because of the vast difference in time zones between Florida and Central Asia, those in theatre found themselves working very long hours to brief the distant commander, who was living in Florida time. They still had to fight in Afghan time. That was quite aside from the reality that a very distant commander might not have a good feeling for local conditions, a feeling that no wealth of remote sensors could provide.

The PQ-17 convoy disaster in 1942 provides us with an excellent example of the perils of control from a distance. The German battleship *Tirpitz* lay in a Norwegian fjord, by far the most potent threat to convoys running from Britain to Russia. The British Home Fleet, which could destroy the battleship, operated in distant support of the convoy. The idea was that, should the German battleship emerge, the convoy would scatter to limit her ability to do damage, while the Home Fleet came up to deal with the battleship. In effect, the convoy was bait. It had to be accepted that, should the convoy scatter, its ships would be easy pickings for the German U-boats and aircraft that the convoy escort normally countered. Killing the *Tirpitz* would be worth that risk.

The rub was that someone had to decide that *Tirpitz* was indeed coming out to fight. The Admiralty in distant London received intelligence, mainly from broken German codes. The convoy escort commander had no access to this information, but was far more aware of local conditions. The coded German messages, of course, did not say something like “*Tirpitz* is about to come out”. Instead they gave hints, such as an order to clear a path through a defensive minefield, or a subtle redeployment of U-boats to avoid the battleship’s path. Just what the hints meant was a matter of judgment. In the case of PQ-17, the First Sea Lord decided that the hints meant the battleship was coming out. The escort commander doubted that; the weather was far too good, and the Germans would have suspected that an aircraft carrier with the Home Fleet could easily disable the battleship. The First Sea Lord ordered the convoy to scatter, against the advice of its escort commander, and the result was disastrous: the convoy was largely destroyed, and *Tirpitz* never left her lair. The First Sea Lord presumably had access to the relevant weather information, but it is one thing to sit in an office and quite another to look up at a cloudless sky, and have its implications thrust upon one. Would we do so much better now?

Fully Network Centric Warfare: An Allegory to Illustrate the Concept

A deeper analysis might replace the phrase “network centric” with “picture centric”, the point being that a navy fights on the basis of a jointly-held tactical picture. For many navies, such as the Royal Australian Navy, that is not a very new idea – it is the reason for the operations rooms devised during World War II and of their computerised extensions such as the naval tactical data system and the action data automated weapon system. What is new is the expected quality and breadth of the tactical picture. The hope is now that the picture is so precise that it can be used for targeting, and that by being created cooperatively, using resources such as uninhabited vehicles and spacecraft, it can extend far beyond a ship’s horizon. Those advocating such policies used to talk about “lifting the fog of war”. In theory, the effect of a fully realised network centric tactical picture is greatly to accelerate the speed of combat, and at the same time to make virtually all attacks surprises, since they appear from over the horizon and are not heralded by any sensing directly associated with the attack in question. A reasonably persuasive theory of combat holds that the enemy’s will can be destroyed if he cannot move quickly enough to react to successive blows. In this “OODA loop” theory, combat is cyclical, consisting of observation, orientation, decision and action. If the cycle used by one combatant is significantly slower, that combatant loses the ability to understand what is happening to him; ultimately he suffers what amounts to a nervous collapse. OODA loop success can be achieved by a combination of accelerating our own operations and slowing the enemy’s.¹

An allegory will give some idea of what this can mean. Imagine a classic Western movie, in which a lone sheriff awaits the arrival of a gang of gunslingers. Since this is a Western, he will make his stand in the saloon inevitably present in such a movie, crouching behind the bar. In modern terms, the bar is his horizon. His only over-the-horizon sensor is a very crude one – his ear – with which he can detect the creaking of a floorboard indicating the arrival of his enemy. His gun is a line-of-sight weapon, and to use it he has to pop his fire control sensors – his eyes – into the sight of the enemy. That movement provides the enemy with tactical warning. Assuming that the gunslingers are much more skilled at their trade than the sheriff, that degree of warning is probably going to be fatal.

But this is an allegory, so the rules can change. In this one, the little town boasts a wonderful general store, among whose wares is a time machine. So what can the sheriff buy now that can solve his problem? He can certainly buy the little television cameras so often advertised as a way of monitoring children, malevolent dogs and nannies, and he can wire them up in the ceiling of the bar. Staring at a bank of monitors, he can see the gunslinger enter the saloon. That is not quite enough, however. The sheriff does not shoot at a television image. Somehow he has to convert the multiple images he can see into one tactical picture that says the gunslinger is at this precise location, within gun range. So the sheriff has to buy himself a computer that will somehow convert all that sensor data into an actionable tactical picture. Ideally it will also alert the sheriff that someone is in the saloon –

otherwise he may well simply fall asleep out of the boredom of staring at blank screens, a problem that often seems to arise with real-world security systems.

This is now a lot more hopeful. Actually it is still not enough. If the sheriff knows exactly where the gunslinger is as he enters the saloon, why should he ever pop up to shoot? What he really wants is a weapon better fitted to the tactical-picture system he has acquired, say a guided shell (which he can fire from a much safer place, such as the local bank's vault).

The combination of the sensors, the computer, the software (to make sense of the sensor data), the real-time tactical picture, and the geographically-guided weapon add up to the more complete form of NCW. The allegory gives some idea of the strengths and weaknesses of the concept. A great strength is that the enemy never knows when he is likely to be struck, because he is always under surveillance, and nothing in the surveillance changes before the attack. This threat of surprise attack may actually be the most valuable part of the scheme, because it puts the enemy on the defensive. Moreover, even if the enemy uses countermeasures, he cannot be sure that they will succeed, because many different kinds of sensors can be wired into the same data fusion computer. Note, too, that because the weapon no longer depends on a line-of-sight sensor (the sheriff's eyes), it need not be fired from very close to its target. It is now an over-the-horizon weapon. Using it, one shooter can engage multiple targets at considerable distances, multiplying his own effectiveness considerably- which is why NCW offers, at least in theory, considerable economy of force. Note that, because the targets are moving, it becomes very important to bring the bullets to them as quickly as possible. Even if the bullets can manoeuvre en route, their manoeuvres are presumably limited. So the ideal weapon or deployed platform ought to be quite fast.

Note, incidentally, that because weapons are guided to designated points on the tactical map, they need not be specially designed to seek out particular kinds of targets. For example, imagine that the town in question has problems not only of gunslingers but also of errant cattle, and that the cattle must sometimes be shot before they can do unacceptable damage. The tactical picture generated by all the sensors strewn about the town will, presumably, indicate the cattle running wild - and the guided bullets can hit them as well as they can hit the gunslingers. Because the sheriff need not be within line of sight of targets, presumably his sensor/weapon combination can take care of this problem, without any need for numerous deputies or armed citizens roaming the streets.

There are also some weaknesses. Unless the sensors and the weapons are very carefully aligned, the system will make errors and the guided bullet will not come anywhere near its target. Also, the scheme of operations emphasises the need to be sure of identification. It is one thing if the movie is *High Noon*, and the streets are deserted as the citizens wait at home to see whether the sheriff survives the gunfight. In that case anyone entering the saloon is almost certainly a gunslinger. It is quite another if the gunslingers slip into town in disguise, waiting to bushwhack the sheriff. What if some of those on the street are the deputies, in theory supporting

the sheriff? Or if one of the figures in the saloon is the mayor's wife or daughter? The sensors can see that someone is moving, and where, but how well can they identify that someone? What if even the redundant sensors cannot be sure of detecting the moving targets? The scheme does not allow for any backup if one of the gunslingers somehow survives to find the sheriff. NCW concentrates on the offensive, it seems, but how should that be traded off against defensive measures? In this example, how carefully should the sheriff hide while manipulating his long range weapons?

There is also an important assumption buried here, that the gunslingers will always be detected. That may well be unrealistic. If some gunfighters are missed, then the sheriff may become particularly interested in protecting himself against errors by staying in that bank vault. If he cannot ensure he will hit the gunslingers, he may want to at least be sure that he does not hit friends or neutrals (or at least friends). In modern terms, he may feel that the minimum surveillance system acceptable is a Blue Force Tracker (a means of detecting and tracking friendly forces). Of course he must then avoid his enemies' ability to pick up the blue force picture and use it against him.

Then there is economics. Even in an allegory, the sheriff is spending a great deal to handle a one-time situation. The expenditure makes more sense if the sheriff is not alone. In that case, the fact that the tactical picture is in a computer, and can be fed into someone else's computer, becomes extremely important. The gunslingers may not even know which of several potential shooters will actually fire the fatal shots; their discomfort will actually increase. Similarly, if the sheriff expects gunslingers on a weekly or monthly basis, the investment in wiring up the saloon (or the town) makes a great deal more sense.

Perhaps the first group of gunslingers is easily cut down, but others come to understand what the sheriff is doing. In this allegory, it is only fair for them to have access to their own general store. They can fire their own sensors into the town, to form their own tactical picture. The main lesson they will probably draw is that the only counter to a kind of warfare that relies so heavily on information (in the form of a tactical picture) is most vulnerable to the destruction of that information—which more probably means deception rather than the physical destruction of the numerous and redundant sensors. So what seemed at the outset to be a quick means of despatching gunslingers ultimately becomes a rather subtle cat-and-mouse game, as each side deploys decoys and deceptive tactics.

Surely the allegory is easy to translate. The main claim of NCW advocates is that by making their attacks more precise they can drastically reduce the weight of attack while retaining its effectiveness. Precision is attained through exact knowledge of the enemy's position. That is not quite enough, however. In many cases in reality, the effect of massed fires is not just to destroy particular things, but to achieve psychological dominance. How do we achieve the desired effects without massed fire? After all, the ultimate point of fires is rarely to destroy particular targets; it is more often to achieve larger aims, such as enemy retreats and surrenders. The Western allegory avoids this issue, because it is assumed that the sheriff's goal

is simply to kill the gunslingers before they kill him. The current solution to this problem – or rather, the currently imagined solution – is effects-based operations (EBO), which really means modelling the effects of particular attacks in hopes that they will have the desired effect on the enemy. The most extreme form of an EBO is an attack on the enemy's centre of gravity – the golden bullet, if you will – which brings down the enemy without bothering to defeat the enemy's forces in detail (if this sounds like the old strategic bombing mantra, that is no surprise). The problem with such an approach is that no country seems to have a particularly good record of understanding enemy thinking, even when the enemy has a somewhat similar culture. Doubters may want to review Western estimates of what the Soviets were doing during the Cold War, and compare more recent accounts of what was actually happening – and, more embarrassingly, why. As for the golden targets, it is difficult to find convincing examples, even for countries that we understand in detail.² One great attraction of the OODA-loop concept described above is that it seems to overcome such problems.

Another example may clarify the problem. Surely everyone has seen detective dramas set in Los Angeles. Many of them open with a suburban night scene. Suddenly a police helicopter appears over a house. The bull horn blares out: "We know that you're in there; come out with your hands up". Then the miscreant begins to run with the helicopter in pursuit, a policeman leaps out and either catches the burglar (caught in the act) or misses him, and the main action begins.

This is actually a network centric operation. The distributed sensors of the system are the burglar alarms in all those suburban homes. The sensor fusion centres are in police stations. They in turn allocate the quick-reaction forces (in the helicopters). The system is a networked alternative to policemen walking a beat, with patrol cars a kind of intermediate possibility. It is a way of reducing personnel – a perennial problem. The system was presumably particularly developed in Los Angeles because that sprawling city is so difficult to patrol.

One might liken the old policeman on the beat to convoy, in which the effort is proportionate not to the threat but to what is being protected. The only way to economise on escorts in a convoy system was to form larger convoys (which turned out to be quite effective), but usually nothing equivalent is possible in policing (gated communities may be likened to enlarged convoys, but they are not really attractive to most people).

What may be missed is that the character of policing depends on the system. The cop on the beat was largely a deterrent, although he could also often catch criminals trying to break in. It was difficult to assess his efficiency because that was really measured in crimes not committed. As personnel became more expensive, American cities switched to reactive policing using officers in prowl cars, although patrols by these cars still carried some deterrent value. The most extreme form of reactive policing is the system currently used in Los Angeles. Note, incidentally, how important speed of reaction is, because the sensor catches only a fleeting detection opportunity.

Just how effective is network centric policing? Advocates of the netted system can probably point to a high rate of crime clearance: the probability that a burglar will be caught is high. The question is whether that is the appropriate way to evaluate the system as a whole. Citizens want to feel safe, which means that they want to imagine that burglars will not attempt to rob their homes in the first place. It is entirely possible that, over time, a high clearance rate will deter so many burglars that citizens will feel safe, so the system will work. However, it is also clear that many criminals are immune to deterrence.

The system does not, incidentally, address another source of citizen insecurity, casual street crime. An absence of officers in plain view most of the time probably is not too reassuring, and reaction is unlikely to deter or prevent casual street crime. That is, the tactic that makes the police efficient in one area may be irrelevant in another. Those committing casual street crime probably are not the burglars, so the anti-burglary effort may not affect them at all. How important was casual street crime in citizens' view?

The reactive system, which seems to be so efficient, may not really answer requirements. It may be that the much more expensive (and more primitive) mass of policemen on beats may actually be more reassuring, and that reassurance is more important than a high clearance rate. The military analogy may be the choice, in land warfare, between attacks on point targets and occupation of territory by massed troops. A choice may be inescapable because resources are finite. Yet strike warfare may not be the whole story, or even the most important part of the story.

At least for the present, most naval operations are designed to project power from the sea against the land. Remember the comments above about making sense of sensor data. It was difficult enough to detect and track warships in the open ocean. What happens on even a few square miles ashore is a lot more complex. The variety of sensors is often enormous. Interpreting their product, which is usually a combination of imagery and electronic intercepts, requires considerable reference information, which the force on the spot is unlikely to have in hand.³ So to make a network centric kind of operation work, that force has to be able to exchange considerable data with some repository of wisdom ashore. Similarly, if several ships are involved, each will see the situation from a slightly different point of view, and the force as a whole has to be able to integrate their pictures.

Now it becomes clear that good communications is only the beginning. The effect of Internet-style systems is that they can exchange graphics - parts of, or contributions to, the overall tactical picture. One issue will be how to align these contributions to form a usable whole. After the 2003 Gulf War, a senior commander complained that he had more information than he wanted: his screen was often white. He wanted filters to leave only actionable information. That meant somehow enforcing precision (the white screen indicated considerable ambiguity) as well as some way of omitting irrelevant information. This was more a software or analytic problem than an information-gathering problem.

All of this is straightforward. Now add a bit more. Interpreting the imagery will require information about just what the enemy is doing and what he has on hand. Much of that will come from intelligence sources. How are they to be used? Is intelligence data the same as what comes out of a sensor, such as a radar, only more secret? Or is it somehow different, more reliant on judgment? In 2001 most of the world's intelligence services were sure that Saddam Hussein had an active program to produce weapons of mass destruction. Their conclusion was based heavily on his own behaviour: why else would he have risked Anglo-American wrath by ejecting the United Nations weapons inspectors? Much has been made of the effect this conclusion had on the large decision for war.

Think instead of targeting decisions once war began. Buildings in Baghdad were not marked "cut here to find atomic bombs". Someone had to decide that Building X was vital to hit because it contained something related to a bomb program. Most such decisions are inevitably based on intelligence, good or bad. All we now know, however, is that whatever Saddam was doing, it was not where we thought it was (proving a complete negative is virtually impossible). Ground warfare inevitably involves attacking large numbers of structures, the functions of which we think we know, with limited information. In the past, because large numbers of imprecise bombs were used, errors in such intelligence often did not matter - we might aim at the wrong building, but hit the right one anyway. Precision warfare prosecuted by small forces with limited weapon inventories is a different proposition.

Now add another factor. Imagine a multinational force. Although radar and sonar and a lot of electronic warfare data may be shared fairly freely, intelligence is another matter. Most multinational forces are coalitions, brought together for a particular operation but hardly permanent. To what extent will any government in the coalition cheerfully reveal its darker intelligence techniques or conclusions to potential future rivals or even enemies? In the case of the Iraqi building, one government might take its conclusions from a defector or agent (which its intelligence service may trust, but who it may be very reluctant to reveal). Another might have infra-red images that, interpreted in a particular way, might indicate a bomb factory. Yet another might have intercepted a fragmentary phone conversation: "I'm on my way to see (static) in Building X" or "Ilkhan just got a job as a guard at Building X. Isn't he lucky". Put together, the three pieces of information might show that Building X is actually a brothel used by high-ranking officials - or that it is indeed a bomb factory. But the odds are that they are not put together. Instead, two of the three governments involved will be told by the third that Building X is definitely the bomb factory, hence is worth hitting. Since munitions are limited, hitting it will entail not hitting other targets nominated by the other two coalition partners. This is not a trivial issue - and it will be very recognisable to members of coalitions.

Some Historical Examples

All of this, allegory and real-life example, is fairly theoretical. It is more colourful than the usual, rather abstract description of networked warfare, but it still cannot

test what real people will do in a situation tinged with uncertainty and risk. What happens in real life? Because technology is developing so rapidly, historical cases necessarily reflect a much lesser sort of netting than is currently envisaged, but their simplicity makes it easier to tease out the requirements and limitations of a networked system. Historical cases also make it much easier to understand the human elements of a netted system, and the way in which the operators affect the operation of the system.

As it happens, Australia was involved in the earliest example of what we would now call naval NCW. About a century ago, the Royal Navy (RN), which counted the RAN as part of an Imperial fleet, was on the point of bankruptcy. Among its many roles was trade defence, the main threat being surface raiders. A rather elaborate staff study conducted in the 1890s showed that seaborne trade, following Great Circle routes, concentrated at what were called focal areas, about eighteen of them around the world (this study confirmed an earlier effort completed about 1875). There was no possible way of detecting raiders at a distance in the open sea, but on the other hand an individual raider could not afford to waste time in the emptiness of the ocean. It seemed clear that raiders would find themselves drawn to areas of denser shipping – to the focal areas. The solution to the raider problem was to place cruisers in the focal areas, to wait for the raiders. As long as the average raider was likely to be a converted merchant ship, the cruisers could be relatively inexpensive. The RAN began life with some ships of just this type, “third rate” protected cruisers. Probably the rationale for dismissing larger raiders was that the RN could blockade the few naval bases in France where they were based. As in the Napoleonic Wars, the main threat to trade would be extemporised raiders operating out of small French ports.

Then some terrible things happened. France entered an alliance with Russia, so that raiders could operate out of places like Vladivostok, which might be outside the range of blockade. France also gained colonial possessions in the Far East, containing bases like Cam Ranh Bay, with similar potential. At the same time both France and Russia began building large cruisers, about the size and cost of battleships. The RN could certainly build ships capable of facing down those cruisers. The trouble was that it had to build enough of them to populate the focal areas. Each of them cost somewhat more than a contemporary battleship, yet the RN also had to maintain enough battleships to face down the French battle fleet.⁴

When John Fisher became First Sea Lord in 1904, his main pledge was to solve this intractable problem. His favourite invention was the battlecruiser, one of which, HMAS *Australia*, was built as the core of the future RAN. Publicly, Fisher pointed out that one battlecruiser could easily destroy two armoured cruisers of the earlier type. However, that was irrelevant. If he operated battlecruisers the way the RN was operating more conventional cruisers, he would still need large numbers. His fleet would go bankrupt the same way, but much more quickly. That was hardly what Fisher seems to have had in mind.

Fisher in effect invented picture-based warfare. He seems never to have said as much, but his creations point that way. He created a pair of war rooms in the

Admiralty, one built around a world (trade) map, the other around a North Sea map. The main source of information for the trade map seems to have been shipping reports by British consuls. Knowing where a ship was going, and knowing when she did not get there, those running the trade plot could guess reasonably well where she had been attacked. In effect they could create a picture of where an enemy raider was operating. The picture itself had only limited value unless some powerful ship could be vectored there to run down and kill the raider. The sources for ship movements in the North Sea, where timing was considerably more important, were apparently agent reports and scout reports, such as from submarines.⁵

Enter the battlecruiser. Her speed can be seen as a necessary complement to the use of the Admiralty War Room to direct her. Much the same can be said of her long endurance. That the battlecruisers had unusually tall masts for radio reception at unusually long range testifies to their dependence on updated command information from the Admiralty. Numerous accounts that mention the Admiralty was an operational headquarters also testify to the meaning of the new concept. Operational command is impossible unless the commander has some idea of the tactical situation. It also seems clear in retrospect that other navies did not operate in this way.

In modern terms, the battlecruiser would have to contend with an area of uncertainty around the predicted position of the target raider. Ideally, she would sweep out that area in company with some smaller ships of similar speed and seakeeping character. In 1909, the Admiralty tried to convince the Dominions to buy what it called fleet units. The units would be used to deal with raiders. In the event of a major naval threat, they would coalesce into a Pacific Fleet. Australia was the only Dominion to buy a fleet unit. Is it surprising that the unit consisted of the battlecruiser *Australia*, and two large light cruisers with similar seakeeping characteristics?⁶

By that time, of course, the Franco-Russian threat was fading, at least for a time, and the British focus had shifted to European waters. *Australia* served in the Grand Fleet during World War I. Even so, it is interesting that the concepts developed pre-war proved effective during the war. What proved ineffective was the main sensor projected for European waters: agent reporting. Its test came in August, when the German battlecruiser *Goeben* operated in the Mediterranean. Various British commanders in the area kept demanding instructions - vectoring. Thanks to the failure to vector the two battlecruisers there onto the German ship, there was a Court Martial of a cruiser squadron commander, which led to publication of the relevant signals.⁷ It is obvious in retrospect that the Admiralty never got the sort of information it needed, hence its estimates of German intentions were wildly inaccurate. *Goeben* escaped, with consequences, such as Gallipoli, which every Australian recalls.

On the other hand, the concept of an intelligence-driven tactical picture was brilliant. It was very well adapted to accept wartime British successes in signals exploitation, including both code-breaking and radio direction-finding. The Battle of Jutland demonstrated how well the system worked. The Admiralty vectored

the Grand Fleet into position to intercept a German sortie on the far side of the North Sea. Nothing like that had ever been done before. The Germans could not imagine what had happened. In effect they saw the battle as the naval equivalent of a random traffic accident. Their entirely incorrect reading was that the British had been probing the Skagerrak (the Danish strait), planning to make a naval descent on their Baltic coast (they had very recently reorganised their coast defence force against exactly such a threat). That is why they called the battle by that name.

The British tried to use the same techniques against U-boats, but they failed. Radio location and intelligence could place a U-boat only within several miles of its actual location. Whatever force was trying to attack had then to detect the U-boat within the area of uncertainty involved. If the U-boat was submerged, detection was virtually impossible. The use of vectoring may well explain why U-boats found attacking on the surface, using classical cruiser techniques (stopping and boarding merchant ships), extremely dangerous. In the run up to World War II, with ASDIC promising solid detection ranges of a mile or so, the RN became quite interested in hunting forces, which would be vectored against U-boats – again, on the basis of radio intelligence. Because ASDIC was not quite as effective as imagined, such hunting proved ineffective. But it was not the stupidly aggressive or romantic concept many have imagined; it was part of a networked concept of operations. Indeed, it is worth studying now because it was part of the failure of a very well thought-out concept of operations. Hunting made sense because the alternative, a convoy, required enormous numbers of escorts, which it seemed the RN and its Empire associates could never produce. In 1939, the RN was actively considering tactics for anti-submarine warfare (ASW) hunting groups, based on assumed ASDIC coverage; and through at least 1942, British destroyers were designed with alternative armaments suited to ASW strike groups.

The Battle of the Atlantic actually illustrated the two-sided network centric case sketched above. The Germans understood that individual U-boats could not hope to find convoys lost in the vastness of the Atlantic. They, too, became interested in radio intelligence as the basis for vectoring. Like the fleet unit, their U-boats would have to comb an area of uncertainty. The Germans' choice was to form U-boats into patrol lines (wolf packs). The wolf packs also had the attraction of being able to destroy even large numbers of merchant ships in a convoy, whereas a single U-boat might be overwhelmed by the sheer number of targets. The relevant radio intelligence was necessarily delivered to a shore headquarters, which directed the U-boats using HF radio. Direction required feedback from the submarines; for example, the shore commander had to know how ready U-boats were before he formed them into a patrol line. The Germans were well aware that transmissions by the U-boats could give away their positions, but they thought that technological advances (mainly short transmissions) would protect them against interception and direction-finding. It turned out that they were doubly wrong. Not only could the U-boats' transmissions be picked up and traced, but the orders from shore could be decoded (after mid-1943), and that information used to set up traps. Communication

is the essence of a netted approach to war, surely both its strength and its key vulnerability.⁸

Vectoring engenders cat-and-mouse tactics. Until about 1942, the most valuable thing the Admiralty could do was order convoys to avoid known U-boat concentrations. Such evasive routing saved many ships, whereas convoy escorts were far too weak to beat off determined wolf pack attacks. Evasive routing apparently failed in 1942 as U-boats became too numerous to dodge, and as the Germans gained the ability to decode the instructions telling convoys what evasive routes to take. By mid-1943 convoy escorts had become so powerful, conversely, that U-boats attacking them often failed entirely. Allied code-breaking successes also made it possible to resume hunting. A surfaced U-boat could generally dive before a surface ship running her down got within range, but aircraft from escort carriers could do much better. Only in 1945, when snorkel-equipped U-boats could stay down more or less continuously, did the Germans feel that they had a chance of overcoming the networked Allied force. Existing sonars could not search the areas of uncertainty quickly enough. The situation changed again post-war, with the advent of longer range sonar.

Networking and vectoring explain mature post-war ASW, with its heavy reliance on very long range detection – largely by using the sound surveillance system (SOSUS) and similar systems – and vectored ASW aircraft such as P-3 Orion maritime patrol aircraft. In effect, networking made highly-capable platforms affordable by limiting the numbers required. One way to say this is that the number of vectored platforms was proportional to the expected number of contacts to be prosecuted at any one time. Convoy escorts, however, had to be in sufficient numbers to cover the number of targets, which was immense. Moreover, really fast nuclear submarines could probably overwhelm the escorts. Supported by a Soviet network centric command system, they could intercept convoys, so evasive routing was impossible. Yet vectored ASW was still likely to be effective.

Note that one advantage of the netted system, perhaps too often neglected, was that Soviet submarines were subject to detection and attack whether or not they were attacking surface targets; there was, in effect, no respite, as there would have been against a convoy defence.⁹ It is not clear to what extent this advantage was reduced by revelations of limits to SOSUS area coverage by the Walker spy ring. Presumably the use of mobile SOSUS platforms, such as the tactical auxiliary general ocean surveillance ships (TAGOS) would have restored the uncertainty felt by Soviet commanders. They may even have had more reason for caution because previously they may not have imagined just how vulnerable they were (the Walker revelations may well have triggered the Soviet silencing program, reflected not only in new designs such as *Victor III*, but also in the illicit purchase of computer-controlled milling equipment for the mass production of quiet propellers).

What we seem not to have seen, either in the Battle of the Atlantic or in the battle between SOSUS et al and the Soviet sea-surveillance system was much interest in large-scale deception, apart from the evasive routing used so successfully during

the early phase of the Battle of the Atlantic. It is not clear to what extent either side was aware of the situational awareness system employed by the other. There is some evidence that the British were aware of the wolf pack operational concept by mid-1940, but the language of netted systems was not used at the time. The first formal awareness of such a system may have come with relatively primitive Western analysis of the Soviet ocean surveillance system (SOSS) during the Cold War. It seems to have been revealed when Soviet bombers flew straight for US carriers in 1964-65, instead of searching for them; the bombers had clearly been cued. We now know that the Soviets hoped to use a comparable acoustic system to deal with Western strategic submarines (the Il-38 and Tu-142 aircraft were intended as cued equivalents to the P-3 Orion aircraft), but that the underlying technology failed them. The rise of a Western equivalent to the SOSS, from the late 1960s on, may have engendered a sense, at least in the US, of the value of deception, because deceptive devices and tactics certainly were of great interest by the early 1980s. Indeed, the public mention of special devices seems to have been an effort to reduce Soviet confidence in the remote sensors involved in the SOSS. The Soviets themselves were very interested in deception in other military spheres, but we do not yet have a sense of its naval component, or indeed of Soviet ability to understand Western fleet tracking concepts.¹⁰

Alternatively, one might say that some form of netting becomes inevitable as the cost of the individual platform rises. Usually there is an alternative involving much larger numbers of ships or aircraft, but at some point it becomes unaffordable, even if those platforms are not very sophisticated. For example, modern computerised combat systems were largely developed to deal with heavy air attacks, such as the kamikazes of 1944-45. All combat systems, including manual ones, can be characterised by the number of targets they can handle more or less simultaneously. Kamikazes were effective partly because they could overwhelm individual ships by presenting them with far more targets than they could handle. One solution to the problem would have been to multiply the number of ships to the point where the numbers were more even. The other was to increase individual target-handling capacity, perhaps to the point where fewer ships would suffice. That was the only realistic choice; the fleets of 1945 were by far the most numerous navies would ever have, and even they were not numerous enough. Computerisation and its cousin, tactical netting, solved the problem affordably.

Another point is worth making here. Network centric ASW would, it was hoped, enforce a rate of attrition over time. In 1960 the USN estimated, for example, that for the first three months of a war about 100 merchant ships would be lost each month – after which no submarines would have survived.¹¹ The convoy approach would have defended the merchant ships directly, however inefficiently. There is a vast psychological difference between the two approaches, and that gulf should not be overlooked. Indeed, it is characteristic of a problem that the netting approach may encounter. In some sense the substitution of precise or targeted attacks on enemy submarines is equivalent to precision attack against land targets. Convoy is

somehow equivalent to massive bombardment, in which many of the shells are, in theory, wasted. Unfortunately, we do not have a deep enough understanding of just what happens in land combat. We do not know, with certainty, what makes a unit retreat, or break, or surrender. All that we know is that some level of destruction, or the credible threat of destruction, works. It is by no means clear that a very few precisely targeted shots are equivalent to massive bombardment.

Naval warfare is unusual in that it is almost entirely a matter of destroying particular enemy units. Space cannot be occupied because the sea is just too large, although of course blockades and embargoes can be mounted. Land warfare is a much more subtle combination of mass of manoeuvre and firepower. It is not clear that an entirely or largely firepower-oriented style of warfare is suitable. Yet we are now faced with the need to project power ashore, to mount land campaigns based on what can be carried over, and supported from, the sea.

Networking also changes the balance between headquarters and forward units in ways that may be unexpected. Naval practice, at least in Western navies, emphasises the initiative of the forward commander, whether on a ship or on a local flagship. Army practice is quite the opposite. That is probably because an Army consists of a very large number of adjacent units. Excessive initiative by a junior commander will quite possibly ruin an overall operational plan, so it is discouraged. The old saying is that the army's book is what the junior commander must do (so that the commander knows how his subordinates will conform to the overall plan), whereas the navy's book is what the commander cannot do while he finds his own way to fight. The early advocates of networking were all naval, and they saw wider distribution of information as a way of empowering lower-level leaders. These leaders would understand the overall plan, and they would self-synchronise to make it work. The advocates knew this could be done, because it was the way they had worked throughout their careers.

However, the other Services have not operated in nearly the same way. They generally have not exercised real-time command and control over subordinate formations. Because their organisations have been so massive, they have had to devise initial plans and then let them run according to preset procedures. The kind of real-time operational picture envisaged in NCW is available both to the subordinates and to the central commander. The high-level commander can now continue to exercise control during combat, in a way previously difficult or impossible. Unless he shows great self-control, he can become fascinated with some very minor detail of the battlefield, to the exclusion of the wider issues he should be addressing. For example, in the aftermath of Operation ANACONDA in Afghanistan, during a fight between the US Army and the Air Force over responsibility for errors, the Air Force published a very revealing photograph of the relevant Army battle staff apparently fascinated by the image produced by a single uninhabited aerial vehicle (UAV) – a very small part of what should have been a wide-area picture. The Air Force's caption was "Wasn't anything else happening?". In a somewhat similar situation, UAV video was piped into the Pentagon during NATO operations

in Kosovo. Apparently senior civilians and officers would demand that this or that particular vehicle be attacked.

Similarly, the connection back to national level, which may be essential to share high-level information useful to the forward operators, also provides national civilian leaders with an unprecedented level of detailed information about what is going on in combat. At the least, combat is chaotic on a detailed level. Professional officers are trained for a lifetime to distinguish normal chaos from catastrophe. There is no reason whatever for civilians to expect to gain similar insights instantaneously. To what extent does providing them with detailed information or imagery (which they will surely seek) cause them to make disastrous interventions?

How can a networked system be filtered or self-disciplined? Can that be done?

Note that the netted system gains much of its efficacy by separating sensing from attack functions; that is why all attacks are likely to be surprises, or why sensing can be done in parallel (which might be very important for mine countermeasures). However, there are some human problems. If the tactical picture is a truly joint creation, then who is responsible for specific items in it? For example, who is responsible for designating particular objects as legitimate or worthwhile targets? That is not an academic issue. During the air war against Serbia, a US Air Force B-2 bombed the Chinese Embassy in Belgrade. The Chinese were furious: surely even the blindest bombardier could see what sort of building it was, and a Chinese flag out front. That may or may not have been realistic. However, it was irrelevant. The B-2 dropped geographically-guided JDAM bombs, for which the only aim point was a global positioning system (GPS) address derived from targeting data (that is, from a tactical picture) by a higher-level commander. No one on the B-2 is likely to have seen the target, let alone have known to exactly what building the bombs had been directed. Who, then, was responsible for the attack? No one ever found out. That was not a cover-up – it was a practically unavoidable consequence of adopting a network centric style of war. Yet personal responsibility is central to our way of war. How do we reconcile the new concepts with the very important existing ones?

Another important issue is just how effective the sensing at the core of the system is. In the allegory, the sensors in and around the saloon catch every gunslinger. Unless the sheriff can hide, any failure will probably lead to his death, which is unacceptable. In effect the sheriff is betting on perfect information as his only protection, and on an entirely offensively-oriented weapon system. Reality is rather more disappointing. Past wide-area sensing systems like SOSUS had a probability of detecting a submarine each day. Over a long patrol, the odds were overwhelmingly that a submarine operating in the area SOSUS covered would be detected and attacked. But some submarines would inevitably survive, at least for one patrol. Similarly, in modern ground combat it is very unlikely that all enemy forces will be detected before they can attack.

We have had a recent case in point. During the 2003 attack on Iraq, probably the most important single strategic target was the television station that kept trumpeting Saddam's non-existent triumphs. It was just the sort of point target that

modern munitions are designed to destroy, but it was never pulled off the air. The Iraqis knew just how important it could be, and they managed either to conceal it or to provide instant replacements as needed. The lesson is that sensing, although extremely good, cannot be as perfect as we may imagine. In the larger war, it turned out that we could never track Iraqi forces perfectly, although we did quite well. We could track our own forces (the Blue Force Tracker), and that made it possible to apply firepower without much fear of generating casualties among our troops. That is, we could much more readily avoid the mistakes inevitable in war.

On the other hand, a very important feature of the war in Iraq was the failure by Saddam to fight the much-heralded Battle of Baghdad. We did observe numerous secondary explosions early in the war, which might have been associated with the destruction of the secret arms caches on which the battle might have depended. One explanation would be that US surveillance photographs, taken over a very long period and compared together, clearly showed the Iraqis digging the spaces for the caches and filling them. The sensors observing Baghdad at different times were being netted together to produce very valuable targeting information. This was an odd sort of netting, and the key was that all the images could be registered to common coordinates. Given such registration, it did not really matter how well the final cache locations were concealed, because they were known. Weapons aimed on the basis of their locations could destroy them, even though they could not possibly detect them from current indications.

Another case is historical. When the US Navy (USN) introduced the anti-ship version of its Tomahawk missile, it suddenly acquired a weapon with distinctly beyond-horizon range. Only under very rare circumstances would shipboard sensors pick up any target at such ranges. The Soviets already had such weapons, and they had a vast range of sensors tasked specifically with detecting and tracking US warships, up to and including a variety of satellites. The USN certainly wanted an active radar satellite to provide just the sort of positive targeting data the Soviets enjoyed. However, this system was adjudged unaffordable. The Navy was left with a variety of passive sources of information, including a passive satellite.

It turned out that correlating all the passive sources could produce a reasonably good picture of the positions, courses and speeds of Soviet warships in the open ocean. Most of the data were time-late, so the system had to include considerable effort to project ahead what the Soviets were doing. It helped that the surveillance was always functioning, so individual Soviet commanders were unlikely to manoeuvre to frustrate projection; to do that they would have had to manoeuvre continuously, getting nowhere. The fruits of this effort, conducted by naval intelligence, were transmitted to US ships throughout the world. The system, incidentally, proved extremely successful in supporting the 1990-91 embargo against Iraq.

It was less well-loved as a missile targeting system. Many, but not all, commanders noted that information was less than precise, and that it usually omitted the many merchant ships near the Soviet warships. They concluded that in

wartime many missiles would end up hitting neutral merchant ships or, at the least, the wrong Soviet warships. How could such a system be acceptable? Others saw the glass as half full. It provided a new capability that would curb Soviet aggressiveness in the build-up to any war. It made Tomahawk a useful weapon. It was very much a network centric solution to a difficult problem.¹²

It is interesting that the Soviets were not satisfied with their wide-area sensors; they wanted the shooter to have at least some organic means of gaining the necessary fire control data, not least to locate the high-value unit within a group. Thus they went to extraordinary lengths to gain visual evidence of which ship was the real target. In some areas that meant deploying “tattletales”, which stayed with carrier battlegroups until the moment of attack. Regiments of anti-ship bombers apparently included reconnaissance elements expected to fly into the formation and report back. Ships and submarines with very long range missiles were associated with Bear D (Tu-95Ts) radar reconnaissance aircraft, which would provide them with radar pictures of the target formation some time before firing. The firing ship received the radar picture from the missiles it fired, and locked them onto the chosen target. Somewhat shorter range shooters had over-the-horizon radars (NATO Band Stand and NATO Plank Shave) for final targeting.¹³

All of these measures strike us as risky. More importantly, all of them offered valuable tactical warning to the target formation, phrases such as “Bears in the morning, missiles in the afternoon” being common during the Cold War.

Characteristics of Network Centric Warfare

All of this means that NCW, if it is effective, is a distinct style of operations. Like other new styles of operations of the past, it works only if all of its elements are accepted. It would be easy – but disastrous – to buy the hardware without buying the concept of operations. That is exactly the sin the French are often thought to have committed leading up to the disaster of 1940: they bought excellent tanks (better than the Germans’), but they misused them.

The new type of warfare centres on the exploitation of a tactical picture created cooperatively. The picture is good enough that it provides most or all of what is needed for targeting.

Consequently attacks tend to be surprise attacks, and they are often delivered beyond the shooter’s horizon.

At least in theory, the picture can be used to unite widely dispersed shooters, who may have greater tactical independence precisely because they are separated. The use of the picture, with its geographical registration of targets, suggests that weapons may be far more universal than in the past. Note recent experiments in which GPS-guided bombs with data links hit moving ships and land vehicles.

Note that the wide-area picture, particularly for land operations, depends heavily on intelligence data; intelligence becomes, in some important sense, a sensor – but it is not quite like other more objective sensors such as radar or, say, electronic surveillance measures. This makes for important as yet unresolved questions.

The key to victory seems to be the OODA loop – fast reactions for one side versus slower ones for the enemy. The implication is that attacks on enemy communications or on the accuracy of the enemy’s tactical picture (e.g. by deception) can be extremely useful.

None of this invalidates the need for weaponry. Nor is it obvious that precision makes much smaller or less powerful weapons sufficient. But other factors, such as the need for expeditionary firepower and the sheer cost of the sensors and links, limit the quantity of weapons available.

There is an important caveat. It is quite possible to buy the hardware without understanding what it provides. A few years ago the US ran Exercise MILLENNIUM CHALLENGE, simulating a war against Iran. The “Iranian” commander, a very competent retired Marine general named Van Riper, demonstrated that primitive technology could defeat the more sophisticated kind. Two examples are relevant.

Prior to the outbreak of hostilities, a US amphibious force anchored off the “Iranian” coast. It was immersed in a mass of minor civilian shipping. Infiltrating this shipping were small craft carrying anti-ship weapons. The fleet grew comfortable with the presence of all of those small boats. One day the national radio carried a coded message, in this case inserted into one of the usual calls for prayer. At this message, the small boats struck and destroyed much or all of the amphibious shipping crucial to the planned attack. Rather than end the exercise there and then, it was continued to keep testing the new concepts.

Van Riper frustrated attempts to intercept or jam his tactical communications by relying on motorcycle despatch riders. Again, it turned out that modern technology failed; his forces performed extremely well.

Did this show that the modern concepts were bankrupt, or that their users were insufficiently alert? An advocate of netted concepts would surely argue the latter. In both cases, it can be argued far too little attention was paid to information flows on the enemy side.

In the case of the attack on the amphibious force, keeping the ships static and relatively close to the shore made it unnecessary for the “Iranians” to keep searching for the ships. Once they had scouted out the ships’ location that was enough. Had the ships been further offshore, had they kept moving, the “Iranians” would have had to search aggressively. That search would have distinguished the eventual shooters from the more innocent traffic. The radio messages needed to home the shooters on their targets would have been detectable, and they might have been jammed. This is not a matter of new technology, but rather of taking the information content of network centric warfare seriously.

Much the same can be said of the motorcycle messengers. The time lags inherent in using them, and the relatively fixed character of their messages, would inevitably slow “Iranian” reactions – would slow their OODA loop. But that would matter only if the US OODA loop ran so rapidly that it forced the “Iranians” to confront their time limitations.

Note, by the way, that all the OODA loop discussion in the world does not matter if the actions involved are not significant enough to their intended target. It would be a pity if the party with the fast loop were like a boxer, dancing and jabbing, who has no effect on his target and is ultimately knocked out by a heavyweight punch.

We are likely to see networked concepts as central to the continuing struggles against smugglers and seaborne terrorists, because we cannot possibly deploy sufficient resources to examine every ship that comes over the horizon. The great hope seems to be that the new commercial automatic identification system (AIS) will make it practical to screen out most shipping and concentrate on important targets. Like any other sensor system, AIS has inherent limitations: it can presumably be spoofed by anyone sophisticated enough. In its current form, it may actually make piracy easier, if the pirates can receive AIS messages. There is also a larger issue. In the past, navies have enjoyed a sea sanctuary, because although various sensors could certainly detect ships, it was far more difficult to distinguish warships from merchant ships (as in the Tomahawk targeting problem). Does AIS make it easier – too easy – for a government facing naval attack to screen out the non-targets? Or does it present navies with a new way to spoof defences?

A Balance?

Where does all of this leave us? The simplest version of networking has become a kind of licence for massive investment in communications and in the computers required as terminals for communication nets. Few would doubt that better communications are useful. Unfortunately, budgets are finite. Investment in better radios or computers can squeeze out investment in ships or weapons or aircraft. Network centric investment initially must have seemed extremely attractive because computers were becoming cheaper and cheaper, so the trade-off against ships and weapons might actually save a great deal of money. That has not quite turned out as imagined, however. The hardware is indeed becoming less expensive, but the software that makes systems work has become more expensive as it has become more complex. Probably the greatest single cost has been that involved in testing. Where the main test of civilian software is whether it can avoid crashing or providing incorrect data, military command and control carries additional critical requirements. It would, for example, be unacceptable to have a piece of software accidentally launch weapons yet, at present, launching is almost always entirely governed by software.

As in the case of transformation, network centric seems sometimes to be a licence to demand money for particular kinds of systems: for sensors, uninhabited vehicles and communications links. How much is enough? How much is redundant? Many years ago I was involved in a targeting project, one solution to which was to develop a very expensive new sensor system. My very experienced USN colleague pointed out that the US already collected – and discarded – vast amounts of information, some of which might solve the problem. My colleague's solution turned

out to work rather well. The main obstacle to adopting it was bureaucratic: a lot of the information involved was classified as intelligence, and to avoid compromising important sources, there was serious resistance to either using it for tactical ends or to sanitising it for widespread dissemination. This resistance was not entirely irrational. Right now we see something of the same kind, when forward commanders ask for long-endurance uninhabited aerial vehicles or for their own dedicated satellites largely because the fruits of existing national systems, which may collect exactly what they need, are not readily available to them. Because so many national systems are very closely guarded (“black”), it may be difficult for potential users to realise what they can offer. Yet funding is finite. Hopefully much of this problem has been or is being dealt with. Note that it deeply affects navies hoping to share a US-created tactical picture.

The USN may exemplify possible applications of netted concepts. As it contemplates warfare in littoral areas, it collides with the classic numbers problem. For a variety of reasons, lines of sight in littorals are very short, so the usual solution is to multiply the number of ships, each using its own sensors. That was barely affordable in the past. The solution currently being advanced is to multiply sensors rather than ships, using the ships to exploit the tactical picture created on the basis of the sensors. At least in theory, the current LCS (littoral combat ship) carries uninhabited surface (USV), air (UAV), and underwater (UUV) vehicles, which strew the necessary sensors through the littoral area. It also acts as processing node for their products (in some versions of this idea, some of the strewn sensors are sub-nodes), and it may carry the weapons used to react to what the sensors detect. These ideas would seem relevant to underwater warfare, including mine countermeasures. In the latter case, UUVs or USVs would in effect map out the minefield, and prosecuting platforms would drop anti-mine munitions on the mines or mine-like objects detected. As in other forms of mine countermeasures, a great deal would depend on the detectors’ ability to distinguish mines from enough mine-like objects to make the exercise worthwhile. That now appears to be practicable, at least under controlled circumstances.

Other forms of warfare may be more problematic. It seems unlikely that the uninhabited platforms will have much capability to detect and track such aerial vehicles as low-flying cruise missiles. They may or may not deploy sensors capable of detecting and tracking small surface craft such as the “swarm boats” that some countries have. Moreover, it is unlikely that detection and tracking will be 100 per cent, so some attackers may well get through. Perhaps LCS cannot be quite as small as some imagine. Passive survivability, for example, is unlikely to go out of fashion.

There is another way to look at this. Anyone attacking beyond the horizon, where the fleet will be, must find it. He must have his own sensor system. The fleet offshore can attack that system. At the least, it can make life difficult, so that the enemy must commit himself more fully and forego the element of surprise. For example, the uninhabited vehicle, which are to be present in numbers, can be

used as decoys (e.g. with radar repeaters). The stealthier the large ships, the more effective such tactics can be. If, as is planned, the uninhabited surface vehicles are armed, then approaching attackers may well feel that they must deal with the boats before they can mount their attacks. Merely firing at the boats will disclose that they are attackers and thus may help sift such vehicles from the mass of more innocent ones in places like the Gulf.

Decoying would also affect any attempt to attack the fleet offshore with low-flying cruise missiles, which have to be directed to a position very near their targets before they can lock on. Given very finite inventories of such weapons, decoying would be an important means of negating them. Normally decoying is imagined as part of a ship's self-defence suite. As imagined here, it would be conducted on the fleet level, to deny targeting to any enemy.

Networked concepts have a more obvious offensive role, for example in supporting US Marines ashore. The point of the new DD(X) destroyer, with its very long range gun, is to provide the Marines with call fire as needed, in effect replacing the howitzers currently organic to their units. Reducing the footprint the Marines must take ashore should make them much more mobile. More generally, the theory of the current Expeditionary Strike Group would seem to be that the ships offshore will enhance the capabilities of the Marines they project ashore, making up to some extent for their limited numbers. That would seem to be a template for other navies that plan to project power ashore using small numbers of very capable troops. The keys would be good communication with the troops and a shared picture of land conditions, which would make for both effective fire and for very limited interference with those troops. Without the shared picture, shells may well hit the wrong targets. The shared picture should also help the Marines deal with developing enemy threats as yet well beyond their horizons, threats that long range fleet assets such as aircraft can attack.

Now the question. It does not take a very large ship to service, carry and launch the uninhabited vehicles, or to serve as a processing node for information for which they, or arrays they deploy, will develop. It is certainly very tempting to seek the smallest, hence least expensive, possible littoral combat ship.

What protects such a ship, which operates in a very hazardous environment? The answer is not as simple as one might imagine. Since World War II it has been tacitly assumed that any substantial hit on a modern surface combatant will put it out of action. That followed largely from the fact that the electronic systems upon which such ships increasingly relied were relatively delicate. The implication, for about half a century, has been that only active defences count. Incoming weapons must either be destroyed or diverted. One reason anti-aircraft systems are very expensive is that they are designed to deal with fairly large numbers of incoming attackers.

Yet our experience also shows that even relatively small ships can be quite tough. Modern anti-ship missiles generally carry relatively small warheads, and almost all of them are designed to hit above the waterline. The USS *Stark*, never

described as a very large warship, took two Exocet hits (one of which exploded), and survived, albeit badly damaged. HMS *Sheffield*, often described as the case proving how devastating modern weapons could be, was not actually sunk by the two Exocets that hit her; she flooded later because smoke drove off her crew and thus precluded effective damage control. The USS *Cole*, which was designed to survive substantial damage, lived through a hit far more powerful than any known missile could have delivered. Moreover, modern solid-state electronics is quite tough, and systems can be dispersed.

Maybe it is time to rethink the balance between knowing what is coming and being able to survive the effects of surprises. That is a very specific way of suggesting that the all-embracing knowledge that often seems implicit in network centric concepts need not be available to us, yet sensing and long range attacks may still be well worth our while. What would make the combination work would be something like passive protection - not armour, which will not work against modern weapons, but the sort of dispersion that a larger ship can provide.

We can find analogies on land. Some years ago the US Army and Air Force staged a series of mock battles between a networked force and a simulated Soviet-type regiment, the sort of force the Marines might expect to face in much of the Third World. They found that under many circumstances a battalion-strength netted force would easily win. One interesting lesson was that to survive the force needed infantry, which are usually not part of any networked scheme of operations. The infantry in effect made up for gaps in sensing, keeping enemy infantry (who might not have been spotted) out of the core of the netted unit. They were the ground equivalent of the armour or dispersion a ship might employ.

Armoured vehicles are a similar but somewhat different issue. It might be argued that a force with adequate over-the-horizon sensors could expect always to detect enemy armour in time to destroy it using missiles on board its own lightweight unarmoured vehicles. In that case the argument to retain armour would be one of uncertainty of detection. However, there is also another issue: rules of engagement. In many cases deployment occurs before hostilities begin, for example as a deterrent against enemy attack. Even if the future enemy is detected, he may well be able to make the first move, such as firing across a border. In that case information likely cannot be complete, because it almost certainly cannot include that enemy's decision to open hostilities. Even if some very secret source detects the enemy's decision, it probably cannot be used publicly to justify a pre-emptive attack. The reality of the transition from peace to war may make it forever impossible to take full advantage of network centric concepts. Surely much the same thing can be said of a ship on a presence mission (like the USS *Cole* or, for that matter, the putatively sunk amphibious ships of MILLENNIUM CHALLENGE).

There was one other, less happy, lesson. If the Soviet-type regiment had netted sensors, its conventional firepower was so amplified that it generally won. This probably exemplifies a wider rule. At a time when warfare is shifting from one style to another, the combination of legacy and future forces can be extremely

powerful. What keeps it from dominating is that the cost of the new kind of force makes the legacy systems unaffordable. For example, in 1945, as it contemplated the future, the USN hoped to retain a powerful fast battleship force alongside its new carriers. That did not mean that US Admirals were too nostalgic for 16-inch guns to recognise reality. Rather, they saw the battleships as extremely valuable adjuncts to the carriers.

Then fiscal reality set in. By 1949 only a single battleship remained in commission, the others having been placed in reserve (most were never reactivated). When the USN had to make extreme sacrifices, it clearly recognised the carriers as its future.

Where are we now, in the transitional period or in the period in which the transition has already taken place?

Maritime Support in a Rapidly Changing Environment

Trevor Ruting

From gunboat diplomacy to peacetime exercises, the operations of the RAN have changed dramatically over the last 25 years. The following are just some of the major challenges facing us at this time, as identified by a number of contributors:

- the demands for flexibility in capability
- the long lead times for acquisition of major capital equipment
- the globalisation of military equipment supplies
- the continuing revolution in military affairs, and rapid change in technologies
- the diminishing ability to retain sufficiently skilled workers in barely viable industries or at sea (in uniform)
- probably the biggest challenge, the ability to forward support, given all the preceding, for long periods.

As Head of Maritime Systems Division (MSD) in the Defence Materiel Organisation (DMO), I wear the Royal Australian Navy (RAN) uniform and sit on the Chief of Navy's Senior Advisory Committee, but I report directly to and am held accountable to the Chief Executive Officer of DMO, which is a prescribed agency within the Department of Defence, and through him to the Minister for Defence. Importantly, I also have a "whole of life" responsibility, from input to capability development, then acquisition, and through in-service to final disposal for all Australian Defence Force ships, submarines and marine craft, but not maritime aircraft.

Typical Lifecycle and the Need for Flexibility

One of the common challenges we all face (unless we buy someone else's ships straight from their production line) is the long timescales involved in a typical frigate, destroyer or submarine lifecycle. Figure 1 shows, below the timeline, typical major events in one of our frigate programs (not batched).

If we examine some of the major deployments and operations that these ships have been involved with or that occurred during the overall time frame shown on figure 1, you will note the wide range of activities, from "hot war" elements like the 1990-91 Gulf War, to Southern Ocean fishery interceptions, to asymmetric threats like the terrorist attacks in Bali.

With these increasingly diverse activities, we are incorporating more upgrades and configuration changes to improve these ships' ability to respond to current and future activities across this broad range of threats and employments. These major changes include the fitting of Harpoon surface-to-surface missiles and Petrel mine and obstacle avoidance sonar, in the Undersea and Surface Warfare Upgrade Program; the Mini-Typhoon remote-controlled gun with TopLite electro-optical sight/target

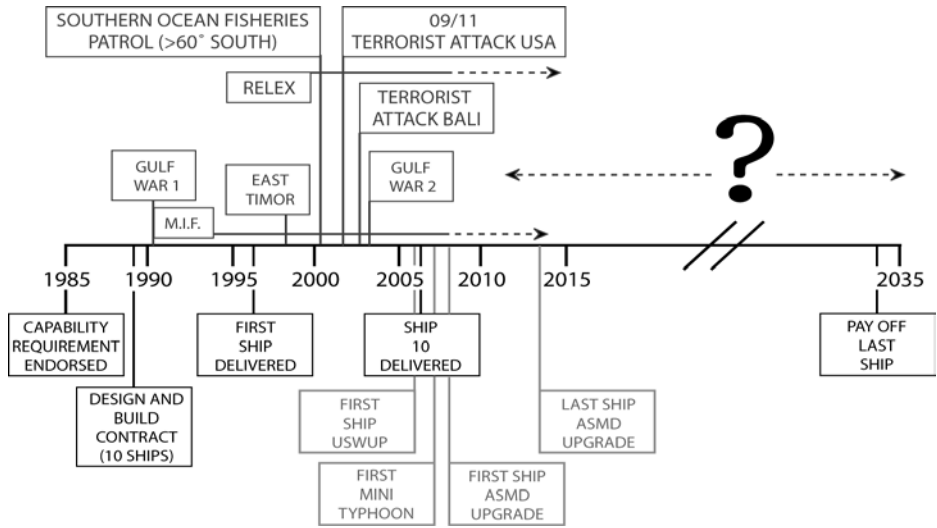


Figure 1: Major Ship Acquisition and Operational Timeline

indicator, and then the Anti Submarine Missile Defence (ASMD), including recent approval to fit the CEA Technologies developed phased-array radar-based solution.

Long Lead Times for Acquisition

The capability development can take up to 12 years from defined requirement to the delivery of the first ship. In Australia, the industry has the capacity to deliver one ship per year. In a commercial run of, say, 12 ships, the last ship is delivered 20 to 24 years after that initial capability requirement was endorsed. In the IT industry there is a 12 to 15 month generation change out. Control systems, weapons systems and communications systems are all in this space. Machinery has a longer lead time for generational change and for construction. So in many cases our contracting methods and those of industry have to be geared to take the changes in stride if we are to maintain the leading edge over the threats.

Capability Flexibility

Examples of typical frigate/destroyer flexibility include the ability to respond to:

- warlike activities (e.g. the Gulf) – for which this type of ship was originally designed, however, not exactly how the developers of the operational concept saw such deployments, since the time between the original threat analysis to the in-service date then the additional time to the actual deployment will have altered the nature and application of the threats to the platform
- support to peacekeeping (East Timor, Solomon Islands) – a non-traditional role for a warship. The loading of the ships will be different with perhaps a high stock of medical equipment, ammunition and equipment to support ground forces and the like

- search and rescue (Southern Ocean) – if a ship is not ice-hardened then the operational risk assessment must be clearly understood before sending platforms deep into the Southern Ocean. The effects of icing on systems performance and stability need to be fully understood by the crews. The evolutions of launching and recovering boat crews in such conditions is not far from what crews are trained for but the environment will stress a platform designed for warmer climates
- asymmetric threats, swarm boats, civilian fisheries. Constant vigilance below the radar and sensor horizons requires a different set of systems and procedures to ensure these risks are managed and the platform protected
- this flexibility is also required of other force elements such as:
 - pressing the hydrographic ships and coastal mine hunters into patrol boat duties (which the RAN did during recent Solomon Islands peacekeeping activities). Northwest oil platform patrols require a greater emphasis on the launch and recovery of ship's boats than does minehunting so the system for this evolution is not optimised
 - humanitarian aid (e.g. the 2004 tsunami) – loading ships with equipment and personnel not trained in the operations of a fighting ship and calling on the crew to operate outside the field of battle.

These few examples show that the capability flexibility required in the modern world of naval engagement means that the inherent capability flexibility of the modern warship has to be matched by the flexibility in operations and therefore our people.

Globalisation of Military Equipment

We have read much in recent times about the consolidation of European, UK and US equipment and weapons industry. For example:

- the US aircraft industry has reduced from a post-World War II level of approximately 70 manufacturers to today's three. The previous small players have formed into conglomerates, which are multinational broad-based manufacturers of specialised platforms, ranging from military to commercial and light aircraft
- consolidation of shipbuilders has happened in the UK and Australia. Where only 10 years ago there were shipbuilders and designers around the country, we are now down to a handful of specialist, single-contract manufacturers and designers with their designs coming, in the main, from overseas.

The consortium approach is also becoming more popular with Western navies, to share the significant development costs of new weapons and platforms across multiple customer countries. Examples include the Evolved Sea Sparrow Missile consortium of 10 nations, and the Joint Strike Fighter consortium with a similar number.

Export of individual equipment, especially sensors and weapons, is also becoming more widespread as countries have opted to build the platforms locally or select systems internationally rather than from a single country. An example of the wide range of equipment sources in RAN combatant are shown for the *Collins* class submarine in figure 2.

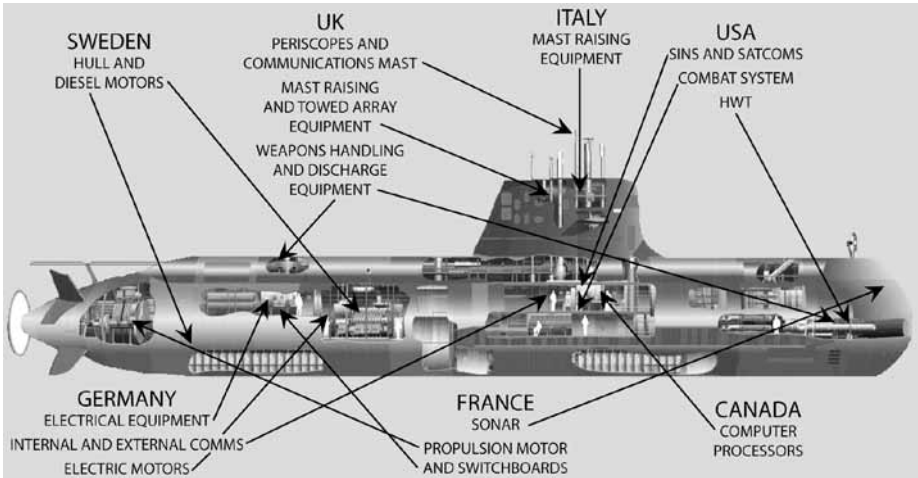


Figure 2: Collins class submarine – overseas sources of major equipments

Revolution in Military Affairs and Rapid Changes in Technology

The simple requirement by government for the military to have superiority in the battlespace will lead to attempts to revolutionise military affairs if for no other reason than industry retaining or increasing its portion of government expenditure. In the early 21st century, the revolution in military affairs relies on changes to technological capabilities in a range of areas, but particularly focused on the following:

- network centric warfare – command, control, communications, computers and intelligence (C4I) focus, data overload, latency. These, combined with an abhorrence of casualties, will require greater reliance on the central control of all forces in the field, thus revolutionising war in a similar fashion to the introduction of the tank, but over all three Services
- asymmetric threat environment – cyber-terrorism, “swarm” boats, mining, attacks on commercial ships, piracy. These threats call for flexibility in operations and fuller understanding by operators and procurers alike of the limits of the equipment we bring to bear
- increased development and use of uninhabited vehicles, including potential autonomous vehicles. Operation of uninhabited aerial vehicles to extend the surveillance horizon of fleets and individual platforms. Use of uninhabited surface or underwater vehicles to deliver payloads of weapons or surveillance is not new, but new and advanced technologies require the platforms that support them to have more complex control systems and different approaches to capability delivery
- nanotechnologies, forcing the size of systems down. The potential of these technologies to make current systems and capability thinking obsolete is high. We are bound to watch and embrace that, which is likely to decrease costs and increase effectiveness, yet we know so little of this area of research and development

- underpinning these changes in tactical approach are:
 - generational change in computer power, now down to less than 18 months. The average capacity of the computer chip has traditionally increased by 60 per cent each year since the late 1960s and the computational power by approximately 25 per cent, while the cost per function has decreased at roughly 30 per cent each year
 - long build and lead times causing obsolescence in systems. Yet the platforms do last longer. Experience with upgrades and refits shows that a platform such as a destroyer or frigate will go through at least four generational changes in systems. These are done in blocks or piecemeal as each system is evaluated for obsolescence, supportability and operational applicability.

There has also been an increasing use of commercial-off-the-shelf (COTS) equipments with perceived development and production cost reductions. There are often second order effects including the effects of hazardous materials that may be safe in commercial applications but produce unhealthy gases or by-products in close military applications such as submarines. COTS products also suffer from rapid obsolescence, which creates support challenges now and into the future for spares, replacement and software changes. The use of dual-technologies (military use of an element used in commerce) is providing the military with opportunities to share the cost of development of new technologies with industry.

Australian Demographics

As predicted by Dr Henry, Secretary to the Treasury, in August last year, the relative proportion of younger people (our typical recruiting and industry entry level) is set to decline.¹ This will make it more difficult to recruit new staff for both the RAN and defence industry, especially in the ever-challenging and changing technical skills.

As a result of a boom in the minerals and resources sector, there is currently a worsening shortage of skilled tradespeople and technicians in the Australian maritime industry. The RAN is having difficulty recruiting electronics technicians, for example.

These skilled workforce challenges come after a decade of pressure from government to contract out increasing levels of maintenance and in-service support. Cognisant of the demographic and industry skill base challenge, the government has implemented a program called Skilling Australia's Defence Industry (SADI), in which DMO partially funds the cost of industry taking on and training new staff. SADI contracts have been signed with Austal (for projects involving fast ferries, *Armidale* class patrol boats and a littoral combat ship contender for the US Navy) and with Australian Defence Industries (ADI).

Defence is not able to offer lucrative salaries to the higher end of the market nor is it currently prepared for the demands of the new generations of professional. Both aspects need to be addressed to stem the flow of skills out of both the Services and the civilian workforce or we are doomed to lose the label of "intelligent customer".

Extended Deployments

With extended deployments to the Middle East and North Asia, often for challenging operational profiles and tasks, the need to be able to maintain our ships and submarines has stretched both the RAN and industry. The need to be able to extend time between major maintenance sessions and to ensure that RAN sailors have the skills to conduct deployed maintenance and to provide spares support (remembering it is essential to have North Atlantic Treaty Organisation (NATO) stock codes and soon radio frequency identity tagging for item tracking and control) are all consequences. They also demand the ability to deploy support forward when required, and to use either the sea basing concept or land-based forward operating base for intermediate support.

Innovative Solutions

So what are the RAN and DMO doing to address these challenges? Many of these solution concepts (and practices) that I will briefly cover address more than one of the foregoing challenges and are often interrelated themselves, so I will not go through them in strict order:

First there is the MSD formal Renewal Program, which covers multiple parallel activities over the period 2005–2006 including detailed division-wide activities focused on:

- Communications Management – which aims at improving the communications between systems program offices and the corporate areas in particular, and the work flows through the team of Chiefs of Staff
- Management Systems Standardisation – implementing the corporately dictated systems and where they do not exist creating an environment where common functions are processed in the same way right across our business
- Ship and Submarine Depot Level Maintenance Management, which includes the contracting approach discussed previously
- Business Enterprise Architecture Modelling (the creation of a robust organisation) and including recent bulk recruitment, the outcome of which has two significant elements. The first is that we need to expend more effort in training our own staff and secondly that MSD, RAN and industry are all drawing from a single employment pool. The modelling will extend into the forward planning of our workforce and a full understanding of our training and development needs, particularly as we look at absorbing the sustainment functions for new capability like the Air Warfare Destroyer and the Amphibious and Afloat Support Ships
- Strategic Contracting Review – alongside the Procurement Improvement Program this initiative is looking into improving our contracting processes and procedures to deliver the products faster, better and cheaper
- Financial Management Reform – compliance as a prescribed agency is one burden but the managing of our business is to focus on forecasting and not the negative backward methods we have used in the past. I use the analogy of driving a car – it

is far easier to go forward looking through the windshield than through the rear view mirror

- Performance-Based Logistics – cross-platform contracts (Navy Fleet Support Unit Concept) where industry benefits through longer term and more holistic contracts and the RAN and DMO also benefit by helping sustain the capacity of industry
- longer term in-service support and maintenance contracts with significant benefits to industry to improve staff retention and skills, improve efficiency (including learning efficiencies, etc.) and with a need to focus on improving equipment and system reliability:
 - the Submarine Through-Life Support Agreement (15 + 5+5 years)
 - the rolling five-year performance-based integrated support services contract that the Mine Hunter Coastal is about to enter
 - Surface Combatant Type A/B contracts – three to five years for each ship between dockings (and possibly including docking maintenance period).

The DMO-wide SADI program that I mentioned before is a policy initiative announced by the government in 2004 to address a significant shortfall in the quantity and quality of skills available to defence industry to ensure that the Australian Defence Force has the capabilities it needs to defend Australia and its national interests.

Another initiative that DMO is now using to respond to rapidly changing operational requirements is rapid acquisition. However, there have been a number of lessons learned during recent Middle East deployments including:

- the approved method for procuring equipments and deploying them rapidly (in weeks rather than years) – they reinforce that this will only be practical for COTS and military-off-the-shelf equipment level changes
- challenges when installing equipment into ships. Integration, radiation hazard, EMC/EMI, training and logistics are but some of the matters we need to deal with, as for minor capital project approvals
- overseas navy releasability of data and equipment – which can also be a time challenge
- this also raises the topic of other consequences of rapid configuration change processes:
 - challenges with DMO and RAN development and approval processes plus, of course, funding
 - need for certification and data from industry, suppliers and manufacturers.

The Commonwealth occupational health and safety regulations place an individual and joint responsibility on designers, manufacturers, suppliers, installers and users. To satisfy the Chief of Navy's responsibilities as a user/operator and DMO's role in the supply chain, the Chief Naval Engineer developed the Naval Technical Regulatory Framework that includes a safety analysis using appropriate design and operational data. This places a significant focus on DMO and industry suppliers working together and also requires industry to provide designers'

certificates. Hence, industry suppliers, designers and manufacturers should not be surprised by DMO requirements for suitably detailed information.

Cognisant of the long lifecycle of our ships and submarines, we have introduced a major ship/submarine Continuous Improvement Program concept. This is being developed in conjunction with Capability Development Group staff, especially for the *Collins* class submarines. This concept provides the ability to consolidate a number of individual equipment, system and platform improvements and upgrades into a larger package for government approval, then progressively to implement each element at shorter notice.

Conclusion

Many of the challenges are probably common in other nations, but the way we are dealing with them may be uniquely Australian. The ultimate aim is to keep our warfighter with the most up-to-date equipment while recognising our responsibilities to government, the occupational health and safety focus, the supportability of the equipment and the disparity between equipment and platform obsolescence. We have two major risks in our business: the first is that someone will be killed and the second is that an enemy will not. The balance is the essence of the modern RAN.

Classification and Project Risk Management Providing Effective Support to Procurement and Upkeep

Vaughan Pomeroy

There is a massive program of change across the defence sector in response to the challenges posed by the New World Order and the ever-present pressure on procurement and support budgets. The consequence, in procurement and support practices for naval platforms, is to seek transformational change to maintain the required flexible maritime capability at an affordable cost. For navies that seek to play a leading role in future maritime military operations, there is a concentration on the acquisition of assets, which are not only versatile but have excellent capabilities for expeditionary warfare and power projection. With asymmetric threats high on the strategic agenda, there is less emphasis on traditional naval doctrine that anticipated sea battles between surface fleets of major powers. The demands of maritime security tasking place additional pressure on constrained defence spending plans, to provide for policing the coastal zones and major trading routes and to protect maritime resources. The changes necessary to provide the desired capability at an affordable cost will, inevitably, be accompanied by unfamiliar and additional risks as the processes and relationships adjust to reflect the new business model.

In this changing defence environment there has been a great deal of interest in examining how other sectors of industry manage their business. This has involved examining how prospective purchasers of merchant ships prepare their specifications, arrange tendering and contract for new construction. The independent supervision, or oversight, of design and building brings into consideration the role of classification societies and national administrations.

The approach to maintenance, upkeep and refit of naval ships in commission is compared with the way that the commercial shipping sector and other industries are organised. The result is that the traditional naval and defence sector practices are being challenged and, in many cases, changed in an effort to reduce the cost of procurement and the cost of ownership. The result is to make the defence spending requirement more affordable.

The technologies employed in modern merchant ships are increasingly sophisticated. The adoption of proven technologies can provide a lower risk opportunity for the navy, provided that full account is taken of differences in the operational profile. Furthermore the commercial shipping sector demands very high availability and the competitive market pressures ensure that cost-effective solutions deliver the required performance are selected for the business

performance necessary for survival and growth. The phrase “commercial practice” is being used more often in naval circles to indicate the adoption of some of the processes and practices from the commercial shipping sector. However, there is no single definition of what this phrase means.

One of the practices that has already been transferred to the naval sector is the concept of classification, with the basic commercial sector philosophy adapted to suit the demands of the naval customer. Classification is absolutely crucial to the determination and verification of standards for design, construction and maintenance for commercial ships. The role of classification societies in the commercial shipping sector is complex and it is evident that, while understanding has increased significantly over recent years, many naval and defence staff fail to grasp the full potential of classification or, indeed, its inherent limitations. The introduction of significant involvement of classification societies into naval projects represents another aspect of the changing naval business environment and its challenges and opportunities.

As with any change, there will be some unfamiliarity and some associated risks and it is the aim of this paper to provide a background resource for defence project staff so that the maximum benefit can be realised through the intelligent application of classification processes.

The classification society and the processes of classification remain unfamiliar to many people currently active in the naval ship sector. It is generally understood to be synonymous with the regulation of commercial ship safety in conjunction with the national and international regulatory regimes for merchant shipping. In fact, the origins of classification were principally concerned with providing sound advice on the condition of ships so that underwriters and merchants could assess the risks to which they might be exposed. The increasing adoption of classification for naval ships brings to the naval sector an established commercial sector safety management model as a convenient benchmark standard. Through the application of the classification process to the supply chain, it also affords valuable support to the management of the risks faced in procurement and upkeep projects. This paper also describes the continued development of the classification system, including the rules, to specifically address the needs of procurement and support projects for naval ships. The opportunity offered to navies and suppliers is a different approach to the selection of standards and specifications and the verification of compliance without constraining innovation. The paper presents an approach to the definition and implementation of an appropriate standards policy throughout the platform lifecycle, with the benefit of established practices for demonstrating conformance with the requirements and, thereby, reducing project risk.

Background to Classification

Classification has its origins in the coffee houses of London in the 18th century when surveyors, generally retired experienced masters, assigned different “classes” to ships and their equipment, so that underwriters and charterers were able to

assess their risk exposure with less uncertainty. However, the current classification society is quite different. The modern classification society is a highly competent technical organisation that operates a worldwide system of classification to provide the commercial shipping industry with an independent assurance of quality and safety.

The major classification societies have developed considerable skills in naval architecture and marine engineering over a very long period of continuous activity. They also maintain and publish standards: the rules for the hull structure, propulsion and steering machinery and essential auxiliary systems for a wide range of commercial ship types. These rules reflect the corporate intellectual capital, in both the published form and more particularly in their application within the classification process. Furthermore, the skills and knowledge of the classification societies are recognised in the international regulatory community and the International Association of Classification Societies (IACS) plays a major role within the International Maritime Organization (IMO), with consultative status as a non-governmental organisation.

Classification depends on a published set of rules which define the requirements for the issue of a Certificate of Classification (COC). The rules have been developed by the classification societies with the active participation of a wide cross-section of industry through their technical committees. In the merchant ship sector, the rules are also influenced by agreed Unified Requirements that are adopted by IACS, and implemented by all 10 member societies, subject to the approval of each member's technical committee. The merchant ship safety regulatory regime also depends on national maritime legislation of the relevant national administration for the ship, which enacts the requirements of the international conventions adopted by the IMO.

The requirements set down in the international conventions and the classification rules form a coherent set of standards for maritime safety. In many cases the national administration will authorise the classification society to act as a recognised organisation on its behalf to issue the statutory certification in addition to the COC. This has, itself, become essentially a statutory requirement since the *International Convention for the Safety of Life at Sea 1974* (SOLAS), states in Chapter II-1, Regulation 3-1 that:

In addition to the requirements contained elsewhere in the present regulations, ships shall be designed, constructed and maintained in compliance with the structural, mechanical and electrical requirements of a classification society that is recognised by the administration in accordance with the provisions of Regulation XI/1, or with applicable national standards of the administration that provide an equivalent level of safety.

So, classification is founded on:

- the development and publication of a set of technical standards, which define the essential safety requirements for ship design and construction

- the uniform implementation of those standards through a regime of survey and independent examinations throughout the lifecycle.

Of course, maritime technology in all sectors is continually developing and the rules must be kept up to date. The rules are also updated to reflect the experience of ship operations. The major classification societies undertake research and development that is primarily aimed at maintaining their rules. Where new technology is proposed it is desirable that the classification requirements are defined prior to widespread application. In some cases sufficient knowledge can be gained during the product development phase for the definition of classification requirements, although in some cases it will be necessary to consider the initial rules as provisional.

The importance of classification societies in the modern commercial ship safety regulatory regime leads to close scrutiny. IACS operates a quality audit scheme for its members. Furthermore, the classification societies are themselves audited regularly by the European Union, by the principal national administrations and, often, by an independent auditor. Lloyd's Register is assessed against ISO9000 by the British Standards Institution Quality Assurance. The regulator is, therefore, closely regulated through audit by those who delegate authority and by others.

The Classification Process

The certification of compliance with the requirements of international conventions (SOLAS, MARPOL, etc.), and any additional requirements imposed by the national administration under whose flag a ship is registered, follows a similar process and this may also be carried out by the classification society acting on behalf of the national administration. The process is an important element of the classification model and involves the following key elements:

- the review of the design, as indicated on the designer's drawings, to ensure that the ship satisfies the rule requirements applicable to design

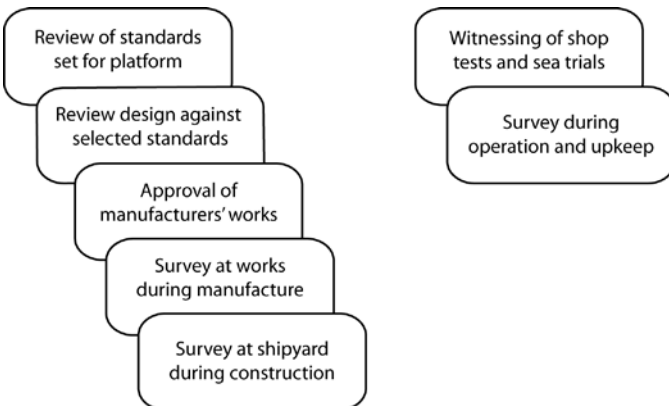


Figure 1: Key elements of the classification process

- the review and approval of key manufacturing works for the manufacture of materials and components
- the survey of key materials and components during manufacture
- the survey of the ship during construction and the installation of machinery and equipment
- the witnessing of testing at manufacturers' works and of the dock and harbour trials of the completed ship
- the survey at prescribed intervals during the operating life and during repairs and alterations.

The survey activities during the design and construction phase are defined in scope and manner in the rules and regulations. On delivery the COC is issued to indicate that the ship complies with the requirements set out in the rules. It is not a form of guarantee, in the strict legal or commercial sense, but the process does give an independent assurance that the requirements of the rules have been satisfied and it gives confidence in the ship. Once in service, classification is maintained, as are other forms of certification, through a continuous survey regime that is defined in the regulations.

Classification rules have become an essential part of the specification of the design of a ship and it is difficult to imagine how a commercial shipowner could prepare a specification for a merchant ship without reference to these rules. However, the ship safety regulatory framework includes standards both within the scope of classification and the international conventions, which together form a coherent set of requirements. When discussing the development of a classification regime for naval ships it is important to recall this interrelationship as many of the pitfalls relate to selecting an incomplete standards package by failing to recognise the entirety of the merchant ship safety regime.

The process of independent review and assurance is fully transferable to any business sector as has been demonstrated by the adoption of similar schemes in the offshore industry, for example. The essential message is that classification is not just about the provision of a set of rules. The rules are an essential part but classification is a process and adopting this process can produce significant benefits to the procurement and maintenance of naval ships.

Application of Classification to Naval Ships

During World War II, the Royal Navy (RN) procured a large number of warships, specifically corvettes and convoy escort frigates, and auxiliary vessels that were constructed in shipyards that usually built merchant ships. It was natural that these were designed and built to standards that were familiar to the shipyards and so the classification societies, Lloyd's Register of Shipping and the British Corporation, played a key supporting role to the Admiralty constructors.¹ The ships built were described as following merchant ship practices. Some were based on commercial ship designs such as the *Flower* class corvettes, which were developed from a whaler by Smith's Dock.

The extensive construction program involving classification societies eventually included the *Loch, Bay* and *River* class escort frigates, which included HMAS *Barcoo*, and her nine sisters. Although not intended for a long life, many of these ships remained in service for the early post-war period, with the last of the RAN ships going to the breakers in 1972 after steaming more than 342,000 miles. One ship, sold to the Royal New Zealand Navy (RNZN), survived another three years before disposal. The evidence, therefore, is that design and construction in accordance with merchant ship practices does not necessarily preclude a long service life in naval use or imply inferior capability.

In looking at ship types where there is no obvious link with merchant ship practices, it is worth considering the aircraft carrier, where again the evidence from World War II classes reinforces the conclusions of the previous paragraph. It had become clear that additional aircraft carriers would be essential for trade protection and that modified warship hulls would not provide the necessary large internal spaces for hangars and workshops.² Consideration was given to adopting merchant ship hulls, with specific interest in the *Winchester Castle*, but eventually the light fleet carriers, the Woolworth carriers, were developed with Vickers providing the design. The expectation was for a life of three years or the duration of hostilities, and the design used merchant ship materials and construction techniques to speed production. In this case merchant ship practice also extended to structural strength and internal sub-division, with the latter depending on the integrity of transverse bulkheads.³ A two-compartment flooding assumption was made, following merchant ship practice. The light fleets of the *Colossus* and the upgraded *Majestic* classes proved to be very successful and long-lived designs, with three serving in the RAN as HMA Ships *Vengeance*, *Sydney* and *Melbourne*. In terms of longevity, *Vengeance* served until 2001 with the Brazilian Navy as *Minas Gerais*, and is currently up for disposal as the last surviving light fleet carrier.

Again the evidence is that successful warships have been designed and constructed in accordance with merchant ship practices and, therefore, the adoption of commercial standards may not present a significant technical risk.

There has been a renewed interest in the application of the classification process to naval ships over the last decade. This follows the involvement of classification societies in the procurement and upkeep of naval ships of merchant ship types, such as oilers and auxiliaries. Lloyd's Register has provided classification services for replenishment ships and naval oilers, including HMAS *Westralia* and the latest *Wave* class fleet oilers for the RN. They have also provided classification services for a large number of patrol vessels and minor warships for many years.

The impetus for Lloyd's Register to develop a classification regime aimed specifically at naval ships, including a comprehensive set of rules focused on naval ships up to the largest ship types, was the recognition of the shortcomings of the merchant ship classification regime applied to the procurement and upkeep of increasingly warlike ships for the RN – particularly the HMS *Ocean* Landing Helicopter Dock (LHD) and HM Ships *Albion* and *Bulwark* Landing Platform

Dock (LPD) and similar ships for other navies. Difficulties arose, not least due to the absence of the equivalent to the merchant ship international convention requirements. Lack of specific rule requirements relating to key features that were commonly found on naval ships, of which there is no direct merchant ship equivalent, reduced the value of classification to the RN.

The development of the *Rules and Regulations for the Classification of Naval Ships* has been directed at filling the gaps that had been identified as significant shortcomings and thereby to remove a barrier to the adoption of classification for naval ships.⁴ The development program has been continued by Lloyd's Register and the most recent additions have been:

- the development of high-level requirements that deal with the aspects of design and construction that are covered by international conventions, including fire safety, escape and evacuation, and pollution prevention. The aim is to provide a clear but non-prescriptive statement that defines what has to be achieved to be equivalent to internationally agreed safety standards without restricting the solution
- the sections relating to mechanical and electrical engineering systems have been enhanced to include requirements for additional systems which are essential to the function of the ship, including operations such as replenishment at sea
- design requirements for military operations, such as aviation and ramp operation at sea have been included
- in cooperation with the UK Ministry of Defence, rules for the design and construction of trimaran hull forms.

Supplementary guidance for designers and project managers has come from expert focus groups. Although this does not form part of the standards against which a ship would be assessed it is, nevertheless, valuable and it is intended that it will be developed into a usable format and, if appropriate, be published as a supplement.

Lloyd's Register intends that the *Rules and Regulations for the Classification of Naval Ships* will be further developed to take account of the experience gained with new construction projects and with ships in service. The rules will also be developed to take account of new and emerging technologies as soon as they have reached sufficient maturity to permit the development of standards. Wherever possible the *Rules and Regulations for the Classification of Naval Ships* will replicate the equivalent requirements for merchant ships, providing they are consistent with the military application, so that the naval community will be able to benefit from the use of standard materials and equipment without incurring a defence premium.

The transfer of standards that have been used with success in a merchant shipping application can help to reduce the risk in the technology transfer. Of course the transfer of experience to the rules is not just one way, and the merchant ship rules will benefit from experience with naval ships. By way of example:

- the adoption of high power density diesel engines of similar types to those used in naval applications for high-speed passenger craft

- the adoption of electric propulsion solutions in naval ships gaining the benefit of recent experience in passenger ships and other commercial ships, noting that there are key differences – not least in the available space for propulsion motors and the variability of the operating profile
- the interest in podded drives for naval ships requiring a high degree of manoeuvrability based on commercial sector experience
- the selection of gas turbines for power generation on passenger ships using units developed for the propulsion of naval ships
- the introduction of higher voltages on naval platforms, following the practices adopted on commercial ships with additional precautions to suit the military system requirements.

However, it is imperative that the operational profile is considered and compared with that for which there is good experience. As an example, merchant ships tend to operate at relatively high power during ocean transits without major load variation, whereas naval ships tend to operate at a cruise power with occasional bursts at high power. The consequence of this difference in operating profile is illustrated by the failure of two sets of similar main propulsion gears: on the P&O liner *Strathmore* pinion failure occurred after a few months of operation close to the rated maximum power, whereas a similar failure on HMS *Sheffield* occurred, after many years of trouble-free operation, under high power operation during the action against the *Scharnhorst*.⁵

Lloyd's Register is taking a keen interest in the development within NATO NG/6 of a Naval Ship Code, which aims to address the issues covered by the international conventions for merchant ships and to set out principles for certification and surveys to verify compliance with the standards. Where necessary the relevant parts of the rules – particularly those developed to fill the gaps normally covered by international conventions – will be amended to align with the final version of the Naval Ship Code, subject to endorsement by the Naval Ship Technical Committee of Lloyd's Register.

Safety Regulation and Value

Safety regulation is sometimes treated as an additional burden on the “business”, particularly when it is being introduced. Experience with a number of navies that are developing their safety management systems suggests that there is considerable resistance. Conversely, there is very little resistance to the adoption of risk management into projects and operations. The evidence from a wide range of industries is that the management of risk is considered to be a business imperative but regulation imposes an external control, which is a constraint, and this constraint becomes more invasive if the regulator considers the management to be weak or ineffective. This route is very clear when the financial services sector is studied.

The maritime industries have managed to retain a high level of self-regulation and the classification society is a reflection of this state. Safety regulation can, however, take a number of forms and it is easy to identify the impact of accidents in

determining the regulatory response. There is still a culture of compliance, which works on the basis that the prescriptive requirements have been met and that this is enough. The challenge to the safety regulator is to provide an effective regulatory regime that recognises active risk management, provides prescriptive requirements and verification where this is an effective strategy, and delivers benefits to the operational managers.

The principles of good safety regulation mean that any requirements must be applicable to the smallest companies, since the maritime industry depends on very small suppliers for many critical components, and the benefits of the requirements must justify the total costs of implementation. Prescription can be a constraint on innovation and encourage a compliance culture, neither of which is desirable, and so performance standards are often an appropriate solution for the regulator.

The challenge to the safety regulator is to demonstrate that by following the safety management regime, there are benefits to the project over its lifecycle that outweigh the costs. The detractor argues that safety regulation adds visible costs, in terms of the charges made by the verifiers such as classification societies and by bureaucracy. The latter may result in inevitable delays and loss of control by the project managers. From the perspective of the professional individual, responsibilities and competences are challenged. However, the good safety regulator is able to demonstrate that there are real benefits to the project as the discipline within the verification processes provides an effective approach to active management of the project technical risks. The safety regulatory regime will also support the through-life safety management and provide a benchmark with a civil sector classification standard.

Process and Project Risk Management

The desire to provide best value in both procurement and upkeep of naval platforms brings with it an increased focus on the identification and management of project and program risks. However, with complex naval platforms it is argued that the application of a well-chosen and clearly identified set of standards, and particularly the classification process, can be cost-beneficial in managing the project risk profile. This is principally associated with the management of the technical risks that tend to manifest themselves during the design and construction phases, and the safety risks that become more apparent during the operational and ultimate disposal phases.

The choice of the contractual route will influence the project risks, including those related primarily to technical issues and safety. The wider use of private sector contractors to undertake tasks previously kept under the direct management and fiscal control of the navy offers both opportunities and threats. Changes in the initial procurement process for naval platforms include the concept of contracting against a capability requirement, allowing a greater possibility for innovation in the response by the contractor. In many cases this is accompanied by the transfer of greater responsibility, such as the role of design authority, to industry. In principle,

this results in a transfer of risk to the industrial partner. Once in service there is a move towards establishing long-term contracts with support contractors, who provide full logistic support throughout the operational life. Additional factors – such as arrangements whereby naval platforms are actually owned by the private sector and leased to the navy – give further options in delivering the required capability within the available defence budget. The changes affect not only the commercial contracting practices but also the important working practices and relationships, all of which change the project risk profile.

Seeking best value is often synonymous with competition for contracts. This may be against well-defined platform specifications but in many cases involves competition between similar concepts that meet most of the capability requirements. Comparison of competing offers is not straightforward unless there is some common baseline. The use of standards that underpin design and construction can provide a rational baseline for determining that all competitors do meet an acceptable minimum standard. In this regard the application of the *Rules and Regulations for the Classification of Naval Ships* as the baseline requirement for the ship, with a suitable selection of class notations and any critical specific requirements that must be satisfied (owner's requirements), could provide a suitable approach to creating a standard to ensure equality of proposals.

The rules for classification of merchant ships obviously have to cover a large range of ship types and different arrangements of engineering systems. The ship type and other key descriptions are identified by class notations that define which parts of the rules are to be applied. For an oil tanker, different sections of the rules are applied than would be the case for a passenger ship. The *Rules and Regulations for the Classification of Naval Ships* are similar but the options available are greater. The selection of the ship types and the key characteristics are essential tasks that must be completed in discussion with the appointed classification society, early in the project development cycle.

The adoption of a standards policy and the selection of an appropriate set of standards can be a complex task. Lloyd's Register advocates an approach based on workshops to develop the requirements and to define the scope of classification at a very early stage in the project. Correct application of the *Rules and Regulations for the Classification of Naval Ships* requires many choices to be made in selecting the relevant rules through class notations. It is unlikely that the greatest benefits will be achieved if the selection of the standards is not sufficiently thorough and rigorous.

A major technical risk is associated with the introduction of new technologies that are not familiar to the navy. The distinction in technical terms between naval platforms and merchant ships, at least as far as marine equipment and key systems are concerned, is becoming less distinct.

There are, of course, distinctly different requirements on system design and configuration for military reasons, such as shock resistance and the ability to reconfigure and reduce the impact of damage. It is, perhaps, the system that

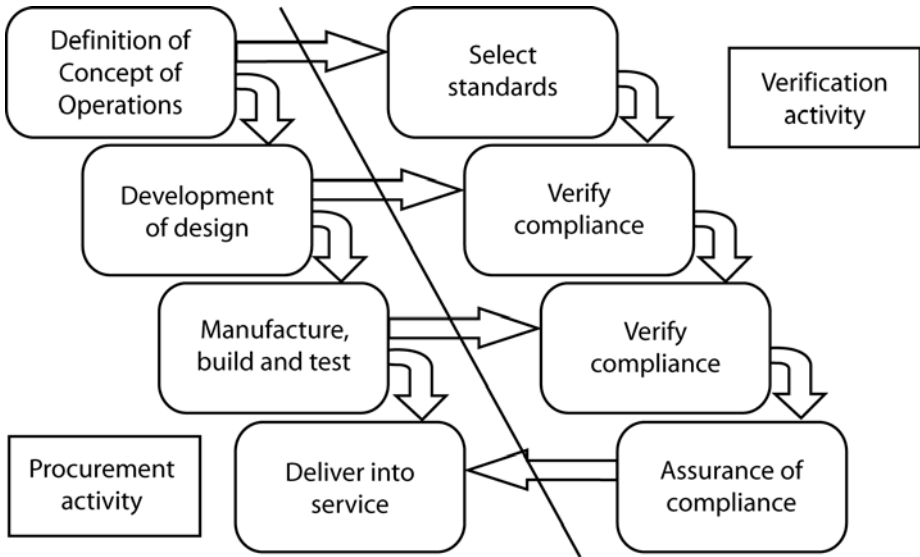


Figure 2: Relationship between procurement and verification

is military, whereas a lot of the individual equipment can be very similar to that used in the commercial sector. In order to reduce program risk there is a lot of interest in taking proven technology into the next generation of naval platforms. This means that more reliance will be placed on marine equipment intended for the larger commercial sector. Successful adoption of commercial-off-the-shelf (COTS) equipment, of course, implies a thorough assessment of any critical differences in the anticipated operational profiles.

Lloyd's Register has developed considerable experience from the developments in the merchant ship market and its practice is to develop appropriate rules at an early stage to set out the essential requirements for safe operation. The rules are developed from available information and with the active involvement of industry. The *Rules and Regulations for the Classification of Naval Ships* also take into account the changes made to the equivalent rules for merchant ships and so the benefits of the experience of new technologies are transferred through the rules to the naval sector.

Further changes at the project level, where the participation of a classification society can provide real benefits, are related to the changing marketplace for naval ships and their components. New players are becoming involved in the supply chain, and often for critical components. The classification process, as operated by Lloyd's Register, makes considerable use of approval schemes, which involve a critical review of manufacturing facilities and the manufacturer's quality control arrangements. The schemes cover materials and the principal components and equipment, and the operation of these schemes and the general survey at manufacturers' works, necessary for classification, gives Lloyd's Register a good insight into the capabilities of suppliers.

As procurement moves through its various stages, it is important that the activities associated with verifying compliance with the specified requirements progress in step. By progressively compiling the records of verification the risks are contained and the assurance of compliance on delivery can be expected with greater confidence.

The transformational changes in procurement and upkeep contracting involve changes in relationships, technology and aspirations, but the anticipated gains will only be achieved if the project and process risks are successfully managed. The classification processes are well established and offer a number of risk mitigating features founded on the published standards for ship design, construction and maintenance, as well as the rules and independent assurance resulting from intervention by professionally qualified and experienced people.

Platforms and Standards

There is a widely held view that standards constrain the designer and inhibit innovation, but standards are also an essential part of the communication between the buyer and the seller. However, the selection of the set of standards that is applied does demand careful consideration to ensure that those specified are directly relevant and appropriate to the particular case. Some standards can be justified for reasons of interoperability or safety or to reflect operating profiles but others can only be justified by the preference of the owner, which may also reflect the way we do things. Whatever the underlying reason, standards have a central role in defining the relationships within any contract and provide the cornerstone against which contractual performance can be determined.

In establishing the *Rules and Regulations for the Classification of Naval Ships*, Lloyd's Register set out to provide, for engineering systems, high-level standards that define the essential functions at system level and allow greater freedom in solution. This differs from the more prescriptive standards that are used in the commercial sector, not least in the International Conventions. It also differs from the parts of the rules dealing with the hull structure, which take the form of a more complete design standard, following the well-established principles associated with the equivalent rules for the hull structures of merchant ships.

The *Rules and Regulations for the Classification of Naval Ships* are framed in such a way that for a particular ship a specific set of standards can be defined by selecting the appropriate class notations, which in turn point to particular sections of the rules. The rules also allow the use of alternative, perhaps national or defence standards, where these can be shown to be equivalent in terms of safety provision. The selection of the total standards set has to be agreed by an appropriate person on behalf of the navy.

In the *Rules and Regulations for the Classification of Naval Ships*, Lloyd's Register adopted the concept of a naval authority as being the "person" who takes overall responsibility for defining and accepting the definition of the standards set. This role may be the same as the naval safety authority, if there is a clear safety management

system in place, such as in the RN and the RAN, but is more likely to have a wider remit for the entire platform capability.⁶ The selection of standards must be entirely consistent with the platform capability requirements and any constraints, such as requirements for interoperability and safety. The standards must also be entirely consistent with the intended operation of the platform so that, for instance, the fire safety arrangements in terms of any fire detection and containment arrangements and the provision of fixed and portable firefighting systems are compatible with the training of the ship's company in firefighting and the specific inventory of hazards that is anticipated.

The *Rules and Regulations for the Classification of Naval Ships* allow, wherever possible, the use of commercially available marine equipment. Additional military requirements, such as shock qualification or short-term sprint ratings, can be added to the specification where these are specifically necessary to meet the capability requirements. The stepwise addition of a military premium is, therefore, possible so that cost-capability trade-offs can be made during the standards selection process and before any contracting is in place.

The classification process model is consistent with taking the specified requirements, as defined by the appropriate class notations, and taking cognisance of any agreed alternative standards, and providing assurance through-life of compliance with these baseline assumptions. The effort and cost expended in the selection of standards is recovered by reduced project and program risk downstream through the increased clarity and transparency of a clear standards policy, reinforced by the evaluation of the cost implications of those policy decisions at the earliest practical stage of the project. Without a clear standards policy or where use is made of inappropriate standards, the project and program risks increase as the supply chain fails to understand the expectations of the navy.⁷ Without doubt, the experience of Lloyd's Register suggests that this early stage of the project is best undertaken with the classification society working closely with the project team, generally through a series of workshop sessions, to develop the right standards set for the particular platform.

The application of a robust process to assure compliance with standards provides a cost-effective route to substantiating the safety case, where such an approach is adopted to support a safety management system. In constructing the safety case, a large number of hazards will be identified and the associated risks determined. Risk control measures will be assigned, which may involve training or engineering solutions. In many cases, the risk will be minimised to a level that is acceptable and as low as reasonably practicable, through the application of accepted industry standards. The safety case is a through-life living document that is revisited and updated as necessary with changes in operational requirements and alterations to the platform or its maintenance regime. This necessitates a robust system for managing the through-life standards compliance, which is provided by the classification process with full documentary traceability. The link between standards and verification of compliance may at first sight appear somewhat

incongruous. The safety case regime is often taken to be a route that frees the designer from adherence to a prescriptive, and by inference constricting, system. Experience in other industries, notably the offshore industry, has shown that where risks can be shown to be mitigated and meeting the “as low as reasonably practicable” criterion, in many cases it is sufficient to show that equipment has been designed and constructed to a recognised code or standard. The value of the safety case lies in the inclusion of operational issues and the living nature of the documented safety case.

Through-life

Key decisions are made during the earliest phases of any prospective naval project. When a classification society is engaged it is often at the time the procurement contracts are tendered, by which time the framework has been defined, though not necessarily in the most beneficial manner. During the concept study phase, considerable advantage can be gained from discussions of the standards that might be applied and the cost-capability implications. The *Rules and Regulations for the Classification of Naval Ships*, unlike many sets of standards, represent a consistent and coherent package, but with options that must be selected by the Naval Authority. Throughout the project phases, the classification society essentially works as an independent third party on behalf of the navy, irrespective of the contractual arrangement for engagement of the classification society. The navy is the only direct beneficiary of the services provided by the classification society, although the designer and builder may find added value. The situation is different from the commercial sector where the classification society is usually contracted by the shipbuilder during construction and by the shipowner after delivery, but where the classification society certification is of great importance to national administrations, charterers and underwriters, in addition to the shipowner. Working on recent naval projects, Lloyd’s Register has found that it is imperative that the classification society is engaged early so that the selection of standards can be properly informed.

As the project advances, the design is developed against the agreed standards and the capability requirement. The classification process offers opportunities for reducing risk through progressive assessment of the design to establish compliance with the *Rules and Regulations for the Classification of Naval Ships* and agreed alternative and additional standards. This can often be achieved by placing classification society design review staff alongside the designer to minimise delay. The classification process is based on the premise that the design must be demonstrated to satisfy the rules prior to the commencement of construction so that a clear baseline is established. While changes may occur during the later project phases, these can be assessed against the known baseline to give assurance that the original intent is not compromised. It may be prudent to carry out the design reviews at key decision stages throughout the design development so that any lack of compliance is found at the earliest opportunity and corrective action taken or appropriate mitigating measures put in place to manage the risks associated with

Support through life

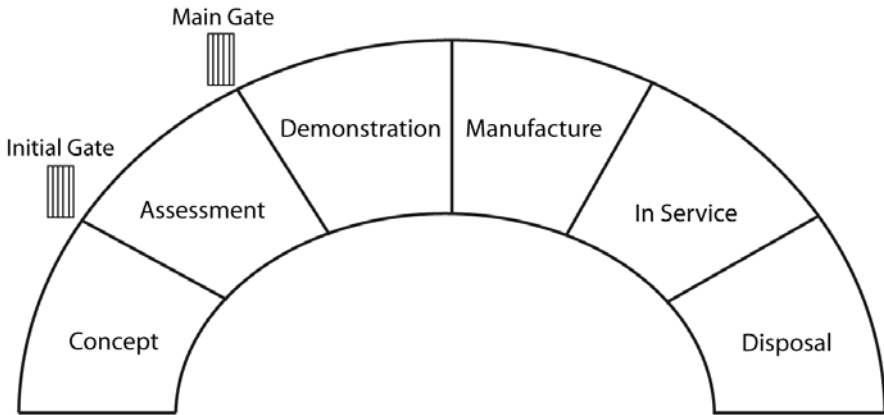


Figure 3: Project phases based on UK Smart Acquisition

the non-compliance. Multiple reviews obviously incur costs but may yield benefits in terms of overall project risk management. The process is valuable to the ultimate beneficiary but it is also helpful to the various levels of contractors, who may hold a level of design authority and the associated risk, since the likelihood of future identification of non-compliances and correspondingly expensive remediation is reduced.

The most obvious involvement of the classification society is during the manufacture and construction phase of the project, simply by the engagement of surveyors to attend at various locations to carry out the classification processes. Classification surveys are not intended to replace either the quality control procedures of the manufacturers and constructors or the supervision of the navy. The owner's supervision, which will involve a large number of matters that are not covered by standards and compliance, is aimed at ensuring that the ship, when delivered, meets the expectations of the navy in all details and that contractual requirements are met.

The classification process will give an assurance that the requirements for materials, components, equipment, construction, installation and testing are met through a program of survey. The use of suppliers with previously approved facilities and of equipment previously Type Approved, against the relevant test specifications, will also reduce the risk exposure. The certification of materials and components throughout the supply chain provides clear traceability.

Once the platform is completed and the commissioning activities begin, classification provides an objective and independent oversight of the test and trials program. The *Rules and Regulations for the Classification of Naval Ships* define certain key survey requirements and additional oversight tasking may be added by the navy. Within the test and trials program there will be requirements that relate

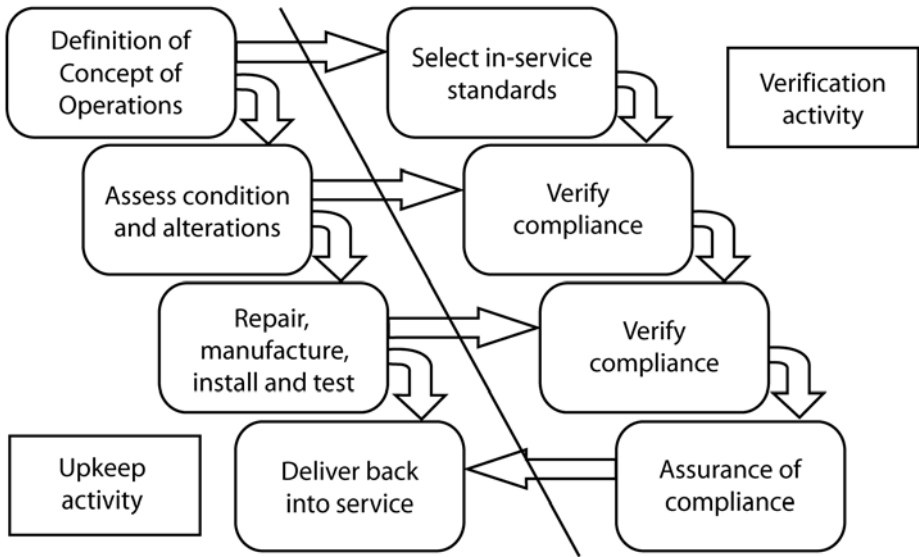


Figure 4: Relationship between upkeep activity and maintenance of verification

to demonstrating that the design assumptions identified with Failure Modes and Effects Analysis and the risk mitigation measures incorporated as a result of the analysis are correct and complete.

At final delivery, the classification process results in the completion of surveys and design reviews that confirm that the requirements of the *Rules and Regulations for the Classification of Naval Ships* and any agreed additional requirements have been complied with and that the appropriate statements, in the form of CoC, are issued. A traceable route will be available through design appraisal documentation and other certificates to support the overall CoC, noting that this certificate may cover the elements that, for a merchant ship, would be covered by statutory certification issued by or on behalf of the flag administration. At delivery a complete record of the ship, as built, has been assembled as the baseline for any future changes or reassessments.

The building of naval ships under a classification regime has found some measure of acceptance, as the assurance given by independent design review and survey during construction is seen to give clear benefits, which are of greater relevance with the introduction of the *Rules and Regulations for the Classification of Naval Ships*. Lloyd’s Register is currently or has recently been involved in the building of a wide range of naval ships to class, including aircraft carriers, destroyers, corvettes, landing platforms, patrol boats and auxiliaries.

However, the adoption of the “maintenance in class” regime by navies has been less enthusiastic. This is despite Lloyd’s Register considering that equally valuable benefits in terms of reduced cost of ownership can be obtained with reduced risk through application of the classification process to the in-service phase, especially during upkeep, refit and conversion. The principal risk mitigation benefit of through-

life involvement is the assurance given that any repairs, alterations and additions do not compromise the original baseline standards, so that proposed changes are reviewed for compliance with the agreed standards and all work is surveyed to give an assurance that appropriate standards are satisfied.

The regular periodic surveys, carried out by professional surveyors with experience of surveying ships in service to determine condition and to advise on necessary and suitable repairs, also provide a key risk mitigator. The benefits appear to be greatest where the naval ship is being maintained under a contracted support arrangement, since the interests of the contractor and the navy may differ and an independent review against clearly defined standards provides clarity and objectivity, and ensures that any remedial work is necessary for maintenance of the ship and is appropriate. The survey records provide a history of the ship in terms of condition, modifications, repairs and maintenance. The classification process, therefore, can assist the navy in managing the technical and safety risks for naval ships in service by application of well-proven professional survey services.

Experience has shown that there are significant differences between naval ship types. These become more evident during the upkeep phase and provide different challenges to the maintenance of verification of compliance with the standards policy through-life. The procurement of ships to support security and policing tasking and for expeditionary tasks tends to favour low cost in order to permit the number of units required. Capability is increased during the in-service phases through incremental acquisition - with special naval ship features - but inherently the ships are cost constrained. For major combatants the maintenance of effective warfare capability results in high upkeep intensity with incremental acquisition of new and enhanced combat systems, and with the changes to the ship and its engineering support system as a consequence. Maintaining a consistent standards policy throughout this intensity of change is a challenge, but the model shown in figure 4 forms the basis of a cost-effective solution.

The disposal of naval ships in an environmentally acceptable manner is becoming an issue of concern. The through-life services provided by classification societies now encompass the provision of records of materials so that appropriate decisions on disposal can be made.

The classification process does, therefore, present a well-established process for assuring the navy that appropriate standards have been selected and consistently complied with and adoption of this approach can reduce the risk exposure - in particular the technical and safety risks - of the project throughout its life. By delegating some functions to the classification society, which employs professional people with experience of the necessary process steps, the navy will be able to release naval staff from these tasks to use their skills where they are most valuable.

Experience and Lessons

Lloyd's Register has been involved in an increasing number of naval ship projects over many years and, more particularly, since the introduction in 1999 of the *Rules*

and Regulations for the Classification of Naval Ships. The involvement with more navies and a wider sector of the defence supply chain has provided insight into a number of issues that are taken into account in developing a naval business for Lloyd's Register. Certainly, there are a number of cultural issues where the naval community simply works differently and has different priorities. The balance of risk, and the perception of risks, is different. What are considered to be significant deficiencies for a merchant ship may be regarded as inconveniences for a naval ship because the manning response is different, the risk mitigation measures are different or the overall risk profile is different.

The principal criticisms levelled at the application of classification to naval platforms were related to the inappropriateness of the rules to naval applications. These arguments have been dealt with by Lloyd's Register in developing and publishing the *Rules and Regulations for the Classification of Naval Ships* with the active involvement of a number of navies and defence industry companies in the Naval Ship Technical Committee. Since one of the main drivers for using the classification process was to gain advantage from procurement without a defence premium, the development of this set of rules has involved challenging the assumption that the naval requirement is necessarily different and whether that assumption is valid for all types of naval ships.

The end result is that choices can be made by the Naval Authority about the specific elements of the platform where more stringent requirements are justified, allowing the gain to be taken from COTS equipment and materials where possible without detriment to the capability. The use of the classification rules in defining the applicable set of standards for the platform at an early stage ensures that thorough cost-capability trade-offs can be made before the project is developed to a point where changes involve significant costs.

By way of example, Lloyd's Register is currently engaged in providing classification services for the hull structure of the RN Type 45 destroyer, with the lead ship now afloat in the UK. At an early stage, Lloyd's Register has also been engaged by the Air Warfare Destroyer (AWD) project for the RAN and for the future aircraft carrier project for the RN. Other naval ships, such as the Project *Protector* fleet for the RNZN and corvettes for other navies are currently being built under classification survey, although these ships are using the merchant ship rules as the standards baseline.

As part of the verification of the *Rules and Regulations for the Classification of Naval Ships*, and to understand the benefits and challenges of maintaining naval ships in class, a number of existing ships have been brought under the naval ship regime. Some had been built under the merchant ship rules, such as the LHD, *Ocean*, and the LPD replacements, *Albion* and *Bulwark*. Others, such as the RN Type 23 frigates and the aircraft carriers, HMS *Ark Royal* and *Illustrious*, have been accepted into class following a review of the design to give assurance that the requirements set down in the rules, or an acceptable equivalent, were met to provide a technical baseline against which future alterations could be evaluated. The survey scope has

been established and the survey cycles commenced after the initial condition survey was undertaken to establish a baseline.

A further involvement has been in the classification of naval ships prior to disposal sale. The reactivation of two ex-RN Type 22 frigates was carried out under survey prior to delivery to the Romanian Navy. This program and similar cases, where naval ships are sold for further service with another navy, have demonstrated that the classification process can provide considerable benefit to both the seller, the purchaser and the refurbishment and conversion contractors to provide a clear benchmark of standards and an independent verification regime.

Concluding Remarks

Any transformation necessarily means major changes either in what is being done or how it is being done or, more often, both. The desired outcome is to gain a major change and, in commercial parlance, a competitive advantage. In defence terms there is no difference: the aim is to get greater military capability within the available budget. When the underlying military doctrine is also changing to match the New World Order it is no surprise that the existing well-established approaches are being challenged, but there is also a recognition that change brings risk and that must be managed.

This paper has attempted to set out a rationale where the application of the classification process, which has been developed in a highly competitive, efficient commercial market, can be adapted for a naval environment. The essential work in terms of developing the product and publishing it in the *Rules and Regulations for the Classification of Naval Ships*, along with supporting guidance on surveys and application, has been completed. The established process of Lloyd's Register for regular review and updating to reflect experience and application will be maintained. Transformation of any procurement process, whether for new ships or for the upkeep of existing ships, requires measures to help manage the risks associated with change. The classification process has a number of key attributes, which act as effective risk mitigation of many of the technical and safety risks a project will face, particularly when the relationships between the various parties involved are changing.

It is advocated that, provided a thorough process for establishing the standards for the platform is undertaken at an early stage, a cost-effective compliance verification regime can be put in place that will deliver benefits in risk management throughout the ship's lifecycle.

The classification process applied to naval ships has now been thoroughly tested by application to concept and design stages in new construction and in operational ships. It is important that navies do not view classification simply as a set of commercial ship standards that could save cost, and attribute any deficiencies to the use of civilian practices. The classification process continues to be developed to match the needs of naval sector clients. The Naval Ship Code offers a complementary approach and Lloyd's Register supports this initiative.

PART 4

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Issues Facing
Today's Navies

Canada's New Defence and Naval Policies: *Déjà Vu* All Over Again?

Peter T Haydon

Since the end of World War II the Canadian Navy has maintained three different fleets and is now contemplating the structure of the fourth under a centralised transformational initiative that emphasises joint forces rather than individual Services. This initiative was announced in April 2005 and was superimposed on a series of programs to replace existing equipment. Some of those new initiatives have already been implemented and others are well advanced, leaving only the high cost items to be started. With the change of government in January 2006, there is some concern that some of the new initiatives may be postponed by the incoming minority Conservative government as it makes its mark cautiously on the policy process. Although national security is one of their priorities, the Conservatives will be forced to implement change with care through a process of consensus-building. The key question is whether the resultant policy will be strategically significant (one that changes the foundations of Canadian defence policy and thus naval policy) or merely change at the margin along traditional lines.¹

Answering that question requires that we begin with a look at what could be thought of as traditional policy. Then we can look at the defence policy as it now stands, separate out the funded and implemented programs from the unfunded proposals and see what scope the new government has for making its own mark, as it will surely do, and the consequences. First, though, I will summarise what I see as the new government's initial defence policy, and I stress "initial" because none of the proposals have been costed accurately or been evaluated in terms of procurement probability. When this happens, the realities of the cost of transformation will come home to roost.

The New Government's Defence Policy

Some things seem fairly clear from statements made during the election. The Conservatives will place greater emphasis on domestic and North American continental security. They campaigned on a "Canada First" platform and they will uphold that philosophy, which goes hand-in-hand with improved relations with the US. Even though a full statement on defence policy and priorities has not yet been made, an outline of their intentions was contained in their campaign document, *Stand Up for Canada*, to give a reasonable idea of what to expect. The rationale was:

For decades, successive Liberal governments have undermined and underfunded Canada's armed forces. We need to strengthen Canada's independent capacity to defend our national sovereignty and security. In an increasingly dangerous world this "Canada First" vision is required to defend our vast territory and

three ocean areas. Greater strength at home will also lead to greater confidence abroad within Canada's longstanding global role. Achieving this vision will require large-scale investments in every region of the country to strengthen Canada's multi-role, combat-capable defence force.²

Domestically, the “Canada First” philosophy will see changes and increases in the military footprint in all regions. Some of this will be for local disaster response (security writ large) and some will be a more balanced distribution of national units. Some new capabilities will be introduced. The security and sovereignty of the Arctic region will be given more attention, something that could be accompanied by development initiatives. Although various governments have talked about putting more emphasis on Arctic security, none have made much progress. Now, the implications of the warming trends are serious enough to warrant a fresh look at Arctic security requirements. Greater access to the region including a longer shipping season and the need to exploit Arctic resources will mean that more people can and will venture into those inhospitable lands, all of which are environmentally fragile. The infrastructure costs for placing greater emphasis on homeland security will be considerable and will need the support of other parties to be approved by parliament.

Internationally, the capability for the type of operation presently underway in Afghanistan will be continued despite some public concerns that Canada has no strategic need to be there. Whether that capability will be expanded to provide a more versatile response capability is the key strategic question. The campaign plans indicate that this will happen but, as I will discuss later, there are problems with this idea.³ The traditional capability to deploy warships either within US and North Atlantic Treaty Organisation (NATO) formations or as a national task group will be maintained; there is no sound reason to abandon a capability that has served the country well over the last 15 years.

Transformation is a reality in the Canadian military, the question of the hour is the extent to which the new government will be able to or wish to continue the previous government's transformational initiatives. Although an increase in defence funding has been promised, concerns are already being raised that the projected 8-10 per cent annual increase may not be nearly enough, especially as the new plan calls for an increase in strength of 13,000.⁴ Something will have to change; the question is, “what?”

Transformation and Defence Policy

What is military *transformation*? The dictionary provides a definition of “change in appearance or structure” but that is too simplistic for the fervour with which the call for change is being embraced. In Canada, people are looking at a more radical change. The motivation is largely political, stemming from a remark made by the previous prime minister, Paul Martin, a couple of years ago that he would not continue to fund a military still structured for the Cold War. Putting aside the fact that the remark was made arbitrarily and without any real understanding of the

modernisation programs already underway, the policy staffs and military advisors seized the moment and advocated more sweeping changes, adopting concepts and language in use in the US.

Some time ago, Donald Rumsfeld provided a useful explanation of what was involved in transformation in saying that “a revolution in military affairs is about more than building new high tech weapons, though that is certainly part of it. It’s also about new ways of thinking, and new ways of fighting.”⁵ In those terms, military transformation (or dynamic change) begins to make sense. Those ideas also form a good point of departure for a discussion of the ways in which Canadian defence and naval policies are changing in an attempt to provide the politicians with force options they think may be needed in the next 30 or so years.

However, there is a caveat that should be set down; organisations like armies and navies seldom effect change at the politically-expected rate. It is not that they are change resistant, it is a reflection of the difficulty in implementing major structural change, especially training the people who will make the new systems and procedures work efficiently. Also, transformation can be expensive, and both political and military leaders are reluctant to discard equipment and systems that are still effective.⁶ Fortunately, the glacial speed of the Canadian procurement process tends to prevent that happening.

Ironically, one of the problems of the present era seems to be the naturally divergent views of the two major partners in the Canadian defence policy process – the government and the military – but I doubt that it is unique to Canada. On the one hand, the politicians (invariably supported by the media) usually demand that the military provide iron-clad rationales for new equipment programs substantiated by recent examples of the utility of that equipment. On the other hand, the military plans for the future under concepts of maintaining capabilities in contingency against undefined or presumed threats. This approach invariably calls up requirements for new technologies and procedures. To some, it could appear that it is the politicians rather than the generals who are intent on fighting the last war. Herein lies the paradox of transformation: because of the costs, politicians are invariably reluctant to endorse the military equipment and personnel requirements necessary to implement politically motivated demands for change.

Part of the problem is that politicians tend to focus on minimum military capability rather than asking, “How much military capability is needed?”, which is the military staff approach. Another factor comes from the fact that political requirements for national defence are seldom stated in absolutes such as, “maintain full surveillance over the waters under Canadian jurisdiction with the capability to respond to all potentially threatening situations or violations of the law” or “maintain the ability to deploy a warship continually with both a US Navy (USN) battle group and with the NATO Rapid Response Force”. Vagueness begets vagueness; clarity leads to greater understanding. The tendency in government today is to obfuscate: you cannot be held accountable if you speak in imprecise terms.

Although successive Canadian governments have attempted to redirect defence and security priorities from time to time, a high degree of consistency has always existed in the higher, or strategic, dimension of Canadian defence policy. With one notable exception, which I will discuss later, change from one government to another was mainly change at the margin at the end of the day. What prevailed from 1948, when the Cold War strategy was adopted, was a simple expression of strategic objectives, often and wrongly referred to as priorities, that reflected the blending of Canada's external and internal security requirements. These can be summarised as:

- self-defence against military and non-military threats
- continental defence in ways that ensured political and territorial sovereignty
- collective security within formal alliances, such as NATO, as well as within the framework of the United Nations.

Now, 15 years after the end of the Cold War, national strategy is again being recast with an accompanying invitation to restructure the military to meet the challenges of the 21st century.

Transformation, it seems, is the new mantra, but not for the first time in Canada. However, one cannot implement new policies, radical or otherwise, without political commitment, especially money. Technical know-how and trained people are the other necessary components to ensure success. That thought, I suggest, is the other caveat to transformation. Paper plans alone do not constitute military change.

Previous Canadian Transformational Moments

The history of past Canadian attempts at naval transformation is interesting even though it tends to make one a sceptic. Putting aside these rather telling lessons of history will of itself be a transformational moment.

Having transformed in 1948 from a World War II-style surface action force to an anti-submarine warfare (ASW) navy, the Royal Canadian Navy (RCN) did not change its basic policy or doctrine until the end of the Cold War some 40 years later.⁷ But that policy was challenged on several occasions. There were also several missed opportunities. For instance, although the 1953 NATO decision to adopt a nuclear strategy could have led to radical changes in naval policy, it did not. The RCN became fitted for but not with tactical nuclear weapons, and the changes were largely doctrinal and tactical in the end.

The next transformational moment happened in 1964 when a brash, new defence minister, Paul Hellyer, attempted to recast Canadian defence policy to give spending priority to a tri-Service UN response force. This change would have seen the army undertake a new role; that of being able to deploy anywhere in the world in response to UN tasking. The navy would have assumed responsibility for new sealift vessels that ranged in capability from *Iwo Jima* class landing platform helicopter (LPHs) to simple military cargo vessels. The concept was short-lived. The army was unwilling to make the necessary changes, which would have come at the expense of traditional NATO mechanised capabilities, and the navy proved

to the minister that the cost of his dream force was outrageously high and that the concept of operations was completely impractical.⁸ The transformational moment passed and defence policy returned to the status quo, but in its wake was Hellyer's legacy of a unified force that some tried, and still try, to equate to jointness. It took a national mobilisation exercise in 1984 to bring people to their senses and realise that while unification worked administratively, it was an operational disaster. It had not provided the expected joint force and had put major constraints on operational training and thus capability.⁹

Some might argue that the *1971 Defence White Paper* constituted another missed attempt at transformation. I disagree because the defence policy review, held in response to Pierre Elliott Trudeau's April 1969 call to "do defence differently" and place greater emphasis on national factors, merely confirmed that the traditional strategy with its three objectives served national interests and that the only changes necessary were adjustments in defence funding priorities. Above all, the review established that continuing military commitments to NATO made sense politically. The status quo was seen as the prudent strategic course, but it would be done with less money, fewer people, and change would be made in slow time.¹⁰ In the process it was re-established that the management of the relationship with the US was a major foreign policy objective. Trudeau's analogy of the mouse sleeping with the elephant as a description of the complexity of the relationship holds today; sometimes the elephant is so preoccupied with its own problems that it forgets about the mouse. The mouse's problem is to get the elephant's attention. Some prime ministers have done it by singing Irish ballads, others by being deliberately annoying.

A case could be made for thinking of the nuclear submarine program announced in the *1987 Defence White Paper* as a transformational moment. The plan was certainly ambitious and would have taken the navy down a new strategic highway that many saw as dangerous and unnecessary. In the end the program was cancelled for lack of available funding. This was the navy's fifth attempt at moving into the nuclear field – seen as the only logical response to the growing Soviet submarine threat in North American waters rather than as a reaction to perceptions of foreign misuse of Canadian Arctic waters. The problems with the SSN program were threefold: lack of government commitment once the Americans agreed to respect Canadian Arctic concerns; lack of trained people; and enormous difficulties in making the necessary technology transfer. As an aside, the competing industrial and training plans are interesting. The British proposal would have seen a concept very similar to that established in 1954 when two and one half submarine crews were given to the Royal Navy (RN) in return for three submarines in Halifax with the long-term plan for Canada to eventually buy and staff its own submarines. All technical support would have been provided by the British. The French plan, favoured by many, was for a systematic technology transfer and integrated training plan that would have seen the first four submarines built and initially maintained in France with the technology transfer being made to Canada at the first full overhaul and reactor core change about six to eight years into the program. The British plan

was probably affordable but the full cost of the infrastructure required to operate nuclear submarines in Canadian waters was never fully estimated. The French plan was logical but expensive and required a parallel transformation in the Canadian energy and shipbuilding industries. Simply, the concept was beyond reach without total government commitment, which was never there.

One would think that the end of the Cold War would have led to military transformation. It did not, despite the very clear invitation to go down that path in 1994. A change of government in late 1993 prompted a much-needed defence policy review. Rather than doing it behind closed doors in the traditional manner, the new Liberal Government conducted six months of public hearings, solicited papers from academics, defence experts and special interest groups, and in November 1994 came out with an essentially status quo defence policy. Strategic objectives remained virtually the same, the forces maintained to meet those objectives changed little other than a requirement for greater mobility, and there would not be the disarmament many interest groups called for. The emphasis was on greater flexibility in meeting unspecified threats. It was a cautious plan: gradual technological change; no increases in personnel, and no radical new missions. Most people saw it as sound policy for a period of instability in which there was little ability to predict what might happen next. The only problem was that the government refused to fund it, and systematically reduced the annual defence budget. Ironically, structural disarmament that some sought was accomplished by neglect while a debate raged over how to integrate foreign and defence policies.

During the post-1994 period, two issues bothered many decision-makers and their critics. First was the need to spend a great deal of money to keep the fleet fully compatible with its coalition partners. In short, to remain strategically relevant the Canadian Navy had to undergo further technological rejuvenation especially in command and control systems. One of the results was that the navy became high-technology while the army and the air force lagged in embracing new technologies. This caused some angst in Ottawa where the navy is usually seen as the junior Service and thus the last to take a place at the trough. There was also some residual bitterness that the navy, rather than the army, had gone to the 1990-91 Gulf War. Resentment over the belief that the navy took more than its fair share of the defence budget still persists. Second was the fact that the navy's primary partner was the USN - to the point of complete integration of frigates into US carrier battlegroups, which raised political concerns at a time when anti-Americanism was much in vogue. Overall, many Canadians believed the Canadian Navy was out of step with national policy and, worse, was not upholding Canadian values in a sufficiently independent manner. I should add that perceptions of democratic values had superseded the traditional economic and territorial interests in the political coin of the day.

Why did the politicians allow the navy to undertake those tasks? The reality of the situation was that the government had to weigh the pros of being part of the new international crisis management system against the cons of doing so as a close ally of the US. As it turned out the prevailing political interpretation of "active

internationalism” was quite capable of turning a blind eye to traditional Canadian suspicions of American foreign policy enthusiasms. Ambiguity is often a feature of Canadian foreign policy and this invariably spills over into defence policy. For instance, Canada avoided Vietnam despite several invitations to commit forces, yet chose to undertake an increased share of the continental defence burden during those years and even provided training support for forces bound for South East Asia. Also, in the aftermath of 11 September 2001, Canada quickly joined the US and other allies in the Arabian Sea and in Afghanistan while noisily declining to join the war in Iraq.

As long as the Cold War was a factor, Canada did not need a national strategy beyond that of defending the North American continent in partnership with the US and of committing forces to NATO. Simply, Canada was able to nestle comfortably under strategic wing of the NATO alliance in the belief that any future crisis would begin in Europe before coming to North America with the exception of possible diversionary or decapitation nuclear strikes. The commitment to North American defence was thus primarily one of helping counter the Russian strategic strike capability at sea and in the air, a military role some chose conveniently to see as a deterrent mission.

On their own, the events of 11 September 2001 did not amount to another invitation to transform the Canadian Forces. It took the implications of sustained operations in Afghanistan and in the Arabian Sea to get people to realise that the government's failure to provide adequate funding for the military between 1994 and 2003 left it a hollow shell.¹¹ Worse, programs to replace key equipment (ships, army vehicles and aircraft) were stalled and so the military had again started on the downward slide of “rust-out” experienced in the 1970s and 1980s. That the people situation was also in crisis merely added fuel to the fire. It was clear to all but the most myopic that something had to be done.

After about a year and a half of public debate on the need for rearmament and new capabilities to meet the challenges of the 21st century (that debate also spanned an inconclusive Federal election) the new minority government appointed a new Minister of National Defence and a new Chief of the Defence Staff (CDS). Promises of a new foreign policy statement with a new and interrelated security policy were made and kept. The interesting fact is that much of the new policy reflected earlier public proposals for new expeditionary capabilities, which were wholeheartedly and very publicly endorsed by the new CDS and his minister. For once, it seemed that public opinion (at least the opinions expressed by the defence policy elite) and government plans coincided.

The April 2005 Invitation to Transform

It could be argued that the recent decision to transform the Canadian Forces actually began just over five years ago with a very sound re-appraisal of longer-term military capability requirements produced by the Vice-Chief of the Defence Staff. That vision, *Strategy 2020*,¹² foresaw the need for a greatly improved

intervention capability that could be deployed within days rather than the usual weeks or months. The problem was that it was only an internal staff document and never received political blessing. In many ways this was not a surprise; the government was in the process of reducing defence budgets and was not receptive to new ideas no matter how sensible. Also, the ideas put forward were sufficiently controversial at the time to start the first rumbles of inter-Service rivalry and also drew out some clear opponents of such radical change. That momentum for change was lost in the post 11 September 2001 activities, and a sound plan died an untimely death.

In April 2005, after the usual flurry of press advisories and leaked insights, the government released its new military strategic vision, *A Role of Pride and Influence in the World*, as part of a larger international policy statement. It was greeted with a mix of scepticism and praise.¹³ Built on a traditional foundation of Canadian security being a function of global stability, especially the instability caused by failed and failing states, the new policy identified diplomacy, development and defence resources as the future tools for ensuring global security. To this end the military was to become more responsive, more relevant and more effective. The new plan stated that “the Canadian Forces will pursue their transformation efforts with renewed vigour and focus”.¹⁴ Transformation, it was established:

*is not just about technology and equipment modernisation. It will require a fundamental change to the culture of our military to ensure a fully integrated and unified approach to operations. This will require new command and operational structures, including the creation of a national operational command headquarters (Canada Command), and fresh thinking surrounding concepts and doctrine.*¹⁵

The challenge for the military was to create a new force structure to deploy and sustain a joint contingency task force by both sea and air for operations of up to six months duration. The same forces were also to play a greater role in domestic security including in the Arctic. Maritime security was to be conducted as a whole-of-government undertaking, and the military assumed responsibility for much of the surveillance and information management process. Operationally, a national joint command structure was created with a parallel structure of functional commands serving as force generators for the new task force.

It was a comprehensive plan that would obviously take considerable time to implement and be very expensive, but it left unanswered the all-important question of how all these new security tasks would be undertaken. Statements made by the CDS on requirements for amphibious and rapid response capabilities quickly fuelled the fires of speculation that the Canadian military was about to embark on a quest for a completely new strategic capability. While a series of staff action teams tried to wrestle with the problem of how to implement the new policy, hampered by the fact that no real indication of the future budget existed, aspects of the new plan were debated publicly.

From a naval perspective, two issues are important: domestic maritime security and expeditionary operations. Interwoven with these is the question of whether Canada needs submarines and the ever-present problem of whether enough people can be recruited, trained and retained to meet the new requirements.

Domestic Maritime Security

Throughout the Cold War Canadian naval policy was almost entirely focused on the ASW role with a limited secondary capability maintained to deal with a few mines.¹⁶ It was always assumed that those ASW forces not immediately required for their primary mission would be available for domestic tasking and that their ASW configuration would be adequate for homeland security operations. The bilateral plans for continental defence would have been implemented ahead of the NATO alert system with the exception of a few Supreme Allied Commander, Atlantic contingency force requirements. This meant that domestic security was synonymous with continental security; dual tasking of the navy was thus not a problem – the tasks were sequential, not concurrent. Also, should a direct threat occur, the coastal and port security structure became the task of the Naval Reserve, where their traditional specialisation of naval control of shipping was expanded to include a broader notion of the security of territorial waters.

Post-11 September 2001 analysis proved that Canadian coastal waters and ports were very vulnerable to disruption and open to subversive use. The emptiness of much of the Canadian coastline became a vulnerability.¹⁷ The rush to find ways of addressing the new asymmetric threats made people realise that not only was a great deal of coordination required, but something had to be done about the means of response.

The need to improve the overall Canadian national security structure has been obvious for some time, and the first steps have already been taken to provide a more closely orchestrated response to security challenges at sea. However, some aspects of this whole-of-government response philosophy remain contentious. Some argued that homeland security should become the navy's primary defence concern simply because of our proximity to and relationship with the US. Simply, Canadian security is still of more concern to Washington than it is to Ottawa. This view advocates a shift in priority from naval support for foreign policy to a more distinct, continentalist policy with greater operational integration with the forces of the US.¹⁸

Balancing domestic and international requirements is more complex than many realise, especially in situations where decisions have to be made quickly. To make this whole-of-government policy work, government has to accept that there are two dimensions to interoperability: technical and intellectual. The technical aspects are relatively easy but, in the latter, bureaucratic inertia has to be overcome and entrenched rice bowl attitudes need to be cast aside if progress is to be made.¹⁹ For instance, even though the navy's lead in providing the real-time command, control and information management is now accepted because the navy is the only organisation equipped to do it, making it work at all levels is taking a little time, particularly in sharing of all security-related information.

There also has to be a logical division of labour. For instance, the navy does not belong on the waterfront except in its own dockyards. It can provide some diving and explosives disposal support, but responsibility for policing commercial ports belongs to those who understand port and cargo handling operations. The new government called for a return of dedicated port police during the election campaign; this can be done but not cheaply. In the meantime, the various agencies will have to learn to work with each other. This is happening.

Law enforcement and intervention at sea are likewise specialised jobs. At the moment there are only two organisations qualified to do them: the Royal Canadian Mounted Police and the military.²⁰ Despite some views that Canada needs a paramilitary coastguard, common sense holds that the coastguard should continue to do what it does best: marine safety, ice breaking and providing transport for law enforcement officers. With more emphasis on domestic security, especially in the north, there is a requirement for better surveillance of Canadian waters. This is happening through new radars, uninhabited surveillance vehicles and more ship patrols. However, as many people have pointed out, the existing navy fleet is not ice-capable and so is very limited in where and when it can operate in northern and Arctic waters. Correcting this shortfall will likely be a priority for the new government. The question is: “how?”. Pre-election statements said that three armed icebreakers would be acquired and that a new Arctic port would be built. This idea is controversial on several counts. A new port would make sense if linked to Arctic economic development provided there is a lengthening of the Arctic shipping season from the present six weeks. This window is barely enough to carry out the annual resupply of the various settlements. Finding a suitable location for the port will in itself be difficult.

Armed icebreakers make very little sense if they are to be naval ships – the learning curve is huge and the navy has not been in the ice breaking business for 50 years. It would make far more sense to leave the icebreakers in the hands of the coastguard and embark military detachments when needed. Alternatively, a case could be made for designing and building a new type of ice-capable patrol vessel with enough flexibility to be able to undertake all domestic maritime security tasks.

The notion that any of these capabilities are needed to prevent intrusions into Canadian waters by foreign submarines is delusional; the existing waterspace management system provides Canada with adequate information on friendly submarine movements in those and adjacent waters. The point about operating submarines is that it buys membership in the waterspace management system. Without the submarines, there would be no access to the information.

Whatever the eventual course of action, it draws in the national ability to build warships and specialised vessels. The competition for the contract to design and build the Joint Support Ship is producing some highly innovative engineering concepts. Technology has advanced considerably since the *City* class frigates and the *Kingston* class Maritime Coastal Defence Vessels were built. Since then, we have built large, highly sophisticated off-shore platforms (Hibernia and Terra Nova

for instance) in Newfoundland outports. The component parts were made around the world, brought to Newfoundland and assembled. The belief is that a similar approach can be taken to shipbuilding rather than depend on a traditional shipyard. In this respect, transformation is taking place in industry as well as the military. The navy is already thinking about completely new hull forms and marine propulsion systems. In some ways, outsourcing warship design several years ago is actually promoting innovative warship design.

The new emphasis on domestic maritime security presents a truly fascinating challenge at a time when Canadian northern and Arctic waters may offer an opportunity for great use and thus incentives for economic development. There is obviously a lot of work to do on the various policies, but what a wonderful challenge.

Expeditionary Operations

The Canadian Navy has always had a limited capacity to support expeditionary operations. Over the years this has ranged from using aircraft carriers as transports for the army (at the expense of the carrier's primary role), to transporting and supporting relatively small army tactical units to conduct extraction operations (as was planned for Jamaica in 1979) and to using a fleet support vessel (AOR) as the logistic and administrative base for UN operations as in Somalia and East Timor. Although the navy always saw its primary function as sea control, the need for the joint capability was always recognised and built into the two remaining AORs. They play prominently in the requirements for the new Joint Support Ships, which will actually have a far better lift and support capacity.²¹ Now, in light of the April 2005 *Defence Policy Statement*, sea-based expeditionary operations have taken a far higher profile leading to proposals that the Canadian Forces should develop an amphibious capability and invest in all the associated hardware. The new CDS has even called for a "big, honking ship" to be the centrepiece of this new capability. As the various groups studying this capability are finding out, it will be a lengthy process, very costly, and almost certainly require some sort of interim concept because of the time required for procurement and training. The current plan is to have the full capability enabled by 2016. That is ambitious.

It should be no surprise that the need for a full amphibious capability is not universally supported. One view holds that the longer-term vision of international security does indeed call for better intervention capabilities and that to stay relevant Canada needs to upgrade its capacity for those operations. Going the route to full amphibious vessels is thus logical and not detrimental to the more traditional and proven naval task group concept. Support for the controversial Canadian role in Afghanistan is part and parcel of this wider strategic view, which holds that the army must be able to fight unconventional wars as well undertake reconstruction tasks in sorting out failed and failing states. Getting the army to new theatres of operations and sustaining them is going to be a major undertaking and the ideal is that it must be done using Canadian rather than rented foreign equipment.

Making this new model army the centrepiece of the transformed Canadian Forces requires that the navy and the air force become dedicated support services to provide strategic sea and air lift as well as provide tactical air support. Restructuring the navy for this task will be expensive and time consuming because the present fleet is not configured or trained for that kind of role.²² Transformation of this nature calls up not just new capabilities but entire new generations of ships and equipment as well as a host of new training requirements. This is not an insurmountable problem; some ships need replacing now, and by the time the army has become proficient in the new amphibious capability the remaining frigates will also need replacing. A phased long-term plan is feasible but costly. Training requirements are huge and probably become the governing factor; this is something that cannot be rushed because the price of failure is too high.²³

Some people are concerned that the new capability will come at the expense of the navy's traditional flexibility that has served the country so well in the past 15 years. They argue that going the amphibious route will require that the navy make that task its primary mission and, as the nuclear submarine program of the 1980s would have done, the task can only be maintained at the expense of other naval capabilities. This may be a little extreme, but it raises a valid question over the naval aspects of domestic maritime security, which could lead to the development of two distinct fleets, one for expeditionary operations and one for homeland security.

Another view holds that a full amphibious capability can neither be achieved nor is it necessary, but that the navy should be able to support joint operations by providing support for troops ashore in a range of non-combat operations. The naval priority, it is argued, should remain the ability to deploy naval task groups and individual ships as part of multinational forces. What is interesting about this status quo perspective is that it invokes the lessons of the history of Canadian defence policy and the political reluctance to embrace new capabilities. For instance, Hellyer's attempt to form a joint expeditionary force in the 1960s was eventually rejected, the nuclear submarine program of the late 1980s never materialised, even naval aviation was enormously unpopular and few political tears were shed when the last carrier went to the scrap yard in 1970, and submarines of any stripe remain widely unpopular. There is a consistency in Canadian defence policy in rejecting radical innovation, and this is the threat to transformation.

Where Do the Submarines Fit In?

For many reasons, the submarines will continue to be strategically important in both international crisis management and homeland security roles. They can conduct a wide range of covert operations including the insertion and recovery of Special Forces, conducting information warfare operations, and non-provocative surveillance and reconnaissance, which allows them to be first in and last out. They can provide 24-hour-a-day coverage in all weather conditions while remaining ready for new tasking, and their inherent versatility enables them to counter threats to themselves as well as provide protection for adjacent friendly forces. And they

have the capacity to embark and operate new payloads such as remotely operated and uninhabited underwater vehicles and other uncrewed sensors.

Although it is the intelligence, surveillance and reconnaissance (ISR) capability of modern submarines that is of particular interest to Canada, the other submarine capabilities are still important. The submarine should be seen as a force multiplier rather than as a legacy system from previous wars. The *Victoria* class submarine gives Canada the opportunity to exploit new technologies, especially in information management operations, something that could not be done to the same extent before they were acquired.²⁴ Yet, despite these logical reasons, there is a vocal cadre that opposes Canada having submarines and the former RN *Upholder* class submarine in particular.

Procurement Problems

Before the latest invitation to transform, several important programs were being prepared for the overly long and pedantic Canadian procurement process. These included replacements for the fleet support vessels as the Joint Support Ship; a replacement maritime helicopter; and funds were already assigned to the submarine modernisation program. Work was also being done on the next generation of surface combatant. In addition, the air force was pressing ahead with replacements for the Hercules aircraft transport fleet. To implement the April 2005 *Defence Policy Statement* a series of additional new programs were announced, including army equipment to improve the Afghanistan mission, 5000 additional people, and an increase in the size of the Special Operations Forces. Requirements for strategic air and sealift and a new warship were to be studied. The people part of the equation is a major problem: recruiting and retention are both down and it is going to very difficult to increase the size of the military without making some major adjustments to benefits, conditions of service, and to concepts of training and employment. The current transformational moment has not, it seems, taken full account of the people aspect of a modern military. It is here that the most radical changes may be needed; the military has to begin thinking about the next generation of recruits. Restoring order and rebuilding failed states is a dirty and often dangerous job that not everyone wants to do, but there are young people who thrive on adventure and accept the risks. Maybe they have a few rough edges. The navy, on the other hand has a far greater need for people who can be trained to operate complex systems without very much personal risk; the problem is that those kids are in demand by industry and so the naval incentive has to be that much more attractive. A new approach to recruiting and probably training is going to be needed if the military is to have enough people to make the latest transformation a reality.

Conclusion

The Conservatives made several defence policy statements during the election campaign that confirm the need for those programs and also promise a greater military presence in northern waters, improvements in the domestic defence

infrastructure, and they also place considerable emphasis on restoring the army's airborne capability as part of the national rapid response force. They have also endorsed the concept of strategic air and sealift. Although nominally committed to continuing the transformation process, they have been strangely quiet on naval capabilities beyond the Joint Support Ship. Whatever happens, it is quite clear that after the acrimony of the pre-election debate, the new government will not endorse all of its predecessor's policies. Something will have to change for political reasons, and the new government's election theme of "Canada First" will almost certainly be a factor in future defence policy. This is why I am sceptical about the outcome of some parts of the April 2005 policy shift.

So, what are the options for political change, and what could these do to the latest transformational moment? The new government has campaigned on reducing waste and the number of poorly reasoned programs. This could be a problem and blessing. Many of the present programs are logical and generally popular so there would little point in cutting them. Where money has not yet been committed, opportunities for review and adjustment exist. This could mean that strategic sealift beyond the capacity inherent in the new Joint Support Ships could well be reviewed. It is an expensive concept and as usual money will be a concern. The inherent strategic policy shift to force projection is controversial because it takes Canada down a new strategic path and is very expensive, calling for a review of the requirement would be politically safe. It may thus be the token piece of policy from the previous government that is struck down. As I mentioned before, with greater emphasis on domestic and continental defence requirements, such a review would make further sense: I do not think there is enough money to do everything. The future is going to be very interesting as Canada attempts to balance domestic and international military requirements.

My prognosis? Very little more will be spent for the next two years; the government needs that amount of time to learn its job and build voter confidence. This would mean a return to a force structure that is largely status quo within a defence policy that places more emphasis on domestic and continental security than active internationalism. Despite public warnings that the Afghanistan mission will lead to casualties, I am not convinced that Canadians have yet acquired the stomach for large-scale casualties. With the Canadian Army committed to that mission and making heavy demands on the defence budget to acquire better equipment, the capacity for parallel transformation is limited without large injections of cash and people. The army is also required to re-establish an airborne battalion and increase the size of the Special Forces (Joint Task Force 2). I simply cannot see the army having the ability to undertake the training for a new amphibious task while meeting all the established commitments.

The very significant organisational changes already being implemented will stay; they make absolute sense and will lead to a more efficient management concept. Canada will stay part of multinational operations, but along well-established, traditional lines where Canadian units are integrated into US and NATO formations.

In other words the future may well look a lot like the concept put forth in 1994 but with limited money to implement the policy. It would not surprise me to see some of the ideas from the June 1999 concept, *Strategy 2020*, resurfacing; it was a very sound plan that essentially remained in the traditional political defence comfort zone. And this is why I think the centrepiece of April 2005 invitation to transform – the acquisition of an autonomous amphibious capability – will wither in favour of a more traditional capability mix but with greater flexibility. In other words, to quote Yogi Berra, “It will be *deja vu* all over again!”

Securing the Littoral: Issues for a New Maritime Power in the Pacific

Alexey Muraviev

When it comes to analysing security challenges in the maritime domain, there is little doubt that the future asymmetrical threats such as organised crime at sea and the growing threat of maritime terrorism, which in the near future is likely to be limited to the littoral, will be one of the major problems for the Asia-Pacific-Indian Ocean Region (APIOR) community.

At the same time, the 21st century is likely to be marked by international instability caused by growing rivalry between the existing hyperpower, the US and other power centres, among them Russia and China in the APIOR. This power competition, and possibly confrontation in the future, is forming a mounting rivalry between traditional and new maritime powers, thus making future conflicts more maritime than ever. Former socialist nations are transforming themselves into free-market capitalist societies, further stimulating the need for a strategic transformation. Another factor is competition for control over sea-based natural resources and maritime communications to support economic growth and prosperity. Furthermore, continuous improvements in naval warfare, strategy and tactics through the introduction of new naval technologies, complemented by the geographic advantages the sea offers to its user and the diminishment in importance of strategic depth will see future conflicts in APIOR being carried out in the littoral.

Western geopolitical theoreticians and strategists have tended to contrast – in historical, rather than strategic, discourse – maritime power and land or continental power. The principal difference between maritime and continental power is the geographic position of the state in relation to, and its dependence on, the sea. Traditionally, it has been thought that continental powers are governed by different geographical considerations to those of maritime powers, where the maritime component was a matter of secondary importance to the national interests of a continental state. Consequently, maritime matters, including naval forces, have been secondary in political and military-strategic importance. To quote Colin Gray, “To a degree, naval power is a luxury for a land power”.¹

However, in the changing strategic environment of the new millennium, the traditional division of countries into two main geopolitical categories, maritime and continental powers, elaborated in the 19th century, is now questionable. Most traditional major continental powers, including Russia and France, have strong naval capabilities sufficient not only for littoral defence but also for long range deployments, or are in the process of building them up, as in the case of contemporary China. During the Cold War years, the development of a formidable Soviet naval power raised questions about the indisputability of the hypothesis that a strong navy is an essential component only of maritime powers.²

What causes traditionally continental powers to make expensive investments in ocean-going navies? For decades, the Asia-Pacific community witnessed the growth of regional Soviet naval power. By late 1970s, the Soviet Pacific Fleet emerged as the largest fleet in the Soviet Navy. After the collapse of the Soviet Union in 1991, followed by a worsening of the socio-economic situation in Russia, the strength and capability of the Russian Pacific Fleet (RPF) has been significantly reduced. However, despite wide speculation in the 1990s and even today that the Russian Navy and its Far Eastern component is effectively a phantom fleet, Russian naval power in the Pacific remains a potent force, the key element of national military power in APIOR, and the principal power tool of the country's involvement in regional affairs.

By investigating contemporary Russian naval power in the Pacific, this paper will argue that new maritime powers like Russia will be very sensitive to any geostrategic developments in their littoral.

Contemporary and Future Russian Naval Power in the Pacific

The RPF occupies a special place in the system of Russian national security, being the keystone of the security and defence of the Russian Far East and its coastline, which stretches for more than 13,000 km from the North Korean border to the Bering Strait. Moreover, the RPF has the largest operational zone of responsibility within the Russian Navy, which extends from the Bering Sea and the US western coast to the eastern coast of Africa and the Persian Gulf: a total area of more than 90 million square kilometres.³ Additionally, the strategic nuclear component of the RPF is still part of Russia's strategic deterrent forces in the APIOR strategic theatre.

Regardless of the turbulence that hit the fleet in the 1990s, the force was able to survive hardships, retain core fighting capabilities and managed to adjust to the new realities, including the understanding of its future role and place in the system of Russia's national security in the Far East. Currently, the RPF is the second largest of Russia's four fleets in terms of strength and combat potential. It consists of sea-based strategic deterrent forces, general-purpose surface and submarine forces, naval aviation, naval infantry and coastal defence, ground forces, air defence and special purpose units, as well as support units.

In 2005, the fleet's total strength was approximately 45,000 active personnel, among them around 10,000 officers and approximately another 10,000 warrant officers. The average age of an officer is 31.⁴ Its order of battle was 5 strategic (SSBNs), and 18 multi-purpose attack submarines (SSGNs, SSNs, SSKs);⁵ 20 principal surface combatants (including two guided-missile cruisers); approximately 28 smaller and other-purpose combatants; some 57 auxiliaries; 55 combat aircraft and 26 combat helicopters. Additionally, the maritime border guard service in the Pacific had a force of 7 principal surface combatants, and 72 smaller armed patrol sea- and river-going units, which can be integrated in the fleet's order of battle in times of crisis or war.⁶ In terms of organisational structure of the naval component the fleet is divided into two flotillas (Primorskaya and Kamchatskaya) and a number of naval bases,

made of divisions (diviziya), brigades, independent battalions, divisions (diviziony) and squadrons. Admiral Viktor Fyodorov is the current Fleet's Commander.

Despite severe economic hardships, the force continued operations and modest modernisation. In particular, the fleet's sub-strategic sea denial capabilities were seriously upgraded after the introduction of 5 *Oscar-II* class SSGNs between 1990 and 2001 and the deployment of Tu-22M-3 Backfire strike aircraft.⁷

There is no doubt that the state of the Russian economy will affect the pace and scale of the future development of Russian naval power in the Pacific. Hoping for an improvement in the national economic situation, Russia's naval command had planned in 1995 to restore and even expand the RPF's capabilities:

*The basis of the fleets in the North and the Far East, from our point of view, would comprise multi-purpose nuclear submarines, aircraft-carrying and missile-carrying combatants, naval aviation and coastal troops. The specifics of the Pacific theatre require more scaled development of mobile forces for operations in the strait and island zones, in particular, specifically-designed amphibious assault ships.*⁸

Russia's naval experts believe that the RPF should have at least the same number of strategic and non-strategic multi-purpose submarines as it has now. In 1995, Admiral Aleksin and Captain 1st Rank Shevelev presented their views on the possible composition of the surface component of the fleet, saying that it should include two aircraft carriers, one to two cruisers, two to three destroyers, two to three frigates, complemented by a significant number of light missile, anti-submarine warfare (ASW), patrol and minesweeping craft.⁹ At the end of 2000, Rear-Admiral Sidorenko gave a more detailed outline of the future RPF. In his view, the future order of battle of both the Northern and Pacific fleets should consist of 8-10 SSBNs, 20-25 SSGNs/SSNs, 85-95 major surface combatants (including 2-3 aircraft carriers), and up to 300 naval aircraft.¹⁰

No dramatic changes should be anticipated in the composition of the RPF and its order of battle before 2007. The fleet will retain its current organisational structure: sea-based strategic nuclear forces, surface fleet, submarine forces, naval aviation, coastal-defence troops (including amphibious forces), air force and air defence units, and ground troops. While the RPF will retain significant combat potential to influence the strategic balance of forces in North East Asia, its power-projection capability will remain limited. While the operational tempo may increase in the next couple of years, the fleet's operations will still mainly be carried out in littoral areas, rather than in distant seas. The regional-geographic section of Russia's Maritime Doctrine nominates the Indian Ocean strategic zone as an area of secondary importance and states that Russia will resume periodical naval presence in the area as well as expand merchant marine and fishing activity there.¹¹

The planned modernisation of all operational *Delta-III* submarines and the extension of their service will keep the RPF SSBNs active until 2008-10. The nucleus of the general-purpose forces will remain practically unchanged, although

some units placed in reserve may be scrapped. The most noticeable addition in the next few years will probably be the commission of the *Akula-II* class SSN *Nerpa*.¹² In addition, if plans to refit and modernise the *Admiral Lazarev* battlecruiser are successful, the surface fleet will receive a powerful platform. Single units of new-generation Type 20380 and 12300 corvettes, Type 667 SSK, 885 SSN and 955 SSBN may be fielded with the fleet before 2010. Nevertheless, these additions will not change the overall existing combat potential of the RPF.

Given the scale and circumstances of the Pacific theatre, the operational zone of responsibility of the fleet, and the APIOR's growing importance for Russia in terms of its economic prosperity and military security, it is quite reasonable to assume that at least one third of future Russian naval forces will be based in the Far East even if, in the near-term future, this goal is impossible for Russia to realise.

Why do the Russians Need a Sizeable Naval Presence in the Area?

Several factors explain Russia's desire to retain significant naval capabilities in the Pacific theatre, among them the need to protect the strategically important Far East; Russian assessment of geostrategic challenges in the Asia-Pacific, especially in neighbouring North-East Asia; the need for a military response to potential threats; and the desire to ensure effective protection of the sea-based strategic nuclear forces in the area.

In the current geopolitical environment, Russia's eastern regions are of growing strategic significance. Siberia and the Far East hold vast natural resources and provide vital communication links.¹³ For example, one of well-known European geopolitical experts, Alpo Rusi, explains that Russia's increased interest in Asia-Pacific affairs is due to the changed geostrategic circumstances of the nation:

*Since the collapse of the Soviet Union, Russia has been gradually increasing its Asian orientation. This may be a case of virtuous necessity, as Russia has already lost its main Black Sea, Baltic and Caspian ports and has in fact been pushed into Asia.*¹⁴

Consequently, the role of the Far Eastern seaports, just like Murmansk in the north, will only grow in the future, especially in the context of Russia's current economic growth. The principal regions of the Russian Far East are the Maritime Territory, and the Khabarovsk and the Kamchatskaya regions. The Maritime Territory (Primorskiy Krai) is Russia's principal gateway to the Pacific Ocean, and subsequently the APIOR, with over 10 major seaports, used by merchant and fishing shipping.¹⁵ Sea transport accounts for 97 per cent of transport services offered by the Russians to foreign clients in the Pacific. Adding to that, the fishing industry plays a key role in the region's economy and exerts a great influence on the economy of not only the Far East but of all of Russia, with 33 per cent of the national yield of fish and sea products and 30 per cent of the total output of seafood.¹⁶

The growing importance of the Asia-Pacific region for the international community, in both an economic and a military-strategic sense, will undoubtedly

highlight the military-strategic significance of the Russian Far East. While assessing the possibility of the country becoming engaged in a large-scale military conflict in the future, Russian strategic and defence thinkers do not rule out the chance of a serious military conflict in the Far East and western Pacific. In his analysis of the potential areas of power struggle and confrontation, one of Russia's most prominent strategic thinkers, General Makhmut Gareev, came to the conclusion that the "most acute outbreak of struggle may be anticipated in Asia and the Pacific".¹⁷ Another leading theoretician and practitioner, Lieutenant-General Leonid Ivashov, argued that it was necessary for Russia to realise growing strategic importance of the Asia-Pacific and stop being a passive regional player.

*Sooner or later, Russia will have to do so because in the 21st century Russia's economic interests will begin to shift from the West to the East for objective reasons rather than the desires of reluctance of its presidents, parties and governments. Moreover, major threats to Russian national security are also likely to come from the East.*¹⁸

Despite obvious improvements in bilateral Russia-US relations, including in the security sphere, mutual mistrust and suspicion remained about each other's political and strategic behaviour. Russia and the US continue to view each other as potential adversaries and, subsequently, incorporate the possibility of a direct military conflict between the two, including naval confrontation at sea, in national defence and strategic planning. The RPF command still considers the US, Japanese and South Korean navies as principal maritime adversaries in the north-western and western Pacific.

Two scenarios dominate ongoing debates: a war with China over the Far East, and China waging war against a US-led regional coalition for supreme dominance in the Asia-Pacific region, with Russia indirectly involved in the confrontation. According to projections, neither conflict situations would arise before 2010.¹⁹ Given the specifics of the region, the likelihood of a future major conflict in the Asia-Pacific being maritime in nature is high. Moreover, it is likely that future confrontation in the Pacific will shift away from the high seas to the littoral.

Preparing for Confrontation in the Littoral

Russia's current and future naval strategy places great significance on the defence of the littoral. The emphasis of Russian naval strategy in the Pacific in the late 1980s shifted from open ocean sea control operations to the protection of two main defence perimeters: the open ocean (outer) 1500-2000 km perimeter, and the littoral (in-area) 200-300 km perimeter.

Currently, the RPF has to accomplish the following goals in peacetime:

- creating a favourable environment for the Russian interests maritime regime in littoral seas and protecting the nation's Far Eastern maritime flanks
- maintaining a highly capable strategic nuclear arm (SSBN force) and participating in strategic deterrent operations

- protecting merchant shipping and guaranteed access to sea-based resources in the Pacific
- protecting areas of Russia's regional industrial maritime activity and its exclusive economic zone (EEZ) against unsanctioned use by other states
- supporting Russia's foreign policy in the region through naval presence and "showing the flag" policy
- participating in peacekeeping operations sanctioned by the United Nations.²⁰

Besides these missions identified in the 1990s, in the near future a greater emphasis will be given to counter-pirate and counter-terrorist maritime operations in the fleet's zone of responsibility.

The RPF Staff and the Directorate of Combat Training plan that in wartime the fleet will concentrate on two principal missions: naval strategic warfare (support of SSBNs operations) and maritime defence of eastern Russia. Depending on their significance, these missions can be divided into three-level tasks:

- strategic tasks – defence of SSBN bastions and, if necessary, strategic strike; limited strategic ASW warfare (operations against an enemy's SSBNs)
- operational-tactical (theatre) tasks – operations against enemy strike battlegroups; ASW operations against attack nuclear-powered submarines (carriers of submarine-launched cruise missiles (SLCMs))
- tactical (local) tasks – local ASW; anti-sea lines of communication (SLOC) warfare; mine warfare; coastal defence and limited amphibious operations.

In many ways, the last two are intended to support defence of the homeland mission.²¹

Russia's current disregard for long range operations can be explained by the concentration of its SSBN operations primarily in home waters. First and second generation Soviet SSBNs were equipped with short and medium range submarine-launched ballistic missile (SLBM) complexes, necessitating close deployment to enemy shores.²² The Soviet SSBNs deployed on combat patrols in forward areas of the Pacific required protection against an enemy's ASW forces, thus predetermining the operations of the Soviet task groups in the areas of their combat patrols. Between 1988 and 1990 all outdated *Zulu*, *Golf* and *Hotel* submarines were decommissioned, and all the *Yankee* submarines were withdrawn from service by 1994.²³ The currently operational strategic *Delta-III-D-9R* system has a firing range of between 6500–8000 km.²⁴ The longer range of the D-9R missile complex changed Russia's strategy of deploying SSBNs in the Pacific and permitted strategic submarine patrols, primarily in the Sea of Okhotsk.

The reduction of the US Navy (USN) SSBNs' combat patrols in the Pacific has decreased the importance of the so-called ocean ASW defence beyond the outer perimeter. In addition to the relocation of Russian SSBN patrol areas back to home waters, this reduced intensity of USN strategic submarine patrols in the area eased the need for forward deployments of strike-surface and sub-surface RPF forces.

Other factors include the loss of the developed network of overseas shore support facilities, a lack of appropriate air support and air defence for the Russian

task groups in forward areas, and a relatively small share of ocean-going combatants. Moreover, the drastic decline in defence spending with the collapse of the Soviet Union resulted in an unforeseen loss of a number of warships to the Ukraine and the premature decommissioning of some major surface units, including both *Kiev* class carriers. Adding to that, the collapse had interrupted organic growth; plans to introduce new major surface combatants (the carrier *Varyag*, the battlecruiser *Pyotr Velikiy*, and more *Sovremenny* and *Udaloy* class destroyers) were not realised, thus further reducing ocean-going capabilities of the RPF. Lack of fuel and lubricants, and limited funds to keep enlisted units operational forced the fleet's command to cut out-of-area operations to a minimum.

Nevertheless, the Russian Naval Staff understand the need to maintain long range sea denial capabilities in the Pacific theatre. The remaining long range sea-based threat forces the Russian Navy to attach greater importance not only to short range (300 km) operations but also to medium range operations (up 2000 km). This shift was influenced by growing numbers of US naval platforms carrying Tomahawk sea-based cruise missiles (SBCMs).

The conduct of the 1990-91 Gulf War and the 2003 Gulf War, and operations in Yugoslavia (1999) and Afghanistan (2001-02) showed the new military-strategic tendencies for war strategy to be influenced by new technologies.

The destruction of the enemy was carried out through destruction of its air defence system; command, control, communication (C3) network; and critical elements of national economic infrastructure.

The direct military contact with enemy forces was replaced by distant non-visual engagement through long range cruise missile strikes (at a distance of more than 800-1000 km from targets or target zones) and air strikes carried out by the air force and the navy. As a result, traditional understanding of the frontline and the rear, applicable to military conflicts in the early 20th century, was disregarded.

The integration of all elements of intelligence gathering and processing (space/airborne, sea and ground-based) into one coordinated system, and the immediate (real-time) presentation of targeting data to the strike elements created new conditions for the deployment of available firepower and significantly enhanced its effectiveness, especially in terms of maximising collateral damage to the enemy.

General objectives of war can be achieved through the destruction of the enemy's economic and other critical infrastructure.²⁵

A critical analysis of the significant military conflicts that occurred in the 1990s showed new tendencies in conducting wars and a new role for naval power. One of Russia's most prominent modern naval strategists, Admiral Ivan Kapitanets, wrote, "Today main efforts in armed struggle are objectively shifting into aerospace and at sea".²⁶ The sea is becoming a key area of modern military operations, not in the sense of confronting an enemy naval force, as Mahan and Corbett would have argued, but as a bridgehead or landing point for the conduct of strategic operations against land. The navies of the world's leading maritime nations are concentrating more on power projection for the purpose of operations against enemy forces on land.

One of the four pillars of the US post-Cold War naval strategy is forward presence and crisis response. The official statement ... *From the Sea*, released in September 1992, confirmed the USN's focus on littoral warfare to provide more effective responses to events that threaten US national interests. The main provisions of the littoral warfare concept are:

- operating forward – operating in the littoral or near land areas of the world. As a general concept, we can define the littoral as comprising two segments of the battlespace
- operating seaward – the area from the open ocean to the shore, which must be controlled to support operations ashore
- operating landward – the area inland from the shore that can be supported and defended directly from the sea.²⁷

The conceptualisation of the employment of US naval power in a new geostrategic environment continued well into the 21st century with the introduction of the “Sea Power 21” Concept in 2002. Admiral Vern Clark, then USN Chief of Naval Operations, explained three principal fundamentals of “Sea Power 21”: “Three fundamental concepts lie in the heart of the Navy’s continued operational effectiveness: Sea Strike, Sea Shield and Sea Basing.”²⁸

While acknowledging arisen transnational threats such as threat of international terrorism and the subsequent need to improve homeland defence (the Sea Shield sub-concept) and global flexible response to this new global security challenge, “Sea Power 21” continues emphasising the need for offensive forward maritime strategy. This is how Clark described the essence of Sea Strike:

*Sea Strike capabilities will provide Joint Force Commanders with a potent mix of weapons, ranging from long range precision strike, to covert land attack in anti-access environments, to the swift insertion of ground forces... Combined sea-based and land-based striking power will introduce devastating effects against enemy strategic, operational and tactical pressure points, resulting in rapid, decisive operations and the early termination of conflict.*²⁹

This new strategic direction places greater emphasis on rapid crisis response and flexible forward presence.³⁰ The development of a new generation of warships, such as the CVN, DD(X) or the *Virginia* class projects, which have the expanded capacity to carry strike weapons for prolonged periods of time, and continuous work on detection avoidance technologies will provide a few advanced maritime nations, notably the US, with additional means to exercise power at sea and on land³¹ and will affect the security environment of perceived non-maritime powers, not on the tactical (regional) level but at the strategic level. The factor of strategic depth, which can be interpreted as the safe physical distance between potential or activated battle zones or sectors and the heartlands (core industrial areas, major population centres, critical resources of energy and raw material supplies, and other strategic sources of power), is being compromised.³² For these nations, considerations about security are no longer limited to exclusive economic zones, territorial waters and

coastal areas (zone 1); much larger territories, sometimes even an entire country (depending on its size), may be under threat (zones 2 and 3) as shown in table 1.

Land zone	Distance from sea, in kms	Naval weapons systems used
Coast (Zone 1)	0-500	Ship artillery, short-/medium range SBCMs, naval aircraft (including armed helicopters); marine assaults
Inland (Zone 2)	500-2000	SBCMs, carrier-borne strike aircraft
Heartland (Zone 3)	Over 2000	New-generation SBCMs and ALCMs; SLBMs

Table 1: Growing strike capabilities for sea-based operations against land

The ability to deliver sea-based strikes deep into continents has given the world's leading maritime powers additional means to exert political pressure and has changed the global military-political situation significantly. The ongoing technological warfare at sea does not affect the security of continental powers as strongly if they are allied to traditional maritime nations. For example, the introduction of new military technology within the US or British navies does not have an immediate effect on the national security of France, since all three nations are part of the same military-political alliance, the North Atlantic Treaty Organisation (NATO), where all members largely share common views on geopolitical and geostrategic developments in Europe and elsewhere. For other continental powers that do not share alliances with maritime powers, technological warfare at sea creates a potential maritime threat to their security.³³

To counter this threat, traditional continental powers have been forced to engage in new technological warfare at sea, a fact most evidently demonstrated during the Cold War years, when the sea was turned into arena of confrontation between the US and the Soviet Union, and their allies. Technological warfare between the two superpowers played a significant role in their Cold War standoff and often drove the level of confrontation. The introduction of the concept of active defence by the Soviet Navy in the 1960s was a countermeasure against the offensive naval strategies of the world's leading maritime powers, and the technological warfare of these states. The continuous technological warfare at sea in times of growing struggle between regional and global power centres in APIOR may lead to yet another spiral of naval rivalry in this strategic theatre.

Russian naval strategists are convinced that one of the main tasks of the navy in wartime will be the defence of Russia's territory against possible massive SBCM strikes, carried out by the US or NATO naval forces against land targets in Russia, including its heartland. Carrier-based fixed-wing strike aircraft and strategic bombers, capable of launching their weapons (mainly Tomahawk cruise missiles) at a range of up to 2500 km from their targets, represent a potential threat to Russia's security.³⁴ In the Pacific theatre, in a hypothetical military conflict with a leading maritime power, sea-based and airborne strikes against Russia can be mounted

from areas of the Bering Sea and the north-western parts of the Pacific, located up to 1500 km east and south-east of Japan and the Kuril Islands. In the Indian Ocean theatre, strikes can be launched from the Red Sea and the Persian Gulf.³⁵ According to Russian assessments, SBCM attacks from the seas of Okhotsk, Japan and the north-western Pacific can hit targets in eastern Russia as far as the Irkutsk meridian, thus further diminishing the advantages of strategic depth.³⁶

Russian naval analysts assess that the next generation SBCMs that will be deployed by the US naval forces in the new millennium could have a range of up to 4500 km. The extended range of new SBCMs will allow the USN to launch missile strikes from greater distances, such as from the northern parts of the Indian Ocean and from areas of the north-western Pacific as far as Guam and the Midway Islands.³⁷ The need to respond to these technological threats will require Russia to reactivate prolonged out-of-area operations in the Pacific theatre, and likewise in other maritime theatres, for the sake of its security, thus posing a challenge to its military-political opponents. In this sense, the resumption of long range submarine patrols in the Pacific, regular deployments of Russian task groups to the Indian Ocean, large-scale exercises in the Russian Far East (Vostok 2003, Bezopasnost 2004), with Indian and Chinese navies (Indra 2003-05, Peace Mission 2005), attempts to reconfigure the Shanghai Group into a quasi alliance to defend continental Eurasia. This has intensified military technological cooperation in the naval sphere with many regional nations and are signs of Russia's attempts to offer countermeasures to these growing sea-based threats.

By going to sea to meet sea-based threats far from home shores, traditional continental powers like Russia can push its defensive depth hundreds of miles from the mainland shores, thus increasing or re-establishing national strategic depth and, as a consequence, a trade-off between distance and time; as shown in figure 1. The adoption and pursuit of counter-offensive strategies supported by the strong naval capabilities of traditional continental powers, and their gradual conversion into incomplete maritime powers is, therefore, a threat response policy, a set of

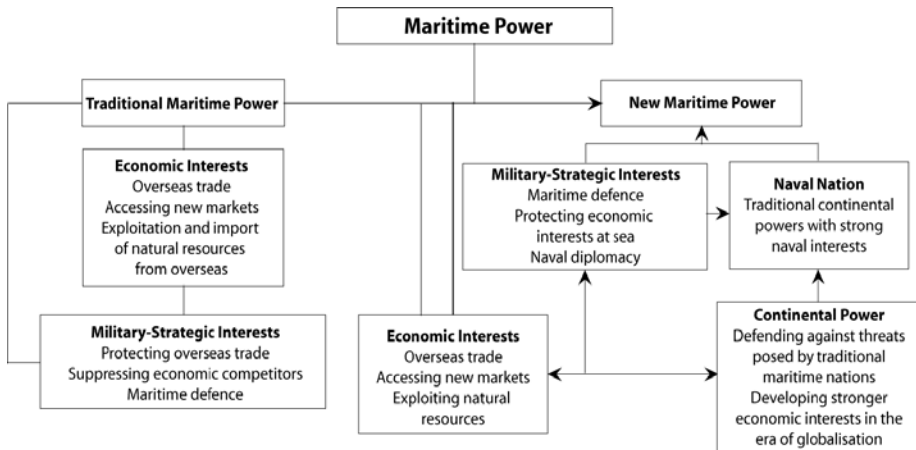


Figure 1: Patterns in Development of Traditional and New Maritime Powers

measures driven by the geographical positions of these nations in relation to the sea and constant improvements in military technologies applied in naval warfare.

Conclusion

A critical analysis of the evolution of Russian naval power in the Pacific, and its current state, helps to demonstrate why traditional continental powers are developing a strong naval orientation. Traditional continental powers like Russia have a renewed strategic interest in securing the seas and influencing global maritime operations. A powerful navy is equally important to these new maritime nations as it is to traditional maritime powers.

Russia's current strategic maritime interests are increasingly tied to economic considerations. There are several sub-factors that need to be recognised: the nation's access to the enormous continental shelf and EEZ; the availability of large merchant, fishing and scientific research fleets; and its excessive network of SLOC, especially in littoral seas. These factors act in combination with a nation's established coastal marine infrastructure, including deep water ports. In terms of the exploration of sea-based natural resources, Russia's situation is unique. Rich reserves of marine products, minerals and other resources are located within the areas of Russia's vast continental shelf and EEZ, and Russia will inevitably exploit these in the foreseeable future. Maritime transport also plays a major role in overseas operations. Russia possesses the seventh largest merchant fleet in the world. With the country's transition from a state planned socialist system to a free market capitalist economic system, the need for overseas trade is likely to increase, thus stimulating efforts to strengthen the national merchant marine. The country remains one of world's largest consumers of sea products, thus extensive sea fishing, including distant ocean fishing, will continue.

Still, military-strategic considerations continue to dominate Russia's decision-making in the maritime sphere. Former RPF Commander, Admiral Igor Khmel'nov has noted that the creation of a naval force in Russia was driven by security threats coming primarily from maritime directions.³⁸ The development of strong naval capabilities by continental powers and their gradual conversion into incomplete maritime powers is a threat-response policy, a set of measures driven by the geographic locations of these states and constant improvements in military technologies applied in naval warfare. The availability of strong naval capabilities developed in response to sea-based threats posed by traditional maritime powers turns into a peculiar form of maritime insurance for traditional continental states, an insurance that will help these new maritime powers to access new markets, retain secured and opened SLOC, and deter traditional competitors from hostile actions.

In the opinion of many Russian naval experts, the nation may face an even greater sea-based threat in the 21st century. These threat perceptions are based on and driven by two principal factors: one is global geopolitical, the second is geostrategic. The global geopolitical factor reflects the continuous instability in

international politics and the failure to diminish old divisions between Russia and the West after the end of the Cold War confrontation. The dissolution of Soviet-led alliances in Europe and the Asia-Pacific, followed by the collapse of the Soviet Union itself, rapidly changed the global balance of power but failed to eliminate the competitive nature of East-West relations. The global supremacy of the US and the expanded potential of its allies, especially NATO, contrast with Russia's worsening geopolitical and geostrategic situation, thus placing the latter in a potentially vulnerable position. This weakness may be exploited by Western powers, should a hypothetical conflict between Russia and the Western world arise.

Approximately half of the entire Russian population lives either along, or in the vicinity of, the country's coastline, and around 60 per cent of the nation's industrial potential is concentrated in coastal and nearby areas, thus making them dependent on local maritime communications and vulnerable to maritime threats. New sea-based strike weapons and next generation combat systems capable of striking targets within zones Two and Three make even Russia's heartland, its highly populated areas (including major cities such as Moscow) and industrial centres potentially accessible targets. Even the events that followed the 11 September 2001 terrorist attacks, followed by the initial unprecedented collaboration between Russia and the Western anti-terrorist alliance, failed to dispel completely the levels of mistrust and suspicion between the old adversaries. Nuclear-powered strategic and attack submarines armed with SLCMs, carrier-based strike aircraft and warships armed with SBCMs, deployed or on patrol in the Mediterranean, Norwegian and Japan Seas, Atlantic, Pacific and Indian Oceans, represent a serious potential threat to Russia's security, should its relations with the US and its allies in Europe and Asia-Pacific worsen. The fact that Russia's current naval strategy emphasises operations in the littoral zone, and most Russian naval exercises take place in coastal waters (in part a response to the USN's offensive littoral strategy) highlights Russia's serious concerns about these developments.

What are the consequences? To counter this potential threat, and to protect other national interests at sea, traditional continental powers like Russia are forced to develop strong naval interests, thus accelerating the development of appropriate naval capabilities. As a consequence, there is a serious concern of a new wave of a naval arms race in APIOR – an arms race that will not only push significant build-up of conventional power at sea but also the introduction of advanced strategic offensive systems. As a result, instead of becoming an area of relative stability, the critically important APIO strategic theatre may turn into an arena of uncompromising rivalry between competing maritime powers, both new and traditional, as well as between former continental powers with new strategic orientations.

South East Asia's Navies in the Early 21st Century: Adapting to New Challenges

Tim Huxley

South East Asia is a particularly maritime sub-region. All of its states except Laos possess extensive coastlines; its two most populous states, Indonesia and the Philippines, are entirely composed of islands. The sub-region includes globally significant trade routes such as the Malacca Strait, and abundant marine resources including rich fishing grounds as well as substantial offshore oil and natural gas reserves. It is also the locus of numerous bilateral and multilateral disputes over maritime boundaries. The most prominent disputed area is in the South China Sea, where China, Taiwan, Vietnam, Malaysia, the Philippines and Brunei contest ownership of some or all of the Spratly Islands, but there are also numerous disputes involving various pairs of South East Asian states. Moscow's naval presence has largely evaporated following Russia's withdrawal from the Soviet Union's facilities in Vietnam, and the US naval base at Subic Bay in the Philippines was closed in the 1980s. However, during the current decade extra-regional powers' naval interest has escalated as a result of the war on terrorism, reports of increased piracy, and a perception of emerging threats to energy supplies transiting the region en route to North East Asia.

In this challenging and evolving maritime environment, South East Asia's navies remain as diverse as ever in terms of their size, technological sophistication, doctrine, equipment and effectiveness. Unsurprisingly in view of their relatively small economies, South East Asian states' naval programs have necessarily been considerably less ambitious than those of the larger and/or wealthier states that surround the sub-region: China, Japan, South Korea, India and Australia. Nevertheless, during the 1990s the six early members of the Association of Southeast Asian Nations (ASEAN) – Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand – all had ambitious programs for improving their armed forces' capabilities. In general, they continued to implement defence plans that had been in train long before the transformation of South East Asia's strategic environment that had occurred since the late 1980s with the ending of the main regional manifestations of the Cold War (Vietnam's occupation of Cambodia, and the Soviet military presence in Vietnam). However, some South East Asian states have developed more convincing capabilities than others, and generalisations about regional trends always require careful qualification.

The ASEAN states' military modernisation plans were generally not merely responses to particular threats but usually also reflected long established, domestically-based rationales: the increasing availability of funding, the military's role in decision-making, internal security concerns, overall national modernisation and industrialisation, and supplier pressure and corruption. These were overlain

by a gradual, long-term response to a regional strategic environment that had been evolving towards greater multipolarity and uncertainty since the late 1960s alongside the perennial concern with keeping up with the neighbours for both prestige and military reasons. The main characteristic of the ASEAN states' defence programs between the 1970s and the 1990s was the enhancement of conventional warfare capabilities. As well as modernising equipment inventories, several of the region's larger armies began developing rapid deployment elements. But the expansion and modernisation of South East Asian navies and air forces was much more striking. In the case of navies, the emphasis was on acquiring larger surface warships, more anti-ship missiles, submarines and amphibious capabilities. Air forces, and in some cases naval air arms, began to deploy maritime patrol aircraft, and combat aircraft with maritime attack capabilities.

This emphasis on expanding and enhancing conventional naval capabilities has continued during the current decade, in some cases with a new stress on exploiting information and communications technology to develop networked capabilities, and on joint-Service operations. At the same time, however, low-intensity concerns such as countering piracy, trafficking and other forms of maritime crime, countering growing perceived threats from terrorism, protecting marine resources, and maintaining national territorial integrity in the face of separatist threats have become significantly more important. In some South East Asian states, coastguard-type forces, some of them newly-created, have taken greater responsibility for managing these low-intensity concerns, but generally still need substantial naval support.

Budgetary Constraints

South East Asia's defence budgets remain small by Western standards: Australia's military spending is still almost as large as that of all the ASEAN states combined. This resource constraint continues to limit the enhancement of naval capacities. Nevertheless, between 1985 and 1996, the dollar value of defence spending grew rapidly in South East Asia: by 45-60 per cent in Indonesia, Malaysia, Myanmar and Thailand, and more than doubling in the Philippines and Singapore. Vietnam was the only major South East Asian state not to increase its defence spending; indeed, the withdrawal of Soviet aid caused a decline of around 70 per cent. In most national cases, there is scant official indication of how overall defence budgets are divided between the armed forces' components, but the greater interest on the part of Malaysia, Singapore and Thailand in developing their maritime capabilities during the 1980s and 1990s suggests that these states, at least, allocated increasing proportions of defence spending to their navies.

Notwithstanding the difficulties of estimating and comparing defence budgets in South East Asia, during the early and mid 1990s it seemed fairly clear that military spending by each of the sub-region's four big spenders (Indonesia, Malaysia, Singapore and Thailand) was roughly equivalent at around US\$3.5-4.5 billion annually. The Philippines was spending roughly US\$1.5 billion. But the economic

crisis that struck the region in 1997 drastically reduced overall economic growth and cut state revenues, forcing several South East Asian governments to curtail defence spending drastically. At the same time, local currencies' depreciation against the US dollar substantially reduced the international purchasing power of remaining procurement funds. The most seriously affected country was Thailand, where economic problems had begun to undermine the defence budget and procurement even before the 1997 crisis. In the Thai case, defence spending declined from US\$4.2 billion in 1995 to a mere US\$2 billion in 1998. Innovative ways of funding defence purchases – notably through barter trade – were found, but in Indonesia, Malaysia and the Philippines, as well as Thailand, the crisis forced governments to postpone or reduce armed forces' modernisation plans.

National Programs

As in many things, Singapore proved the exception in a regional environment of recession induced defence cutbacks. Because of the city-state's acute geopolitical vulnerability, since independence in 1965 its government has always taken external defence more seriously than any other South East Asian state with the exception of Vietnam. Despite the severe impact of the crisis on Singapore's growth, in 1998-99 its defence budget was increased significantly, and in 1999-2000 and 2000-01 was held at more or less the same level. In 2001-02, year-on-year increases began again. Singapore's defence spending has increased fairly steadily during the current decade, and at US\$5.6 billion in 2005-06 is now approaching three times that of Thailand (whereas they were more or less at the same level a decade ago).

Though Singapore's procurement plans were apparently stretched over longer time frames because of the recession, there was no significant hiatus in the overall SAF2000 modernisation project. This had been adopted in 1988 as the result of a major force structure review, and emphasised the importance of maintaining and where possible enhancing the Singapore Armed Forces' technological advantages over potential adversaries (including immediate neighbours) particularly by developing advanced command, control and communications (C3); intelligence, surveillance and reconnaissance (ISR); and logistic capabilities, thus mitigating the city-state's size, personnel and budget limitations. The maritime component of SAF2000, "Navy 2000", saw the acquisition of mine hunters, maritime patrol aircraft and submarines, as well as new patrol vessels and landing ships. Older vessels were modernised and many were armed with air defence as well as anti-ship missiles. Two new naval bases were built from scratch.

During the current decade, investment in further major procurement programs has underlined the importance that Singapore's Government, which includes such former high-ranking military officers as Prime Minister (Lee Hsien Loong) and Defence Minister (former naval chief Rear-Admiral Teo Chee Hean), attaches to enhancing naval capabilities. Singapore depends on maritime trade for its economic survival and the maritime service sector of its economy is increasingly important. Project Delta, involving procuring six *Formidable* class frigates based on the French

Lafayette class from DCN, will substantially enhance Singapore's capacity for protecting its sea lines of communication. Ordered in March 2000, the frigates' armament will include Harpoon anti-ship and MBDA Aster 15 point-defence missiles. Perhaps more importantly, with their state-of-the-art combat management and communications systems, the new ships will constitute key nodes in Singapore's emerging 3G networked military capability, which is encapsulated in the Integrated Knowledge-based Command and Control doctrine. The frigates potentially allow the Republic of Singapore Navy to make a capability leap but, despite the Service's undoubted technological sophistication, absorbing them into service represents a major challenge.

Other major current procurement programs involve the purchase of six S-70B Seahawk multi-role helicopters for the frigates, and two ex-Swedish Type A17 *Västergötland* class submarines (to begin replacing Singapore's existing squadron of four Type A12 boats from 2010). There is also acute interest in exploiting uninhabited vehicles: the landing ship tank (LST) deployed to support coalition operations in Iraqi waters during 2004 operated a Rafael Protector uncrewed surface vehicle; Hydroid Remote Environmental Measuring Unit (REMUS) systems have been acquired for hydrographic work; and uninhabited aerial vehicles (UAVs) are being considered as future maritime patrol aircraft.

With gradual economic recovery over the last several years, defence spending has begun to grow again in Malaysia, Indonesia and Thailand. However, even in Malaysia, where defence procurement (funding for which is hard to assess because of the country's opaque system for budgeting development spending) has recovered significantly, programs suspended in the late 1990s are being scaled down or stretched. The ambitious project to build 27 New Generation Patrol Vessels (NGPV) based on the German MEKO A100, mainly in local shipyards, has been reduced to just six ships, four of them yet to be funded. After protracted delays and financial problems that led to the government assuming control of the shipyard concerned, the first two *Kedah* class vessels will be delivered during 2006. However, problems with command, control, communications and computers (C4) integration mean that entry into service is not imminent.

Guided by the VMAF21 (Versatile Malaysian Armed Forces of the 21st Century) doctrine, under the 9th Malaysia Plan (covering funding for 2006-10), the Malaysian Armed Forces' development will stress joint-Service operations, establishing new capabilities and extending the operational reach of the three Services. In support particularly of the second and third objectives, the most important naval procurement program involves acquisition of two Franco-Spanish *Scorpena* submarines. Since 1985, when it inaugurated a 30-year program to establish a submarine arm, the Royal Malaysian Navy (RMN) has sent submariners for training in Australia, France, Germany, Pakistan, Sweden and Turkey. Crews for the *Scorpena* submarines, totalling more than 150 officers and ratings, are training on a French-based Agusta 70 and the first batch graduated in December 2005. After delivery in 2009, the submarines will be based at a new facility facing the South China Sea at Sepanggar

Bay, Sabah. The other major naval procurement program in prospect, funding permitting, involves an additional two *Lekiu* class frigates to supplement the two British supplied ships already in service.

With the RMN concentrating on building blue water and warfighting capabilities, during 2005 the Malaysian Maritime Enforcement Agency (MMEA) was established as a national coastguard with assets and personnel drawn from the police, customs and fisheries departments as well as the navy, and a three-star naval officer as Director-General. While the marine police will continue to provide security within 12 nm national waters, the MMEA will ultimately be responsible for maritime security out to the 200 nm exclusive economic zone (EEZ) limit. Though MMEA units are deployed on both sides of the Malaysian peninsula, its initial focus will be on the Malacca Strait in particular – the focus of much regional and international attention since early 2004 – where it began operations on 30 November 2005.

By July 2006, the MMEA is expected to deploy 72 vessels, including 15 ex-RMN patrol boats. These craft lack the endurance necessary for the roles with which the agency has been tasked, but in the longer term a resuscitated NGPV program supplying stripped-down MEKO 100s might provide the necessary ships. The MMEA will include an air component, and is expected to lease a small number of helicopters and patrol aircraft during 2006. Longer term plans call for 20 helicopters, and both amphibious and conventional aircraft, potentially undermining the Malaysian Air Force's ownership of the maritime patrol aircraft role.

Additional funding has been insufficient to resuscitate the ambitious modernisation programs that the Indonesian and Thai armed forces planned in the 1980s and early 1990s. In Indonesia's case, the defence budget still provides perhaps only 30 per cent of the armed forces' overall resources. The bulk of military funding derives from military-controlled commercial operations (both legal and illicit), from regional administrations (which have offered to purchase patrol boats), and from reserve funds (which are used not only to pay for operations, but also for some major procurement). The saga of the Indonesian Armed Forces' efforts over the last several years to purchase major equipment including new naval vessels has demonstrated the extent to which the procurement process is ad hoc and subject to inadequate political control.

Indonesia's huge geographical extent and its armed forces' central *Wawasan Nusantara* doctrine (stressing the vital importance of the integrity of the country's island and maritime territory) have long pointed to the importance of deploying a sizable and modern navy. During the 1990s, a combination of funding restrictions and eccentric decision-making (involving the purchase, largely for industrial reasons, of most of the former East German navy) stymied plans for growth, which had included local construction of a class of 23 frigates. Nevertheless, the prospect now is for a limited revival of Indonesia's naval capabilities in the medium-term in the face of maritime security challenges that are more acute than at any time since the 1960s.

The US proposal in 2004 for a Regional Maritime Security Initiative (RMSI), possibly involving the deployment of US forces in response to increasing piracy and potential maritime terrorism in the Malacca Strait and other waters close to Indonesia, reinforced Jakarta's fears over foreign interference in the archipelago. As well as spurring Indonesia to collaborate more effectively on maritime security at the regional and international levels, the RMSI also galvanised efforts to improve national capabilities. In addition, in early 2005 the maritime dispute with Malaysia over the resource-rich Ambalat area off Kalimantan/Sabah, which escalated to a naval stand-off, heightened Jakarta's sense that the navy needed to be strengthened. Simultaneously, the Indonesian army's diminished political clout has opened the way for the navy to secure a greater share of military resources.

In June 2005, Chief of Naval Staff Admiral Slamet Soedijanto revealed the Indonesian Navy Blueprint 2004-2013, which spoke of achieving green water capability by 2020. Integral to current plans is a shift in the composition of naval assets. The strike force group, comprising warfighting vessels equipped with sensors and guided weapons, will be reduced from the present total of 36 ships (many unserviceable or ineffective) to 14, with the aim that these will be fully operational and ready to deter foreign forces from intervening in the archipelago. Twenty-two ships (including the 16 former-East German *Patimura* class corvettes, which are being re-engined) will be transferred to the lightly-armed patrol boat group.

Under the naval blueprint, the existing Western and Eastern Fleets (HQs at Jakarta and Surabaya respectively) will be amalgamated into a single Fleet based at Surabaya with subordinate commands in Riau (west), Papua (east) and Makassar (central). Existing bases in these locations will be upgraded, along with forward operating locations such as Kupang in West Timor and Tahuna in North Sulawesi. The Marine Corps is being strengthened, with a third brigade forming in Sumatra and a fourth planned for Papua from 2008.

The main Indonesian naval procurement program currently involves four new *Sigma* class corvettes ordered in 2005 from the Netherlands at a cost of US\$1.9 billion, of which two will be built by the local shipyard PT-PAL. By Indonesian standards, this is a huge procurement, and it highlights the importance now attached to maritime defence. The other major procurement programs include four Korean-built landing platform docks (LPDs) (two to be built by PT-PAL); Chinese C-802 anti-ship missiles (probably to replace MM-38 Exocets) and four *Todak* class large patrol boats built by PT-PAL. There are also plans to upgrade naval aviation, with ten Polish M28 maritime patrol aircraft ordered for delivery during 2006. Four locally-built NC212-200 maritime patrol aircraft are also being delivered, and the air force will receive three CN-235MPs in 2007. The restoration of US Foreign Military Financing for Indonesia, announced in November 2005, is likely to result in near-term purchases of American equipment: additional Harpoon missiles are the most likely first candidate.

Indonesia's marine police and the coastguard, Kesatuan Penjaga Laut dan Pantai (KPLP, a directorate within the Ministry of Communications) share

responsibility for law enforcement in territorial and archipelagic waters. The KPLP is Indonesia's primary agency for counter-piracy. However, despite fairly extensive foreign assistance (particularly for the KPLP from Japan) serviceability of both organisations' assets is still unimpressive.

Despite resumed economic growth, Thailand's armed forces still suffer from static budgets and significant new procurement is limited. They are only just emerging from a "make do and mend" phase, which saw the Royal Thai Navy (RTN) accept donations such as the air search radar from the decommissioned HMAS *Brisbane* in 2002 in order to maintain a semblance of operational readiness. Though Bangkok has announced a military procurement budget of US\$6.6 billion for 2005-15, details remain unclear and this projected spending apparently depends on barter trade deals involving poultry and commodities. However, despite being classified as part of mainland South East Asia, Thailand has extensive maritime interests, and its government is concerned over the vulnerability of offshore oil and gas platforms, ports, fishing fleet and the Eastern Seaboard Industrial Zone to maritime terrorism, particularly in light of escalating separatist insurgency in the southern provinces. Other maritime security challenges include trafficking and potential conflict over maritime resources. Though there is a small marine police force, the navy has responsibility for the coastguard role.

The most important current procurement program involves two new frigates. Although a provisional deal with the UK to supply the ships as part of a wider military modernisation package was announced in 2003, indications are that the RTN is considering alternatives. In the meantime, it is taking delivery of two Chinese-supplied, missile-armed offshore patrol vessels (OPVs) with combat systems supplied by STN Atlas. Two additional similar vessels may be purchased. A multi-purpose hydrographic survey vessel, to be built in Thailand, was ordered from the Netherlands in December 2005. In the naval aviation sphere, two Super Lynx 300 helicopters have been delivered for operations from the *Naresuan* class frigates; and three P-3T maritime patrol aircraft are being modernised. The RTN remains interested in acquiring a submarine capability, but funding constraints imply that this remains a long-term prospect.

At the other end of the South East Asian military spectrum is the Philippines, where chronic funding shortages have prevented implementation of the *AFP Modernization Act*, which is supposed to have guided development of the armed forces (AFP) since 1995. At little more than US\$800 million annually, Manila's defence spending is by far the smallest of any of the larger South East Asian states (that is, excluding Brunei, Cambodia, East Timor and Laos). In 2006, the naval procurement budget amounted to less than US\$1.5 million, so upgrading the Philippine Navy (PN) depends largely on US military assistance. US Foreign Military Finance for the whole AFP amounted to US\$30 million in 2005.

The AFP's Capability Upgrade Program is costed at US\$600 million over the period 2005-10, though sufficient funds and US aid may not be available to ensure its completion. Improvements in naval capabilities will focus on improving support

for land operations against the Maoist New People's Army, Muslim separatists and Jihadist terrorist groups. Amphibious lift capabilities will be improved with construction of a new LST and four utility landing craft and the marines will receive new weapons and other equipment, and enhanced C4ISR commonality, with the air force and army to facilitate joint-Service operations. Efforts are also being made to enhance control over territorial waters and the EEZ. Under a 2003 contract, the UK's QinetiQ is upgrading the armament of three ex-Royal Navy *Jacinto* class large patrol vessels. Also, since 2002 the PN has received a *Cyclone* class coastal patrol craft and two *Point* class cutters under the US Excess Defense Articles program.

Because of the nature of their political systems and economies, it is difficult to estimate the defence spending by Vietnam and Myanmar with any accuracy; neither was directly affected by the 1997-98 financial crisis. However, Vietnam remains determined to defend its economically vital offshore natural resources and to deter future Chinese naval pressure aimed at securing greater control over the disputed Spratly Islands. Relatively fast economic growth has allowed Hanoi to increase defence spending significantly during the current decade, with the navy receiving substantial infusions of new equipment. Three new corvettes, with German-supplied engines and UK/US-supplied Bridgemaster marine radars, are being built locally. The three *Petya* class frigates are being refurbished. Two *Svetlyak* (Project 1041.2) fast attack craft supplied by Russia in 2002 are likely to be followed by an additional 10-12 similar craft, and South Korea may supply *Sea Dolphin* inshore fast patrol craft. The coastal surveillance radar network has been modernised with 10-12 short range Thales systems; there is a requirement for 20 long range radars. In April 2005 Vietnam signed a major arms deal with Poland, which is likely to include 10 M-28 Skytruck maritime patrol aircraft (to be operated by the air force on behalf of the coastguard) and 40 second-hand Su-22M strike aircraft, some for the maritime attack role. Continuing discussions with Poland may cover the transfer of surplus ships including four *Gornik* class (*Tarantul*) corvettes.

The military regime in Myanmar has placed much less emphasis on maritime defence than Vietnam, emphasising instead counter-insurgency and air power. The navy deploys a small number of corvettes as well as a much larger force of patrol craft. During the 1990s, there were reports that three *Jianghu* class frigates had been ordered from China, but these never materialised. While the navy is kept afloat largely with Chinese material assistance, Myanmar's emerging relationship with India could balance this influence: in January, it emerged that New Delhi had begun supplying surplus equipment, including BN2 Islander maritime patrol aircraft and naval air defence guns.

Of the remaining South East Asian states - Brunei, Cambodia, East Timor and landlocked Laos - only the first has naval ambitions extending beyond a coastal role. However, while lack of finance has not constituted a problem, a lack of suitably educated personnel and technical expertise has proved a continuing challenge for oil-rich Brunei, which aspires to deploy a serious naval capability (notably in support of its South China Sea claims around Louisa Reef). To this end, in 1995 the

Sultanate ordered three Yarrow F2000 OPVs (smaller versions of the Malaysian *Lekiu* class frigates), armed with Seawolf and Exocet. However, though the first two ships were completed in 2003 and 2004, Brunei has refused to accept them, claiming they failed to meet specifications. Amidst rumour that Brunei's lack of capacity and suitable domestic facilities constitute the real reasons, the matter is now subject to legal arbitration.

Maritime Security Cooperation

Given the relatively small scale of South East Asian states' armed forces and military modernisation programs compared with those of other Asia-Pacific powers, observers often suggest that they should collaborate more closely with a view to producing a more powerful common defence effort, not least in the maritime sphere. However, the absence of strongly-held common threat perceptions and pervasive bilateral tensions amongst ASEAN members effectively preclude significant multilateral defence collaboration, notwithstanding the inclusion in the 2003 Declaration of ASEAN Concord II of the Indonesian-inspired initiative to create an ASEAN Security Community by 2020. In the naval sphere, ASEAN-sponsored multilateral naval cooperation has extended only to bi-annual Chiefs of Navy meetings, and annual ASEAN Navy Interaction Conferences.

There have been some important developments since 2004. Until then, significant naval cooperation within ASEAN had seemed likely to be restricted to a rather patchy matrix of bilateral exercises and coordinated (but not genuinely joint) patrols. Singapore maintained the most wide-ranging network of intra-ASEAN naval links, engaging in collaboration with Brunei, Indonesia, Malaysia and Thailand. However, the furore over security in the Malacca Strait following the US airing of RMSI and the spectre of external intervention galvanised the inauguration of trilateral Malaysia-Singapore-Indonesia (MALSINDO) coordinated naval patrols during 2004, which were expanded to include Thailand in 2005. Also during 2005, a maritime aerial surveillance element – known as “Eyes in the Sky” (EiS) was added. In May 2005, Indonesia and Singapore inaugurated the joint Surpic naval monitoring system, which will allow their navies to share a real-time situation picture of the Singapore Strait and to deploy vessels more effectively. In the east of the ASEAN region, where illicit maritime activities have increasingly become rampant, the Malaysian and Philippine navies also exercise together. Malaysia and Singapore are discussing the possibility of establishing a joint submarine rescue capability, and this could be expanded to involve other South East Asian submarine operators (probably Indonesia in the first instance).

However, it is Western states' involvement in South East Asian security that still provides the framework for some of the most important regional and international maritime security collaboration by ASEAN members. The Five Power Defence Arrangements (FPDA) – involving Australia, New Zealand the UK as well as Malaysia and Singapore – provide the context for a far wider range of maritime-focused defence activities involving the two South East Asian members

than their tenuous bilateral arrangements. During 2004, the FPDA exercises' scope widened to include maritime counter-terrorism for the first time. The three non-regional FPDA members also conduct bilateral exchanges and exercises with Malaysia and Singapore. In addition, Australia has a regular naval exercise series with Brunei and is collaborating with the Philippines on maritime security. Despite the sensitivities aroused by the RMSI, the US Navy's (USN) links with South East Asian partners continue to be wide-ranging. While relations are close with Washington's two formal allies, Thailand and the Philippines, they are closest with Singapore, where the government provides substantial facilities for the USN. Notably, Singapore has contributed naval units to coalition operations at the northern end of the Arabian/Persian Gulf. In addition, the annual USN CARAT series involves exercises with Brunei, Indonesia and Malaysia as well as Singapore, the Philippines and Thailand, and allows for limited multilateral links. The US also sponsors the annual Western Pacific Naval Symposium (WPNS), which encourages multilateral exchange, particularly through the Western Pacific Mine Counter Measures exercises (MCMEX). The US is also believed to be encouraging Malaysia-Singapore collaboration on waterspace management to eliminate conflict in the two neighbouring states' submarine operations.

Simultaneously, non-Western regional powers are becoming more closely interested and involved in South East Asian maritime security. China remains opposed to multilateral maritime security cooperation, and South East Asian governments remain extremely wary of entering into bilateral security arrangements with Beijing. But while China's maritime security role in South East Asia has been restricted to occasional naval port calls, and transfers of equipment to some South East Asian navies (notably to Myanmar and Thailand), Japan and India have developed more substantial roles. Though self-constrained from sending naval vessels into the sub-region other than for occasional training cruises, Japan has deployed sea and air elements of its coastguard, which have exercised from Singapore. Tokyo has also helped to galvanise multilateral maritime security cooperation through the Asia Maritime Security Initiative 2004 (Amarsective 2004), aimed at boosting the anti-piracy capacity of Asian coastguards, and the Regional Cooperation Agreement on Anti-Piracy (ReCAAP), primarily involving intelligence exchange and involving the ASEAN members as well as Japan, China, South Korea, India, Bangladesh and Sri Lanka. With its fast-growing economy more and more trade dependent and increasing resources for naval construction and operations, India has begun to strengthen its naval cooperation with South East Asian states bordering the Indian Ocean. As well as pursuing bilateral naval cooperation with Indonesia, Malaysia and Singapore, in January 2006 the Indian Navy hosted a major multilateral exercise including units from not only these states but also Myanmar, Thailand, Bangladesh and Sri Lanka.

Looking Forward: the Next Decade

Low intensity maritime security issues – revolving around the need to control piracy, trafficking and other maritime crime, to deter seaborne terrorism, to protect natural resources within EEZs, and to prevent environmental damage – will continue to loom large for South East Asian governments. More than ever, these challenges will call for multinational responses, sometimes involving non-South East Asian powers as well as littoral states. Continuing rivalries and tensions between South East Asian states and outside players, as well as within the sub-region, will continue to limit the intensity and operational usefulness of cooperation between navies. However, coastguard bodies will increasingly assume responsibility for low-intensity concerns, which may augur well for more intense maritime security cooperation. Because of their semi-civilian nature, their relatively low public profile, and their orientation towards and training for constabulary duties rather than warfighting, fostering cooperation between coastguards – as Tokyo has already realised – may be less politically sensitive and more potentially productive in operational terms.

National economic circumstances permitting, considerations of national prestige and continuing concerns over outstanding territorial disputes will be one of the key factors encouraging South East Asian governments to maintain the momentum of their naval modernisation programs over the next 10 years. Malaysia and Thailand will continue upgrading their surface combatant inventories, while developing submarine arms. Indonesia will seek to ensure that its 14 strike force ships and its small submarine force are as modern and as well-equipped as can be afforded. Vietnam's historic national concern with resisting Chinese pressure will almost certainly ensure that it continues its own modernisation program.

However, the technological and personnel challenges posed by absorbing major, technologically sophisticated naval units, whether surface or sub-surface, into service are huge (and seem to have been particularly evident in the case of Brunei's OPVs). Too often in South East Asia, platforms and weapons systems have been ordered without adequate planning for the infrastructure, logistic support and training necessary to bring them into operation. Thus, while acquisition of platforms and weapons systems may proceed apace, in general South East Asian navies will probably be slow to develop significant new capabilities. The exception is again likely to be Singapore. It has the key advantages of a highly developed economy and a relatively well educated population, reinforced by increasingly intense interaction with the armed forces, defence industries and research and development (R&D) establishments of the US and other advanced industrial states. Singapore has already made great progress in developing a navy that ranks alongside its counterparts in other developed countries. Most importantly, the city-state has increasingly fielded sophisticated C4 and ISR assets that far outclass those available to other South East Asian states. Singapore has also stressed joint-Service operations, and has made considerable investments in simulators for training and in infrastructure. Singapore's Defence Ministry has made overt efforts to transform military capabilities by establishing the Future Systems Directorate and a Centre

for Military Experimentation. Almost 10 per cent of Singapore's military budget is channelled to R&D, information technology procurement and experimentation. For these reasons, over the next decade the RSN is likely to develop genuinely networked capabilities based around *Formidable* class frigates, *Västergötland* class submarines, S-70B (Seahawk) helicopters and a range of uninhabited systems. There are few signs of similar developments elsewhere in South East Asia: the only potential sub-regional peer-competitor for Singapore in terms of naval transformation is Malaysia. But the city-state is still likely to be ahead in 2015.

The Royal Malaysian Navy: Adapting to Non-Traditional Security Challenges

H.J. Sutarji

Malaysia's maritime areas are of immense strategic and economic importance. Almost half of the Malacca Strait is within Malaysia's territorial waters and exclusive economic zone (EEZ). Similarly, the western and eastern portions of the South China Sea also form a significant part of Malaysia's territorial sea and EEZ. Both the Malacca Strait and the South China Sea are important sea lines of communication connecting the Indian and Pacific Oceans. They are also the main source of Malaysia's maritime natural resources, namely oil, gas and fisheries. The maritime industries generated from these natural resources have contributed more than 12 per cent of Malaysia's gross domestic product.

Since the past few decades, these maritime areas have faced persistent security challenges of both traditional and non-traditional nature, notably the overlapping claims of offshore islands and EEZ in the South China Sea, intractable maritime boundary issues, protection and preservation of both living and non-living marine resources, navigation safety in the Malacca and Singapore straits and prevention of illegal activities such as illegal fishing, illegal immigration, smuggling, piracy and robbery. Since the 11 September 2001 terrorist attacks, the security issues of the Malacca Strait have been in the forefront of the maritime issues, not only in Malaysia but also in this region.

The Royal Malaysian Navy (RMN), besides being responsible for the defence of the Malaysia's maritime areas, is also required to assist other maritime agencies for maritime surveillance, reconnaissance and law enforcement. In fact, the RMN is now the lead agency in providing security measures in the Malacca Strait until such time when the Malaysian Maritime Enforcement Agency (MMEA), Malaysia's coastguard, established on 16 April 2003, is ready to assume the new responsibility. The RMN must also adapt itself to face the non-traditional security challenges in the Malacca Strait.

This paper highlights how the RMN has developed its new capabilities to deal with the non-traditional security threats effectively, while at the same time maintaining the capabilities of a true navy. Hence, this paper shall discuss the non-traditional security challenges in the Malacca Strait, RMN approaches to developing the special capabilities to deal with non-traditional challenges at no additional cost, lessons learned and the way forward. It is hoped that the RMN experiences would be of relevance to other navies in meeting similar challenges.

Non-Traditional Security Challenges in the Malacca Strait

One of the maritime security challenges facing Malaysia is the security of the Malacca Strait. The Strait is a narrow, 800 km long strip of water running between Indonesia,

Malaysia and Singapore. The southern portion of the Strait is extremely narrow and dotted with shallow patches. The Strait is a crucial transport route for more than 50,000 ships a year, carrying about one quarter of the world's overall trade,¹ including 11 million barrels of oil daily.² Any serious disruption to the flow of maritime traffic through that channel would clearly have far-reaching detrimental effects, forcing ships to detour around 600 miles and, without doubt, resulting in higher freight rates and more costly goods. That is why the security of the Strait is so important.

Besides being a strategic waterway, the Strait is also a rich fishing ground. In 2002, there were 12,497 fishing vessels registered to fish in the Strait, employing 32,463 fishermen. Assuming that 10 per cent of these vessels were at sea at any time of the day, 1250 fishing vessels would operate in the Malaysian side of the Malacca Strait.³ The number could be doubled should the Indonesian fishing vessels be taken into account. Unfortunately these fishing vessels would interfere with the radar detection of boats operated by pirates.

There are several non-traditional security threats in the Strait. First, the Strait is noted for the relatively high incidence of armed sea robbery on passing ships and ships lying at anchor within port limits or outside port limits awaiting clearance to unload their cargoes. Robbers, known to some as "pirates" in the Malacca Strait, are believed to be those living in the vicinity of the Indonesian side of the Strait. They are very familiar with local waters, able to operate at night in small groups of less than 10 men, using high-speed boats and armed with automatic weapons. Their intentions are to rob for cash and valuables, or demand ransom for ships and crew they have seized.⁴ They carry out attacks only when an opportunity is presented, usually at night, and within a short distance of their hideouts. They are often disguised as fishing vessels and possibly have inside help.⁵ They do not roam the sea, nor do they risk encountering ships of the enforcement agencies. Their modus operandi demands that patrol vessels patrolling the Malacca Strait possess special capabilities to be effective.

Second, the presence of several militant organisations in this region suggests the possibility that terrorists could turn large hijacked vessels carrying dangerous cargoes into weapons or huge floating bombs against high value targets in the Malacca Strait. The hijacked vessel could also be caused to spill oil into the sea or be grounded at a critical spot to block the shipping channel.⁶ Any such attack could severely disrupt oil shipments from the Middle East to East Asia, and the shipment of Asian manufactured goods to Europe and Africa.

The interest shown by foreign powers to patrol the Strait and their increasing concerns about a potentially bigger threat have prompted both Malaysia and Indonesia to launch a program to improve security through coordinated maritime patrols, whereby ships from their navies patrol the area. Singapore also later joined the initiative.⁷ As part of the operation, each navy is committed to providing between five and seven ships to patrol the Malacca Straits. They have also established a hotline that will allow them to communicate to better coordinate the operation, particularly when a vessel from one of the countries is in pursuit of pirates. In

addition, a warship from one country will also be allowed to enter the waters of another country when chasing a suspect vessel, provided that this is communicated first to the host country.

To enhance the effectiveness of these coordinated maritime patrols, Indonesia, Malaysia and Singapore declared the creation of a special joint task force to ensure the safety of the Strait, MALSINDO, on 18 June 2005. In November 2005, Indonesia reported that the three countries' cooperation had been successful in reducing the frequency of attacks as reported by the International Maritime Bureau (IMB). According to the IMB, between January and September 2005, the number of attacks was halved when compared with that of the corresponding period in 2004.⁸

The close cooperation between these three navies, whose modern warships are equipped with the latest technology, does not necessarily guarantee that the Malacca Strait would be more secure. These ships, the RMN warships in particular, are designed, equipped and armed for conventional operations rather than for law enforcement activities against pirates.

Malaysia's Policy on the Security of the Malacca Strait

The threats facing the Strait led the US to propose the Regional Maritime Security Initiative (RMSI) in 2004, intended to prevent terrorists from activities such as seizing a vessel loaded with liquid natural gas to slam into a pier in Singapore; scuttling a tanker in the Malacca Strait to close a vital waterway; or from exploding containers full of chemical fertiliser in busy ports.⁹ Singapore was quite receptive and supported the idea,¹⁰ but it was opposed by Indonesia and Malaysia. Both countries felt that the littoral states bordering the Strait should be responsible for the safety of the Strait.¹¹ Malaysia has pledged to take every form of preventive measure and operational arrangement to ensure the safety of the Malacca Straits¹² and has rejected the employment of a private security company to provide escort services to vessels passing through its territorial waters in the Malacca Strait.¹³

Since the last decade, maintenance of security in the Malacca Strait has been given top priority. In order to ensure effective and efficient enforcement, Malaysia has adopted several strategies, such as visible deterrence, by maintaining continuous presence; swift response, by placing fully capable marine assets close to the trouble spots to reduce response time; forward reaching, through maintenance of good surveillance and reconnaissance capabilities; and cooperation, to disseminate accurate and timely information. Three notable projects as part of these strategies that are already operational are: the Sea Surveillance System, covering the Malaysian side of the Malacca Strait from Langkawi Island in the north to the eastern portion of the Singapore Strait; the Malaysian Vessel Traffic System; and the Mandatory Ship Reporting System. These systems generate a variety of information, including radar video on vessels' identity, movement, location, cargo, ports of call and other data relating to traffic in the Strait, distress management, piracy reporting and pollution monitoring. Presently, the backbone to realising these strategies is the RMN, until such time that the MMEA is fully operational.

Royal Malaysian Navy Approaches to Developing Special Capabilities

The RMN currently has a strength of about 16,000 officers and crew with a modern fleet comprising various classes of ships such as frigates, corvettes, support ships and auxiliary platforms, as well as the naval air wing operating AgustaWestland Super Lynx and Eurocopter Fennec helicopters and two units of Naval Special Forces. The capability of the RMN will be further enhanced through the acquisition of two *Scorpena* class submarines from France.

The fleet is organised into various classifications of flotillas and squadrons. There are five flotillas, each of which has a few ships from the respective squadrons. Two of the most important flotillas are the Strike Flotilla and the Support Flotilla. The Strike Flotilla comprises frigates, corvettes and missile craft squadrons, while the Support Flotilla comprises multi-purpose command and support ships, landing ship tank and mine countermeasure vessels squadrons. The organisation is designed to better manage the specific capabilities and roles of the platform, to be flexible, dynamic and ready to react and respond not only in terms of countering threats but also in meeting government expectations.

The most serious constraints facing the RMN in providing deterrence as a maritime force and meeting government expectations are its limited resources and the expectation for it to do more with less. The small number of platforms in its inventory and limited budget has forced the RMN to look into the optimisation of resources and to achieve a competitive advantage by capitalising on state-of-the-art technologies.

In the past, it was observed that incidents of unlawful activities on the Malaysian side of the Malacca Strait occurred not in all parts of the Strait, but in sectors where the presence of ships of the maritime enforcement agencies were thinnest. Hence, effective law enforcement requires visible presence.

Taking these constraints into account and the need to maintain an appropriate strategy for effective enforcement, the RMN formed the Malacca Strait Joint Task Force comprising ships from Strike and Support Flotillas backed by the Naval Special Forces Unit, the Navy Air Wing and the Air Force's Maritime Patrol Squadrons. The Naval Special Forces Unit is to provide response teams for special boarding, rescue operations of hijacked vessels and interception of suspected pirates in the shallow water areas using high-speed rigid inflatable raiding craft (RIRC). The Naval Air Wing will provide Super Lynx and Fennec helicopters to support the Naval Special Forces teams for aerial boarding and platform for aerial sharp shooters. The Royal Malaysian Air Force will support the task force by providing maritime patrol aircraft as "eyes in the sky".

Concept of Operations

Maintaining security in the Malacca Strait is no easy task. There are three main challenges: the ability to maintain continuous 24-hour surveillance, a good all-round communication system, and the ability to provide immediate response to any contingencies that threaten the security of the Strait. Considering the constraints

facing the RMN, the nature of the maritime areas of operation should cover the following:

- suitable RMN ships with helicopters and special forces boarding teams embarked to maintain presence in the high risk areas.¹⁴ At least two ships should be deployed at any one time. The boarding team will be tasked to provide appropriate and immediate response to any crisis situation
- maritime patrol aircraft will provide daily patrol in the high risk areas. Air surveillance in the lower risk areas will be scheduled, subject to the availability of additional aircraft or when a patrol aircraft is in transit
- the Sea Surface Surveillance System should be manned continuously and any suspicious contacts reported to naval ships and the maritime aircraft on patrol
- an effective command and control system should be maintained to facilitate the free flow of information within the task force as well as to the task force commanders of other navies on patrol in the Strait.

Tactical Employment of Special Forces RIRC

Employment of Special Forces' RIRCs to intercept suspicious contacts at night in shallow water areas requires special skills and tactics (several tactics were attempted but found to be unsuitable).¹⁵ Radar control intercept missions commonly practised by air force fighter aircraft to intercept unknown contacts are the best option. Using the same concept the RIRCs, once launched, would be guided by radar to intercept the suspicious contact. While this intercept is in progress, the activity is also monitored by the sea surveillance system.

The climax of the efforts was demonstrated to the media during the recent Exercise NAGA EMAS (GOLDEN DRAGON) held in the Malacca Strait for three days. During the exercise an oil tanker carrying a large volume of crude oil on night passage in the Malacca Strait was attacked by a group of "pirates". The ship was held hostage and would only be released if ransom money was paid. The Malacca Strait Joint Task Force was deployed to secure the ship. The full motions for securing a hijacked ship were carried out based on the new RMN doctrine and the National Security Directive No 18. The motions include mobilising the various levels of command and control from the task force through the RMN Fleet Command, Malaysia Armed Forces Headquarters and the National Security Division of the Prime Minister's Department; intelligence gathering; and mobilising the crisis management team, headed by the Director of Internal Security and Public Order. Together with the various support groups - the negotiation team, emergency support groups and the assault teams - the Navy Special Forces Teams embarked onboard the ships and carried out negotiations with the hijackers, mobilised additional military resources from shore, and prepared for follow-up actions after the ship was retaken. The climax of the exercise was when the negotiation failed, and the crisis management team directed the Commander of the Task Force to deploy the assault team to secure the ship during the early hours. The exercise was completed when the hijacked ship was secured successfully with clockwork precision.

Lessons Learned from RMN Experiences

The RMN is a learning organisation and it has become a culture in the RMN to make improvements or reinvent certain processes for greater effectiveness. In the process of adapting to non-traditional challenges, the RMN has developed a new doctrine specially designed for the task force to be able to secure immediately the release of a hijacked ship of any size or nature (e.g. a large oil tanker, liquefied natural gas carrier or passenger liner).

The new doctrine emphasises the pre-planned actions from the start to the end and includes the organisation, command and control, divisions of responsibility, standard operating procedures for high-speed intercept on suspicious craft, employment of assault teams, employment of helicopters to support the assault teams, and patrol coordination with maritime patrol aircraft, the Malacca Strait Sea Surface Surveillance and other relevant agencies. What is most interesting from the RMN experience is the new doctrine of using existing assets with no additional cost.

Some of the lessons learned in the process of developing the new doctrine are:

- the willingness of those involved to think outside the box and accept calculated risk. For example, even though the Super Lynx helicopter is too big to land on the *Kasturi* class corvette's helicopter deck, it was successfully done using a diagonal approach
- each single Service in the Malaysian Armed Forces is serving the same ultimate purpose. However, each Service has its own culture and Service objectives to meet. Hence, when they do work together in delicate operations, it is often easier said than done. In RMN experience, better coordination is achieved by using all assets taken from the same Service during a high precision operation such as hostage rescue operation at sea and at night
- on many occasions, senior officers were inclined to believe that the younger officers were not as capable as they themselves were when they were young. However, when they were given the responsibility, these young officers were able to inject new ideas that had not been commonly practised in the past. They were able to carry out the mission successfully with minimum supervision
- practice makes perfect. Every member of the force must be an expert in their own job and understand their role in the bigger picture. Training at every level of the organisation must be realistic and carried out tirelessly to resemble a real life operation.

Conclusion

The Malacca Strait is very important not only to the littoral states but to other international users. Lately its safety has been threatened with high incidence of sea robberies and the possibility of terrorists turning hijacked large vessels carrying dangerous cargoes into weapons of mass destruction. Even though such a threat is only a possibility, Malaysia and the other littoral states are serious in ensuring that it would not occur in the future.

Over and above the coordinated patrol and “eyes in the sky” initiatives, the RMN has taken steps to develop a capability to secure the immediate release of a hijacked ship before it is turned into a dangerous weapon of mass destruction. The new capability has not been tested in a real life situation but every effort to improve continues to be made. What is important to mention is that the new capability was developed using existing infrastructures and at no additional cost. We believed that the experiences gained in developing this capability are worth sharing.

India's Security Concerns and Emerging Challenges for the Navy

Premvir Das

India's interests at sea flow from the totality of its security environment. These maritime concerns are, therefore, to be viewed holistically, in conjunction with the entire gamut of the nation's interests. Further, unlike land frontiers, which are more defined and quantifiable and have to be protected or defended, maritime interests have a larger connotation, requiring them to be safeguarded and enhanced. This important difference between sanctity of territorial integrity, and consolidation of maritime interests, needs to be recognised, especially by nations whose fortunes are closely tied to the seas.

On another plain, traditional concepts of control of the seas have undergone transformation. Long drawn-out wars have become obsolete. In the new military environment, the time available for achieving results has been sharply curtailed and, in this reduced period, the focus must be on achieving gains that are strategically useful, not merely tactical. At the same time, a new form of threat, non-traditional and transnational, has taken shape. The naval domain has, slowly but surely, moved to the littoral, and cooperative paradigms, much more than confrontation, are becoming important to maritime security.

The Emerging Security Environment

The emerging global security environment is focused on the Asia-Pacific generally, and in Asia, in particular. Two of the three largest economies of the world in the next 15 years will be Asian. The immediate concerns of the US – such as rogue or failed states, radical Islamic terrorism, oil and its supply routes, and proliferation of weapons of mass destruction (WMD) – are Asia-centric. In the longer term, the only country that can emerge as a rival to US global interests, China, is an Asian entity. It is, therefore, not surprising that there is a large US military presence stretching from Turkey in the west to Japan in the east, and including the Central Asian Republics, in addition to formidable capabilities that can be brought to bear from the sea. It is unlikely that this will change in the foreseeable future.

The Indian Ocean is one of the major theatres of the Asia-Pacific region. The strategic imperatives of the US, to have a dominating presence in Asia, to exert influence over its energy assets, to ensure safe movement of commerce and to counter radical Islamic terrorism, are inextricably linked to this vast stretch of water. The countries of concern are littorals of this space. The major terrorist movements originate from here and safe movement of energy requires the sea lanes to be made secure. It is in this overall context that India has to look at the maritime dimensions of its security.

The Indian Ocean

Nearly half of the entire seaborne commerce of the world moves across the waters of the Indian Ocean; even more importantly, as much as 20 per cent of it, US\$200 billion annually, is in the form of oil and gas. More than half is shipped eastwards through the sea lanes of South East Asia. For example, 70 per cent of Japan's needs of oil are met from the Gulf, and South Korea is equally dependent on imports from this region. The US imports 20 per cent of its energy needs from here, France 50 per cent and even China has become a major importer of Gulf oil, overtaking Japan. Thus, the entire Asia-Pacific region is critically dependent on the energy resources of the region and on the safety of their movement. As much as 65 per cent of the world's discovered oil reserves and 35 per cent of its gas are located in this region, which accounts for 40 per cent of global oil production annually. These are very important and critical assets. There are also resources below the sea that are still to be discovered. These existing and potential resources lend great strategic significance to the Indian Ocean region.

At the same time, the region, its northern part in particular, suffers from serious vulnerabilities. The sea lanes entering and exiting from these waters pass through several narrow passages, such as the Strait of Hormuz, the Gulf of Aden, Suez Canal, the Malacca Strait etc. These choke points make it possible for rogue states and non-state actors to interdict or disrupt shipping, thus, jeopardising the safety of cargoes moving across the important East-West trade routes. Last year, more than half of all piracy at sea worldwide took place in the Malacca Strait and surrounding waters. With some 55,000 ships transiting the Strait annually, the effects of consequent disruption in the trade chain on the economic growth of most major economies are not difficult to visualise. Furthermore, most littorals have been nation states for less than 50 years, and religious, ethnic and societal discords plague many of them. The fact that several are ruled by authoritarian regimes and are dependent on single product economies, especially in the Gulf region, adds to their domestic and political fragility.

India's Interests

As many as 3.5 million Indian citizens work in the Gulf countries, contributing over US\$10 billion annually to the Indian economy. Our interests require that their work environment remains stable. India's own very large Muslim population has many interfaces with all Islamic Gulf littoral countries. These include, in a positive sense, religious interaction as in the Haj pilgrimage but also activities inimical to its security from the several radical Islamic terrorist movements stretching across the North Indian Ocean region. Another vital concern is India's own dependence on oil imports from the Gulf. Over 70 per cent of India's annual consumption is imported and the figure is likely to go up from 85 million tonnes in 2005 to 300 million tonnes by 2020. Any stoppage or interdiction of this oil will have a crippling impact on the country's economic growth. It is equally important that our offshore oil assets, spread over an area of over 48,000 km² and likely to double in the next

two decades, are protected from attacks or encroachment by hostile elements. The same holds true for the nearly 4000 odd tankers that come to our ports every year. Their number is likely to grow to over 8000 by 2020. Almost 95 per cent of India's overseas trade moves through the medium of the sea, and is expected to reach US\$250 billion this year. This figure is likely to exceed US\$1.2 trillion by 2020. Of this, about US\$600 billion would be moving through the waters of the South East Asia region. Safety of these sea lanes, the coastal offshore areas, and of our ports through which this trade moves is, therefore, critical to its interests. In earlier times, the emphasis was on securing important assets against conventional military threats but the greater danger now posed is by non-state actors.

India shares maritime boundaries, not just with three of its South Asian neighbours, but with Myanmar, Thailand and Indonesia. Malaysia is also not far away. While boundaries have been delineated with most of them, there are, inevitably, irritants such as poaching, smuggling and illegal movement of arms. Another serious concern is of the smuggling of narcotics, which is closely linked to the arms trade and, therefore, to terrorism. India is located in the middle of two major narcotics centres of the world, centring on Myanmar in the east and Afghanistan in the west. We hear a lot about drug seizures made at airports and on land but one seldom hears of transportation by sea, which is infinitely easier and permits large quantities to be shipped. Two years ago, a Japanese vessel, masquerading under a false name and flag, was routinely investigated in an Indian port and found to have been engaged in the smuggling of narcotics and arms. There must be many other vessel carriers that have not been caught.

Finally, India's interface with the Asia-Pacific region is crucial to its economic growth and national interests. Bilateral trade with China and the Association of Southeast Asian Nations (ASEAN) exceeded US\$14 billion each last year and is slated to grow to US\$35-40 billion in the next five years. Trade with Japan and South Korea, even if not of the same magnitude, is also poised for growth. Stability in the countries with which we trade, and their own prosperity, is, therefore, in India's interest. Linked to the security concerns highlighted earlier, this makes an India-Asia-Pacific relationship an important adjunct of the overall equation. The medium that acts as the binder, as well as the facilitator, is the sea.

Maritime Terrorism

Many people tend to mistake piracy at sea for maritime terrorism. The former has existed for as long as men have sailed the seas and largely covers robbery – petty or big and sometimes with the connivance of the crew. In recent months, incidents have seen greater violence being used by the raiders, and crews have also been taken hostage for quite heavy ransoms. These developments are disturbing but will not, unlike terrorism, affect the security of nation states or produce widespread trauma in populations. But piracy, which leads to hijacking of ships, falls under a different and much more serious category. It is organised crime, because these activities are not executable without a vast network. It is also transnational. Ships belong to one

country, are registered in another, crewed by people from several others and carry cargoes bound for destinations around the world. Once hijacked, they can be used for nefarious purposes anywhere. So the security of restricted waters, where such crimes can be more easily perpetrated, is important, not just for those littoral to it but also for those well beyond. So far, we have seen terrorist attacks on the USS *Cole* in Aden, on the French oil tanker MV *Limburg* off Yemen, on offshore oil terminals and tankers at Basra, and on super ferries in the Philippines. The ultimate terrorism, on par with the 11 September 2001 attack, can be the sinking of ships in busy channels or at the entrances of major ports to bring their activities to a standstill for many months. Ships are easier to hijack and will cause damage beyond that inflicted on 11 September 2001. Countries cannot cope with maritime terrorism by themselves. It will also not help to react when the damage has already been done. Preventive capabilities are essential. There is need for information sharing, for effective and stringent laws, for suitable organisations and capabilities, and for coordination and cooperation at the regional level with countries around us, external to the region and littoral to it. As one of the region's major maritime powers, India has to play a proactive role in such cooperative interfaces.

The Stakeholders

The US is a major player in the North Indian Ocean. Not only does it have vital strategic concerns in this region, it is the largest importer of Gulf oil and its seaborne trade through the Malacca Strait exceeds US\$500 billion. It also deploys considerable maritime power to support and safeguard these interests. India shares many of these interests, in particular, those pertaining to the fight against terrorism, proliferation of WMD and the safety of seaborne commerce. The Indian Navy (IN) has been carrying out joint exercises with the US Navy (USN) for about a decade and their scope has been increasing. It is very unlikely that these interfaces will diminish, as there is a convergence of interests between the two countries at the strategic level. This can be seen in the 10-year New Framework for the India-US Defence Relationship signed by the two countries on 28 June 2005, which includes participation in multinational operations by mutual agreement and coordinated patrols at sea. This positive relationship also extends to India's maritime interfaces with countries such as the United Kingdom, France, Russia, South Africa, etc. The level of maritime interaction between India and Japan is increasing commensurate with the shared interests of both countries in the Asia-Pacific region. The level of interface with Australia has been somewhat disappointing. Both countries need to move more positively in giving impetus to this relationship.

Region and Neighbourhood

As far as the littoral countries are concerned, India has important economic, political and security interests, and naval interactions with these countries through ship visits, exchange of personnel and joint exercises, enhance them. The Gulf region is not only critical for its oil and gas but also for other inputs to our economy, while

the Malacca and Singapore Straits are among the world's most important shipping routes; half of India's overseas trade passes through them. The gathering of ships hosted by the IN in January 2006, under Exercise MILAN, attracted participation from nine regional navies. Such cooperative programs, which build trust and confidence, must be encouraged. IN ships have assisted Sri Lanka in times of natural disaster. In the Maldives, it was only the timely intervention of our naval and airborne forces that saved the legitimate government from being overthrown. Most recently, both countries have seen immediate and credible response from IN and Indian Coast Guard ships during the tsunami disaster even as India, itself, suffered great loss of life and devastation. Indian naval ships have carried out patrols of the exclusive economic zone of Mauritius at that country's request and ensured offshore and coastal security for the African summit conference in Mozambique last year. Just recently, a dedicated organisation for international maritime cooperation, under a Flag Officer, has been constituted at Naval Headquarters, which is a measure of the seriousness that the IN attaches to this issue.

Relations with Pakistan are presently quite tranquil, but it is likely that things will change radically in the foreseeable future, given that Pakistan's military can only retain its elitist position in society if India is portrayed as hostile. Therefore, the Indian Navy has to be prepared to cope with any eventualities and needs maritime power that is sufficiently dissuasive. However, likelihood of military conflict is not high. Apart from the fact that the nuclear environment imposes its own constraints, the dynamics of the international environment and India's deterrent capabilities cannot be wished away. However, terrorism in Kashmir and, indeed, elsewhere in India, supported from Pakistan, is likely to continue and its threshold will depend on India's capabilities to cope with it as well as the pressures that it can bring to bear internationally on Pakistan. The country is well known as the training hub for terrorists around the world, as also highlighted in the third report of the 9/11 Public Discourse Project published in November 2005. Perpetrators of the London explosions, those arrested in Australia a few months ago or those responsible for various acts of terrorism in Afghanistan and, of course, in India, have all emerged from institutions in Pakistan. A senior minister of the present government is well known to have operated one of the largest of such camps. Pakistan is developing the port of Gwardar on the mouth of the Strait of Hormuz through Chinese assistance and its president is on record that the People's Liberation Army-Navy (PLA-N) would be allowed to use the port facilities whenever Pakistan felt threatened. This pronouncement has overtones and needs to be factored into our security calculations, given that India's oil lifeline can easily be threatened by hostile elements, both state and non-state, operating out of Gwardar.

China

As far as China is concerned, India's relations with that country have fluctuated, but in the emerging world order, things have begun to change. India is aware that China is going to be one of the two largest economies in the world by 2020

just as China realises that India, with its existing gross domestic product of about US\$700 billion, growing at about 8 per cent per annum, is poised to become a major economic power in the same time frame. Strategically, both China and India are very important ingredients of the Asian chessboard. Bilateral trade between the two countries has jumped from a few hundred million dollars a decade ago to nearly US\$14 billion last year and is likely to reach US\$40 billion by 2010, possibly making China our largest trading partner. For the first time, IN and PLA-N ships have exercised together at sea and there have also been high level military visits; this type of engagement is likely to continue. At the same time, there are long festering boundary issues still to be resolved. In addition to the Gwardar project, China is also assisting Myanmar in developing its port facilities. Its ambitions to become a credible sea power are well-articulated, and the PLA-N's modernisation under which submarines and destroyers have been, and are being, acquired from Russia, and its own indigenous warship building plans, have already made it possible for it to deploy at long distances. Availability of port facilities in Myanmar and Pakistan will give it a North Indian Ocean capability that it does not presently have. In short, while India does not view China as a threat, the implications of its maritime postures will have to be watched carefully.

Challenges Facing the Navy

As we move into the 21st century, the IN needs to make some course corrections to cope with the new realities. On the one hand, the typical geopolitical threats have not disappeared even if they have altered, and capabilities must exist to cope with them. On the other, a much more diffused, invisible, irrational and fanatic threat is developing, with potential to harm our long-term interests. This threat does not differentiate between peace and war. The traditional concept of training in peace, simply to prepare for war must change. The IN has to assume more proactive functions in peace than it would like to or is comfortable with, because this is now as important as traditional combat functions in war. India also has a coastguard of reasonable size, and these two maritime forces have to coordinate their responsibilities. It has taken some time for the traditional mindset to change, but the process has begun. To move from the comfort zone of preparing for conventional war against identified adversaries on one's own, to the uncertainties of looking for and countering unknown non-state actors, in cooperation with others, is a challenge that has to be faced and overcome.

Piracy and other illegal acts at sea, hijacking of ships and maritime terrorism come under this category. These, generally, take place in coastal waters or narrow channels, are executed quickly and cannot be countered, much less pre-empted, without a tightly integrated system of surveillance and response, networked for operations in real-time. Even more important, given the transnational nature of such crimes and the differing approaches and capabilities of littoral nations, it will be very difficult to cope with the crimes unless there is close cooperation and coordination amongst the littoral states and, if necessary, the stakeholders. India

has, in recent years, collaborated in joint patrols in the Malacca Straits with the USN, and in waters off Sumatra with Indonesia. Similar patrols have now been initiated with Thailand. IN ships and aircraft also participate in patrolling the coastal approaches of Sri Lanka jointly with ships of that navy. With its Asia-Pacific overseas trade likely to exceed US\$600 billion in 2020, India is, potentially, one of the most important stakeholders in the safety of the East-West sea lanes.

In this same context, recent steps taken to foster multilateral cooperation must be welcomed. The Regional Cooperation Agreement (ReCAAP), which brings 16 regional countries, including India, on a common platform to share information in coping with piracy in the region is an important initiative in promoting regional security cooperation. Similarly, India must play a more positive role in the Western Pacific Naval Symposium (WPNS), being one of the few countries with credible maritime capabilities in the Asia-Pacific region.

As the IN begins to acquire a more proactive profile, pressures are likely to be faced from the historically continental mindset of the nation's strategic community, which, for close to five decades, has viewed security concerns in terms of threats to territorial integrity and sanctity of land borders. This could have an impact on resources likely to be made available for naval development. Force levels are also likely to be a constraint as the IN tries to cope with its traditional as well as non-traditional tasks. At the same time, its share of the defence budget has risen progressively, from 10 per cent in the 1970s to just over 18 per cent in 2005. There is, obviously, growing awareness of the importance of maritime interests and it is probable that the share will reach 20 per cent by 2010, which should be adequate to fund capabilities needed in the 2020 time frame. An important element of the force development plans must be to provide capabilities for network centric operations. Work in this field has been ongoing but much more progress is necessary.

India's Maritime Strategy

Looked at superficially, it might appear that the two principal tasks outlined for the IN, to cope with traditional geopolitical threats and to counter non-traditional threats, are in contradiction. In fact, there is a synergy between the two. Both need credible capabilities: in the first instance to deter, and in the second to pre-empt or to prevent the threat from materialising. Both require reach in the area of interest. As has been highlighted, India's concerns stretch across the North Indian Ocean, from the coast of the Gulf countries to that of South East Asia. Its maritime forces must be able get to the areas of concern, to remain there for reasonable periods and to operate there credibly. For this a broad spectrum of capabilities is needed, including access to timely and appropriate intelligence; near real-time surveillance and reconnaissance inputs; efficient and secure communications, logistics and integral air, without which maritime operations cannot be entirely credible. An element of expeditionary capability in the area of interest is also important to give greater meaning to the credibility, in peace as much as in conflict.

Conclusion

Like the Royal Australian Navy (RAN), the IN is one of the two major seagoing forces in the Indian Ocean; unlike the RAN, it is the only regional navy with integral air power. It also has substantial strengths in shipbuilding, including design and weapon-sensor interfacing skills and in missile and information technology. These add to credibility. India is also well positioned in the northern Indian Ocean. This largesse of geography affords several advantages in easy deployment and sustenance of naval forces, thereby providing a potential maritime capability that no other navy in the region can have.

In the emerging security environment, the North Indian Ocean region has acquired strategic and security dimensions that cannot be ignored. Non-traditional threats are becoming increasingly potent and the sea lanes of communication, critical to India's energy security and economic growth, are becoming vulnerable to disruption. Altogether, the environment requires capabilities at sea that can safeguard our interests through a strategy that encompasses engagement, cooperation, reassurance and deterrence. The Indian Navy has to play a proactive regional role in cooperation with maritime forces of other countries with mutually compatible interests. The RAN falls in this category. Interfaces between the two navies must reflect this convergence, and move from the existing realm of a largely cosmetic interface, to something more meaningful and substantive.

The United States Navy: Challenges and Responses

Gary Roughead

One of the great leaders of the 20th century said, “a pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty”. Like him, I believe in the optimistic exploitation of the opportunity that every challenge presents. The modern security environment presents us all with a plethora of challenges and opportunities. In this paper, I will discuss the challenges that the United States Navy (USN) faces, the opportunities it sees in them, and the responses it employs to maximise those opportunities.

The USN on 10 September 2001

History is replete with examples of disruptive events in the security environment that force us to re-examine how military operations are conducted. Clearly the attack on the World Trade Center on 11 September 2001 was one of those events for the US. Those responsible for that dastardly act represent a threat that has redefined the global security environment.

Effective response to this threat called for a total re-examination of how the US military thought, trained, equipped and fought. Prior to these events, the USN was a threat-based force almost exclusively focused on high-end warfighting against well defined adversaries and threats. Our force was built around carrier battlegroups and amphibious ready groups. Deployment of these force packages was routine and usually based on a desire to maintain constant presence in potential or actual hot spots. The USN, in effect, was rooted in the traditional notion of naval power projection and typified blue water sea power in its purest sense.

The Post-11 September 2001 USN

Today’s post-9/11 global security threats are many and varied. They are no longer only conventional, traditional, legacy threats. They are now irregular and unrestricted challenges posed by regimes, institutions, organisations and individuals committed to terror and tyranny the world over. They are characteristically amorphous, decentralised and transnational. They are fleeting, they are criminal, and they make no distinction between lawful combatants and innocent human beings.

It has become clear that those who threaten, and the regimes, institutions and organisations that support them, are linked to the vast and largely ungoverned waterways of the world. They hide on them, move on them and, as we have seen, they attack on them – in harbours and ports, in territorial waters and exclusive economic zones, and on the high seas. Piracy, weapons proliferation, abuse of environmental resources, human and narco-trafficking are just a few of the insidious transnational

and maritime criminal activities that erode the fabric of society and threaten peace and prosperity.

In response to these new security concerns, the USN has transformed doctrinally and operationally. The USN has, as have all of the US armed forces, changed the way it views and prepares for the future. Our focus has shifted from optimising forces to fight one or more major military conflicts, to developing forces capable of a full range of operations from humanitarian assistance and disaster relief to high-end warfighting. This new approach is capabilities-based, not threat-based. It assumes that it is easier to make relatively accurate projections about future capabilities and develop them, than to accurately predict who exactly the enemy will be and structure forces to fight specifically against the threat that enemy poses.

The USN now deploys force packages that offer greater flexibility, agility and responsiveness than the traditional carrier battle and amphibious ready groups. Our fleet response plan provides unprecedented readiness, enables presence with a purpose, and injects unpredictability into our deployment patterns. The plan produces an enhanced surge capability that allows ready units to deploy for various lengths of time, often in multi-carrier strike group formations, in support of a wide range of activities that include homeland defence, bilateral and multilateral exercises, security cooperation events and deterrent operations. Naval presence in the Middle East, for example, is easily sustained, while operations in the increasingly important Asia-Pacific region continue uninterrupted. In fact, later in 2006, multiple aircraft carrier groups will conduct extensive operations together in the Pacific, exercising the capability to operate globally and demonstrating our commitment to the security of this region.

Much of the flexibility and capability of these naval force packages is their full joint capability. As a Joint Task Force Commander for Pacific Command, I know how well our forces are linked by joint processes and procedures that maximise the effectiveness of the Navy-Marine Corps Team when operating with the US Army, Air Force and Coast Guard. We are committed to continuing the development and standardisation of procedures that improve interoperability among our forces and those of our friends and allies.

The USN is investing heavily in the development of new capabilities to transform our naval forces. We have just completed the first of four ballistic missile submarine conversions. These new boats will have extensive precision land-attack capability and incorporate an unprecedented merging of special operations capability. This conversion epitomises the USN's transformation from a threat-based, Cold War force to a capabilities-based, global, expeditionary force.

Similarly, we are renewing our littoral capability. The USN has just established the Navy Expeditionary Combat Command – a command that will have a new riverine combat force and consolidate already existing naval construction, expeditionary logistics and force protection units. And late in 2006, the USN will accept delivery of USS *Freedom*, the first of the new Littoral Combat Ships (LCS), which will be home ported in the Pacific. These innovative combatants are designed to counter-

challenge shallow-water threats in the littorals, specifically mines, submarines and fast surface craft through rapidly reconfigurable mission packages. Operationally capable just four years after concept development, their rapid development and acquisition is a major change in a process that previously took up to fourteen years from concept to sail-away. The LCS, as well as the new destroyer (DD(X)) and cruiser (CG(X)), represent the USN's next generation family of ships that is designed to enable total battlespace dominance.

Another shift that reflects the USN's response to post-11 September 2001 security challenges is the proof-of-concept development and employment of high-speed transport vessels. These ships have been used for everything from supporting tsunami and hurricane relief to moving the US Marine Corps around the Pacific. The ability of these fast ships to transport significant loads great distances will play a tremendous role in increasing the agility of the USN. Specifically, as we embrace the concept of sea basing, we will require secure, mobile and interoperable bases at sea from which joint and international operations can be supported and sustained for long periods of time. To date, we have successfully established sea bases with aircraft carriers, cruiser-destroyers, and amphibious and military sealift ships.

In the Asia-Pacific region, there are more than 140 diesel submarines. Given the worldwide proliferation of submarines and new submarine technology, the USN has renewed its focus on anti-submarine warfare (ASW). In cooperation with partners and allies, we regularly conduct training and exercises to ensure that our ability to dominate any submarine threat is sustained. In fact, we are currently benefiting greatly from the Swedish submarine HMS *Gotland*, which is participating in ASW training with us in our Southern California operating and training areas.

Similarly, technology proliferation has amplified the importance of a renewed commitment to ballistic missile defence. Regimes seeking ballistic missile and nuclear weapons capability pose new threats to the security environment. Deployment of our guided missile cruisers and destroyers, and continued development of AEGIS weapon systems and missile technologies, will give us a rapidly-deployed, moveable defence against those who could employ these weapons of intimidation.

In today's world, speed matters – the speed of response being based on speed in decision-making. Thus, the USN is improving situational awareness of the maritime domain. Maritime Domain Awareness (MDA) – effectively understanding all activities, events and trends within the maritime domain – is an essential security requirement, particularly where decision-making is concerned. Such domain awareness enables the early identification of potential threats and enhances appropriate response opportunities and options. A vast challenge, true global MDA demands cooperative arrangements and agreements that promote enhanced visibility into the domain, and enables critical information sharing with many users at all levels. Within the US military, developments in joint command and control capabilities have increased our ability to achieve and maintain awareness. And we embrace opportunities to standardise information sharing and command and control procedures among the navies of friends and allies to ensure the effectiveness of future coalition efforts –

whether to frustrate transnational threats, when joined in combat, or in the prompt provision of humanitarian relief.

The Case for Sea Power

Sea power, and its applicability as a force for peace and stability in the world, has never been more apparent. The themes, discussions and sessions of this conference, and of last year's International Seapower Symposium, make that very clear. While we of the naval services inherently appreciate the enduring importance of sea power, the current security environment reminds those who do not that international prosperity is directly related to maritime security.

True globalisation has magnified the importance of the relationship between a prosperous international economy and universal access to the world's oceans. The single most significant geographical feature of our planet, the maritime domain covers almost three quarters of the earth and more than two billion people live within 60 miles of it. Some 90 per cent of international trade and two thirds of all petroleum produced moves upon it. In 2003 alone, 50,000 merchant ships from more than 150 different nations moved the equivalent of six billion tonnes of cargo four million miles. The global fishery and aquaculture industries provide us with more than 130 million tonnes of food annually; and offshore oil rigs in more than half the coastal nations of the world provide 60 per cent of the world's petroleum.

Mutual Security Interests Within the New Security Environment

These numbers are staggering. They show that global stability depends on free and unrestricted access to the sea, the great facilitator of international interaction. And they indicate that we are all, as members of the international community, inescapably linked to the sea. Threats to one nation's shipping, destruction of another's natural resources, or proliferation of weapons of mass effect, threaten the collective security and prosperity of all nations.

Maritime security is particularly important to those of us who call the Asia-Pacific region home. Highlighting the region's obvious and growing influence, President Bush identified this century as the "Pacific Century". The Asia-Pacific region includes some 40 nations and almost 60 per cent of the world's population, and it covers more than half of the world's surface - 105 million square miles - and 16 time zones. The region is home to the six largest militaries in the world and is responsible for almost one third of the world gross domestic product (excluding US GDP). Regardless of where you live, Asia-Pacific maritime security is vitally important to all on our planet.

A Case Study: International Relief by Naval Forces

While the historic role of sea power is offensive in nature and designed to maximise the ability of naval forces to project combat power, recent history shows us that, in the interest of protecting and advancing the global civilisation, warfighting must not be all that naval forces are about. The importance of establishing peace through strength

is clear. But not so clear, and of increasing relevance in today's security environment, is the importance of establishing and maintaining peace through cooperation and goodwill. In this globalised world of ours, waging peace is as important as waging war. And naval forces have a critical role in waging that peace.

The obvious recent example of this is the tremendous international disaster relief effort in January and February 2005 in tsunami-devastated South and South East Asia. The response to this incomprehensible destruction was one of immense proportions. Hundreds of non-governmental organisations and the militaries of 21 different nations were involved. 137 airplanes, 161 helicopters and 127 ships delivered 25 million pounds of relief supplies and equipment in just six weeks. It was a multinational, interagency and civil-military effort measured in the billions of dollars.

For the US military, it was our largest relief operation since the Berlin Airlift of the 1950s. For all of us, however, above all else, it was an event that epitomised the generosity and responsiveness of the global community and its armed forces. Serving at the Pacific Command, I saw an incredible demonstration of just what is achievable when we work together for the betterment of the human condition. But, it was also an event that clearly showcased the importance of collective sea power, and of agility and cooperation on the sea.

There are other such examples of international action to relieve human suffering and provide aid to fellow human beings. The successful rescue of the AS-28, the Russian submarine entangled 600 feet down on the ocean floor off the Kamchatka peninsula in August 2005 is one. Japan, the UK and the US contributed to an unprecedented international rescue effort with extraordinary speed and unencumbered communications, which demonstrated the strong and universal bond that unites all seafarers in ways unique to our calling.

The interagency and international relief effort after Hurricane Katrina, which ravaged the gulf coast of the US, also demonstrated the importance of sea power. It was a massive effort by the USN and US Coast Guard that included an aircraft carrier, amphibious assault ships, several support ships, a high-speed vessel, a hospital ship and dozens of helicopters. But it was not just the USN. Ships of the Canadian, Dutch and Mexican navies were there with us. For that and for the assistance of so many countries (some 100 in all - several of whom are still recovering from the tsunami), my country is sincerely grateful. These are examples of the great and true benefit of maritime security based on collective, cooperative sea power.

Our Imperative: A Global Network of Maritime Nations

I believe our imperative is to establish a global network of maritime nations that better enables us to work together to address challenges to the maritime security environment and seize the opportunities available to establish a more secure and stable maritime domain. The upcoming donor nation conference in San Francisco provided an excellent opportunity to do just that: advance regional maritime

security by pooling our resources and closely coordinating our efforts to respond to the needs of the Malacca Strait nations.

In December 2005, at the Royal United Services Institute's Future Maritime Warfare Conference, the USN's Chief of Naval Operations, Admiral Mike Mullen, proposed principles for establishing just such a cooperative effort. First and foremost, he said this effort must respect national sovereignty and the baseline capabilities of individual nations. It must be grounded in common interests and challenges, and focused on security in the maritime domain. It must be about more than navies, but helping those who need and want it, and about asking for help when it is needed. While it must be a global scheme, it must be one built from many smaller regional constructs, all of which must be committed to sharing and disseminating information to all participants. Finally, it must be an effort that starts its work now and is committed to the long-term challenge that true global maritime security presents us all.

We live together in a new security environment. The peace and stability of this environment is threatened by forces that, when challenged, thrive on indiscriminate destruction and oppression. Our collective efforts in pursuing opportunity and spreading prosperity can overcome and defeat the threats we face.

While much has yet to be done to combat these threats, we in the Pacific have done much already, working together to secure our maritime domain and to establish good order and render assistance at sea and from the sea. We must continue this work together: enhancing relationships and establishing procedures and networks for securing the sea and securing our futures.

PART 5

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The Royal
Australian Navy

An Industry Perspective on the *Armidale* Class Patrol Boats

Mark Taylor

The broad Department of Defence requirement for Project SEA 1444, released in 2001, was for a commercially-based “best value for money” integrated capability system. It would deliver a replacement patrol boat force to meet a specified capacity to perform defined tasks within a defined framework of time, space and environment. The system was to be sustained for 15 years from the time of delivery, with the potential for a further five years of operation if required.

The capital procurement budget had declined from earlier estimates of around \$500 million to around \$375 million. There were no firm figures on what Defence expected to spend by way of an annual support budget for the replacement patrol boat capability, although direct expenditure on repair and maintenance services for the 15 *Fremantle* class patrol boats was estimated at about \$20 million per year, and there was an extensive, and fairly labour intensive, maintenance and logistic support system in place.

Obviously, the first requirement was to deliver a solution that stayed within the acquisition budget, and that would minimise the annual costs of operation.

Personnel issues had a big bearing on both how the requirement was expressed, and how we viewed the solution. Besides aiming to keep crew numbers to the acceptable minimum, naval personnel management practice and recruitment and retention matters were prominent concerns. The ships had to be made attractive to those who would be taking them to sea – and keeping them there for long periods.

The Royal Australian Navy’s (RAN) annual operational commitments required the patrol boat force to be able to provide at least 3000 days of programmed activity, with enough reserve capacity to meet additional, short-notice (or surge) requirements of up to 50 days per month, and to keep that up with undiminished performance for at least 15 years. The number of vessels they were expected to provide was not defined. We came up with twelve. The government has since asked for two more, and as a result output requirements have grown by one sixth as well. Defence Maritime Services (DMS) will also set up a forward support facility in Dampier, in leased commercial marine facilities.

The challenge, then, was to figure out how to provide reasonably low-cost, capable assets that could be heavily utilised within the constraints of available naval manpower. Added to that was the factor of time. The *Fremantle* class patrol boats had already served about three years longer than originally intended. The full replacement capability had to be in place no later than 2008.

As I think we can see, the aim of Defence in adopting the output specification format was to be clear about the results required, and stimulate a bit of creativity in developing the ways in which those results might be reliably delivered.

And I believe that is what DMS, Austal Ships and CEA Technologies, the communications system provider, successfully did. We delivered a well-integrated solution designed on sound commercial principles: an innovative ship design, competitively priced and conceived with a view to long-term supportability, and incorporating a range of widely-used present-generation technologies. Experience with the management of commercially-operated fleets, characterised by minimum crewing and very high availability requirements, and complemented by experience supporting other naval operations and activities, was applied to develop an integrated, tightly focused yet flexible support package suited to the challenge of a 20-year output delivery period.

The DMS Approach

The ships had to be able to safely and reliably perform a range of constabulary missions, and some limited military roles, across a very broad range of operating conditions. But they did not have to be warships. That meant they could be designed and built to meet a defined civil classification standard. That was expected to permit lower costs of both construction and support. It also helped open the way for more commercially oriented shipbuilders.

There was still a heavy leavening of peculiarly naval requirements. Chief among these were that the ships would be armed, and they required a very comprehensive communications suite. But there were a host of other, individually minor but collectively, certainly significant requirements. Many of these arose from the stated need for the ships to conform to methods, practices and equipment common throughout the rest of the RAN.

DMS had had some exposure to the practical issues involved in supporting naval operations, in Australia and abroad, and in meeting other naval requirements, through our long-term contract for port services and support craft. We had experience in the procurement and operation of seagoing vessels and other craft for our own use, and to meet RAN requirements, including the tendering and management of construction contracts. We had sourced around \$50 million in new capital assets to meet naval support requirements. They were privately financed, with the cost of that financing factored into the monthly contract payment for the support services they were used to provide.

We thought Defence would place a premium on the long-term supportability of whatever ships were provided, and that the key was to approach the project as a service delivery requirement. The ships fundamentally were the hardware we had to have to deliver the service. We took seriously the need to capture all costs up front, and not get caught up in (or dependent upon) spiralling contract variations.

That is where Austal Ships came in. Their record in delivery to tight schedules and tight budgets, a first-rate design team and a record of innovation all seemed just what was needed. They were used to the idea of ships that had to operate almost continuously throughout the year. As our relationship developed, DMS and Austal both agreed that the long-term service delivery requirement was the fundamental

driver in how the team would interface with the Defence Materiel Organisation (DMO) and the RAN. It made sense therefore, that DMS should manage overall development and delivery of the integrated capability package, and thus we took on the role of prime contractor and project manager.

It appears this approach was rather different from what both Defence and our competitors had first expected. There seemed to be an assumption that the shipbuilder was the natural prime. But at least for relatively uncomplicated platforms, it seems to me that our approach has a lot of virtues. Not least of these is a service provider's strong wish to win the customer's favour by aiming to reduce what we might call the costs of ownership. And naturally, to minimise the risk that the essential hardware – the ships – will not meet the availability targets, and cause us to fail to meet our service obligations, to the cost of our income and reputation.

Thus, the process of designing a ship that would meet the mission performance criteria was also heavily influenced by our need to ensure its economical, long-term supportability by a compact in-service support organisation.

Costs of Ownership

Probably the main saving in this program is made in the costs of asset management.

Since the Commonwealth opted to purchase the *Armidales* direct, rather than take up the option of private financing, it has the full responsibilities of any owner once it has accepted the vessels. But the output-specified contract format, integrating hardware acquisition with lifetime management of the asset, ensures there are still a number of ways in which the costs of ownership to Defence are reduced throughout the delivery of this project.

The direct costs of ownership are reduced by the contractual devolution of a range of functions from Defence and the RAN to DMS. These include:

- “start to finish” responsibility for delivery of the capability from contract signature through to end of life
- overall management of the building program
- development and delivery of:
 - operation and maintenance procedures for ship systems and equipment
 - ship-specific training programs for all officers and sailors, covering operation and maintenance of all systems and equipment relevant to their fields of employment onboard
 - complete equipment inventories and related stock management system
 - an electronic maintenance and configuration management system
 - provision and management of other information technology systems.
- development and implementation of an appropriately staffed and supported in-service support organisation
- management and control of all maintenance, including coordination with operational programming requirements
- planning and management of all mandatory dockings

- planning and management of all other repair activity
- delivery of all vessels to the designated handover location
- management of all vessel and system documentation
- provision to the builder of key mission systems – primary weapon, electro-optical sensor system, 7.2 metre sea boats
- provision and management of all spares and tools
- maintenance of quality assurance and international safety management systems
- obtaining and maintaining all required domestic and international civil certifications
- audit of subcontractors.

This effectively transfers a major wedge of performance and financial risk from the Commonwealth to the contractor, as well as providing budget savings. The operating budget itself is made more predictable by the fixed fee for service pricing formula.

In effect, DMS is now responsible for managing the major part of the operating budget of the Patrol Boat Force. Our presence will generate other savings.

As the *Fremantle* class phases out, this transfer of responsibilities is permitting the RAN to very significantly reshape the shore staff that directly supports the Patrol Boat Force. This will have knock-on benefits by allowing redeployment of scarce technical specialists, possibly even reducing the overall RAN requirement a little. It remains to be seen what impact there may be in the longer term on the make-up of the DMO System Program Office staff.

Another basic aspect of the cost of ownership is of course the cost of acquisition. The nature of competitive tendering, and the strong focus on providing the best value for money mission system, definitely influenced the selection of key system elements. Our assessment of value also took into account the need to reduce crew workload wherever possible, through use of automated or assisted systems. An example is the Marinelink integrated monitoring and control system, which enables the ship to operate routinely with unmanned machinery spaces.

Our choice of the Typhoon fully stabilised gun system was similarly conditioned by its simplicity of operation, not to mention its accuracy. It was also a good deal less expensive than the system originally nominated as preferred by Defence.

With all the various items that make up the ship in general, our approach was to go for the highest achievable level of commonality with the commercial maritime world, preferably sourced through suppliers with well-developed service and support networks. This saves twice, reducing both initial costs and logistic support costs, especially in spare part stockholdings. The owner gets the benefit in reduced support costs.

There are other, more indirect facets to the cost of ownership or value for money. One is the value placed on time. Companies have no shortage of processes and procedures, yet ours generally seem to take less time to move through to a result. Part of it undoubtedly is that a company like DMS is pretty small and compact. The structure is rather informal, and with few defined layers. Responsibility and

authority – executive and financial – are closely linked. Coordination is relatively easy. So there is a capability to take quick action to satisfy requests or snuff out potential problems. This is a useful thing to have at your disposal.

It is evident that coordination and unification of all the interested parties is a major task all in its own. The place to start is to ensure that they all have a common understanding of what the contractor is there to do. At this point, I would just say there have been some demonstrable weaknesses in that regard, and future projects must develop early an effective, joint strategy for the procurer, contractor and end-user to manage stakeholder interests and expectations. A similar approach needs to be applied for providers of government furnished inputs, including minor projects and other parts of Defence. We have come some part of the way, but not as far as needed; and it could have been done more easily. I think the UK practice of Integrated Project Teams bears examination as a possible way forward.

The RAN has saved considerably on other direct costs of ownership. Perhaps most notably, it has not had to invest in specialised training or technical support facilities and its direct commitment of high-skill training staff is numerically low (but vital). It is DMS's responsibility to provide the necessary systems training, including whatever facilities are required. There will be savings in logistics administration, too.

Finally in relation to cost saving, may I briefly address a missed opportunity?

As many of you know, the first stage tender response had to offer pricing for a direct purchase, with the option of a private financing arrangement.

In the event, private financing was recommended by DMO as the better option for purchasing this integrated capability. It seems the Department of Finance and Administration agreed, too. But as we know, it was rejected for procedural accounting reasons that seem not to have been considered until near the completion of the Stage 1 shortlisting process.

That is a shame. The private financing option from our standpoint matched perfectly with the concept for purchase of capability on an availability basis. As it is, rejection of private financing deprives the RAN and Defence of the opportunity to exploit the potential of non-ownership to vary and rejuvenate the asset mix to meet the fluctuating pressures that go with changing times.

Being able to “roll-over” ships long before they are utterly exhausted, or when it is clear they are not really suited to changed operational demands, is a pretty useful management tool. There is a weight and performance margin for growth built in to the *Armidale* design, but in some respects it might be better if there were not. The temptation to drag out its life would be less likely.

On the other hand, there is still clear value in having avoided reversion to the old multiple contract way of doing things.

Working an Output-Specified Contract

DMS's positive experience with a similar style of contract in the Commercial Support Program meant that we felt the risks inherent in delivering specified

availability levels at a fixed price could be managed effectively. Much depends upon development of close working relationships with operations planners and the operators themselves, and this has been a key feature of our relationship with Navy Port Services Organisation.

In this case, it has been harder to get the relationships going. The customer identity is much more diffuse and complex. So are lines of authority, responsibility and accountability.

At times it seemed that a number of stakeholders felt left out or threatened by the whole idea of an output specification built largely around application of civil standards and commercial practice, and wanted to go back to close control over the inputs. This was not helped by the whole thing being forced into an inappropriate contract template – Strategic Materiel – which in many respects tended to push people’s minds back into more familiar frames of reference.

DMO’s lead negotiator did have a clear view of what was to be achieved and did a pretty heroic job of herding the cats. But it seemed it was a constant battle, and his departure early in the contract implementation was sorely felt.

And yet, we still were developing an effective relationship and understanding with the key players of the Project Team and the Force Element Group, and that meant progress could still be made.

The first major objective in the project master plan was to have *Armidale* in commission before the end of June 2005, but DMS’s real concern was that we were spending so much time arguing over ship issues that our attention was being diverted from preparation of the training and support effort. We needed to get people out of Fremantle and into Darwin in time to establish the core of our logistic support system, set up the first of the ship management teams to be assigned to each four-ship Division, and begin to develop our working relationships with key RAN people and local businesses before *Armidale* arrived. Indeed this all had to work in order to complete the capability system mission trial and qualify for the acceptance that we had something ready to deliver.

The RAN was also having some difficulties finding people for a few positions that were to support development and delivery of the training programs. They did it, but it highlighted to us that with the best will in the world, you can not wish away a shortage of skilled, experienced personnel.

This had always been a big thing for DMS when considering how to treat the requirement for us to create meaningful work for a forecast assignment of up to 30 sailors, rank and skills unspecified, to work within our support organisation. We could hardly figure on using an input over which we had no control as part of a team that had an absolute obligation to deliver well-defined outputs in terms of programmed available days, capacity for additional surge days, and time-sensitive response to defects and requests for support. So the DMS ship management organisation was developed with the express aim of not having to rely upon naval

personnel, but with the ability still to team up effectively with those that may be made available.

Ship acceptance is obviously a big issue, because until the ship is accepted for naval use, we cannot use it to generate the required output of available days. In the worst case, DMS could get hit with a triple whammy:

- liquidated damages for late delivery
- loss of support fee income stemming from the late arrival of the expected additional capacity
- and additional losses through application of the fee Abatement Regime if a patrol boat is not made available on time for programmed tasking.

The abatement regime itself is points-based: DMS has a quarterly allowance of 700 points. If we earn more than that number, then one day’s service fee is deducted for each additional 40 points.

Request/Obligation	Response Time	Cure Period	Abatement Pts
Failure to make a Patrol Boat available	n/a	1 Day	40
Very High Priority Request for Support (RFS)	12 Hours	1 Day	20
High Priority RFS	24 Hours	2 Days	10
Medium Priority RFS	48 Hours	5 Days	5
Low Priority RFS	14 Days	60 Days	5
Request for Surge	12 Hours	1 Day	20

Figure 1: Abatement Table (DMS)

The principle is simple but application is potentially tricky and it will take time to work out the practicalities in concert with the operational commander and the ship’s captains. A big concern obviously is the potential for assigning very high priorities to defects that may in fact have negligible impact on performance of the ship’s current or forecast tasking. Another is cost control. No ship operator in the world, civilian or naval, does not perform a constant balancing act between keeping the ship in a fit state to do the job, and what has to be spent to do that. We all know that, and DMS has been hired by the Commonwealth to be both a prudent and a budget-conscious ship manager. So close cooperation and mutual understanding of both operational and financial imperatives is essential. I should also point out that any damage or defect attributable to operator error or omission is liable to be paid for as an additional charge. DMS philosophy has always been to fix it now and argue later, but if we come to believe that the defect management system is being misused, and abatement points capriciously attributed, then I suggest there is high potential for much argument over what was caused by whom. Both issues need and will reward a cooperative, commonsense approach.

Through-Life Support Contracting

The idea of a fixed-price contract for through-life support of the Patrol Boat Force seems to us eminently sensible, if not without its risks. Just how do you estimate what it is likely to cost to maintain a fleet of ships at high availability, and still meeting ship performance criteria, for a period of 15 years?

There are a number of things that help us to model annual support costs with some confidence.

The first of these is that the Statement of Work has been well developed, making good use of the RAN's accumulated knowledge and experience in programming and conducting patrol boat operations. The geographical areas of operation, mission profiles, frequency and concurrency of tasking, types of tasks are all well defined. While there may be some shifts in focus from time to time, it seems unlikely that the aggregate annual fleet support costs are likely to stay in balance. We have been given some quite detailed information, such as the percentage of time typically spent operating at various speed ranges across the mission spectrum. This kind of information is a big help in calculating, in conjunction with the suppliers, the optimum major service intervals and likely service life of major sub-system elements, such as main engines.

DMS is also fortunate in being able to call upon quite a body of experience in the field of long-term ship management, internally and through our commercial maritime relationships. Not least of these is the direct relationship with P&O, and its especially valuable experience in managing offshore services vessels and various other specialised ships in Australian and regional water. I personally have been surprised (and delighted) to observe how accurately various rules of thumb developed by commercial marine engineers, architects and surveyors can be applied to estimate the trends in various cost areas as ships move through their lifecycle.

The ship itself will be a fertile source of information, through the data recorded in real-time by the Marinelink system. The ability to constantly monitor the condition of key ship systems allows us to move closer to a condition-based maintenance regime. It supports earlier identification of potential problems, and also permits us to safely extend routine service intervals on the basis of empirical evidence – not just stinginess. It also reduces the likelihood of unpleasant surprises when things are opened up for maintenance or repair.

Added to that, the general scope of work to be undertaken at the major class-mandated 30-month and 5-year dockings is well understood. So a kind of cost-growth curve can be applied to each of hull and machinery, major systems and so forth. The contract recognises the need to review support pricing if the five-year extension option is to be exercised.

Even if we are obliged to carry on with some ageing items for whatever reason, if they have been sourced from the worldwide market, they are likely to be supported in it. According to the International Maritime Organization (IMO), there are over 46,000 registered ships in the global trading fleet alone. There is a thriving, and

easily accessible, “world wide warehouse” of parts and service that supports these and countless other ships of all ages.

A further advantage of through-life service contracting is that it encourages the company to invest in its staff – and the staff to invest themselves in the company. The ability to sustain a professional team of ship managers and maintainers is itself a key to ensuring the ships are kept in top condition by people who know them – and the operators – inside out. Needless to say, it also ensures there is a strong body of experience to support operator training and to advise the ships’ teams when the vessels are deployed on operations. Minimising the potential for inadvertent operator error minimises the potential for things to break too often and wear out too soon.

Finally, there is also sufficient flexibility in the contract to allow for some variation if there is a major shift in operational requirements caused by changes in national priorities. And the DMS support organisation and systems are sufficiently simple to remain highly flexible and adaptable, even through major changes in the client’s organisations, structures and priorities. Before the last election, I was asked more than once “What will DMS do if a coastguard is created and takes on the Navy’s patrol boat force?”. My response was and is that we could just paint the boats white and keep working.

There’s plenty more that could be mentioned regarding the pros and cons of long-term support contracting, but in my view it all leans heavily towards the pros. And the core reason for that is that long-term contracts do foster a real commitment to and identification with the customer. This is not all about warm sentiments either. It allows us to learn and profitably apply the knowledge gained in the job. DMS relies heavily on the competence and professionalism of the operators, and on the input, formal and informal, that they can provide to make our work more efficient and our lives easier. As always, a great deal depends upon the mutual trust and confidence that underpin any effective working relationship. You just do not get that with short-term contracts.

Crew-Related Management Issues

While DMS is providing the tools, it is the officers and sailors of the Patrol Boat Force who will be doing the job. They are the vital quality linkage between equipment and output quality.

Roughly speaking, your average sailor can spend about 200 days a year away from the base port. For the patrol boat, it is an annual average of rather more than 300 days. Thus the RAN’s multiple crewing policies, by which six full crews will be assigned to each division of four patrol boats.

The question is legitimately asked whether that will have impact on the standards of operation and onboard maintenance, because the crews will not have a permanent attachment to their ship. From our perspective, the concern might be that organisational level maintenance (OLM) is not performed diligently; that the ship is carelessly operated or thoughtlessly damaged; that due care is not taken

with onboard stores. In other words, things are let slip because in the end someone else will carry the can. DMS has tried to mitigate that likelihood first by trying to minimise the OLM load anyway. Second, we doubt people will get too sloppy with something so central to their lives. Third, if it is proving hard to get through the OLM tasks due to the general tempo of operations, then we encourage feedback and suggestions on how to improve procedures and methods. And at least there will not be much chipping and painting!

At root, though, naval management and leadership of their teams must surely be the key. The RAN has been working this same regime with the two *Leeuwin* class hydrographic ships, so must know a lot about what problems arise and what remedies are applied. Certainly, from a civil maritime perspective, multiple crewing is hardly novel. The industry has well developed procedures and processes for handovers of ships from one crew to the next, and DMS will be a willing participant in helping develop these with the RAN. Although the US Navy Sea Swap program is not a precise analogy for our circumstances, the US Government Accountability Office report on its effect on ship maintenance also makes valuable reading.

My greater concern is with the RAN's perennial problem of recruitment and retention, consequent personnel turnover, and how that might affect both the numbers and skills of those sent to us for training and to the divisions for their crew pool.

We designed the *Armidale* to be operated at sea by 13 people. For this to work, they need to be very competent people. I do not suggest they will not be, but there is room for thought here. Typically civilian seafarers – in Australia, anyway – work a six-week swing, or something close to it. Half the year ashore sounds a bit light. But they do this year in, year out. There is no sea-shore roster behind the swing system, with full-time postings ashore. As ship operators and managers, they are very professional indeed. The idea of being a full-time seafarer, with plenty of time ashore, and geographically stable at home, has its attractions. It would be interesting to test the naval population's reaction to it.

As commercial ships of all types have become progressively more automated and crew numbers have steadily reduced, the ratio of officers to ratings (basically, that of qualified technical and trade professionals, to limited-skill labour) has also changed greatly. Globally, it is about one officer to two ratings. Many ships have significantly more officers than ratings.

So, I wonder if, having dipped its toe in the water, the RAN should not consider wading in a bit further and exploring the potential application of some of these things. Consider for example whether multiple crewing might not be further developed to allow some major changes in total personnel requirements, through changes to the old sea-shore roster system, an end to “members required in uniform” billets created largely for geographical stability reasons, and a realignment of the individual and collective skill sets in the naval workforce.

It may be easier than we think. The commercial lineage of the *Armidale* itself, the commercially-based in-service support system, and the introduction of a multi-

crew system offer quite an opportunity to test out some new concepts. I imagine there may be some fear that going too far might isolate the Patrol Boat Force from the mainstream RAN. But it may be that the *Armidale* class patrol boat project helps open the doors to some new ways for the RAN at large to achieve a more stable, sustainable balance between money, manpower and machines.

Conclusion

In closing, may I just say that I believe the achievements of this project are in my view very substantial. Getting there is hard, but getting there we are – all of us, DMO, Navy, DMS, Austal Ships, CEA and a raft of smaller companies and other entities. Whatever gripes I and others may have had, participating in this project has been immensely satisfying, and I think its positive effects are already far reaching.

The manner in which the capability has been specified is being delivered and will be sustained, is also stimulating for those with an eye to the future. I wonder what influence it might turn out to have on future procurement programs, and on the RAN as a whole.

It is now just over 25 months since Senator Hill and our then Chairman Ross Brewer signed the contract for this project. The lead ship has been cleared for operations, our support organisation is in place at Darwin Naval Base, two more ships will be commissioned next week, and the remaining ten will be in service before the end of next year.

Overall, the *Armidale* class patrol boat project is indeed something to be proud of.

The HMAS *Westralia* Replacement Project: from *Sirius* to *Success*

Gary McFarlane

Project SEA 1654 (Replacement of Afloat Support Capability) is for the replacement of HMA Ships *Westralia* and *Success*, the Royal Australian Navy's tanker (auxiliary oiler) and replenishment ship (AOR) respectively.¹ Initially the in-service date for the *Westralia* replacement was 2009, and this date was driven by the *International Convention for the Prevention of Pollution from Ships 1973* (MARPOL) requirement to phase out single hulled tankers by 2009, and programming issues in designing a robust long-term capability plan. However, in 2003 the Royal Australian Navy (RAN) became aware that the MARPOL requirements were becoming more stringent to manage the inherent risk of single hulled tankers, with operational limitations imposed on *Westralia*, including limiting the amount of fuel that could be carried by not using her wing tanks. Given the age and condition of *Westralia*, this had the consequential impact of bringing forward *Westralia's* replacement.

These changing MARPOL requirements created two problems: *Westralia* could not be readmitted to her classification as a civilian tanker and would therefore need to be replaced, and funding within the Defence Capability Plan was predicated on a replacement in 2009, not 2006. *Westralia* was reclassified by Lloyd's Register Classification Society from a Category 1 tanker to a Category 3 tanker in late 2004. The Defence Material Organisation (DMO) had done some initial costing in late 2003 and had established the replacement cost for a capability similar to *Success*, for two ships of the same class that would replace *Success* and *Westralia* was about \$450 million. We were advised that about \$150 million would be available for the 2006 time frame. This being the case, DMO would have to purchase a second-hand ship, modified to meet RAN requirements.

Lessons Learned from Previous Projects

The approach adopted was to examine what second-hand oil tankers were available on the global market, informed by the lessons learned from earlier projects. The lessons learned from the acquisition of two US Navy (USN) *Fairfax County* class landing ships, which were converted to become the amphibious transports (LPA) HMA Ships *Manoora* and *Kanimbla*, were especially instructive. That particular project had been the subject of an Australian National Audit Office review and the Department of Defence was subjected to severe criticism.²

The first lesson was that major Defence acquisitions should only be made after the capability needs have been clearly defined, costed and budgeted. Considerable effort was expended upfront to get a set of clearly defined capabilities that had to be delivered with this ship, which were incorporated into a preliminary design study

that could be used to assess what types of ship were available on the world market that might meet RAN requirements.

The second lesson concerned the need to avoid additional funding by adopting a whole-of-capability approach to the capability development process. The way we interpreted this lesson was that we had to have a good understanding of all the capabilities required. That is, we could not purchase a ship with a low level and then continually modify it over a number of years to reach the level of capability required. The problem with this type of approach, apart from increasing costs, is that progressive modifications that are not properly planned, scheduled and integrated might actually not work together. So in the context of this lesson, we were keen to ensure we had a reasonably firm idea of the total capabilities required.

The third lesson, and probably the major lesson from the LPA project, was the risk inherent in the purchase of a second-hand ship. This called for the use of qualified and experienced personnel to make a detailed examination of the condition of each ship being considered. The DMO recognised it did not have the skills or the experience with tankers so Teekay Shipping, which had experience in operating and maintaining tankers, was engaged to undertake this assessment. They were engaged to develop a checklist of what we should be looking for as we assessed different ships that would form the baseline capability, which we would then revise to develop the full capabilities we required.

The fourth lesson was that any additional work required after contract signature must be closely examined for overall cost effectiveness and likely impact on the project budget and schedule. Our original view was that there would be no changes, but, of course, there is rarely a project that encounters no changes. We are now more than halfway through the production phase with the ship due for delivery at the end of July 2006 and there have been about 31 engineering change proposals. We recognised that having established a baseline capability with a signed contract, we need to resist change to the maximum extent possible.

The fifth lesson was that given the high design of production and risk association with ship modifications, including repair and refit, there needed to be some provisions for contingency. This had been a major factor in the LPA project where there had been inadequate contingency, requiring the diversion of RAN ship refit funds and Department of Defence expenditure to finalise the project. One of the other hard lessons we learned from the LPA project was that a lot of repair work had to be done to the ship. When we were compiling these lessons learned, we knew we were going to buy a ship that was between one and five years old, and had the capacity to meet the overall performance capability as defined in the original Operational Concept Document (OCD). The ship we purchased was effectively brand new but we discovered some corrosion in the galley spaces and in the wet spaces, as well as corrosion on the main deck. Initially we thought that the purchase of a new ship would allow us to expend the entire budget in providing the capability upgrade as we would not need to put much aside as contingency funding to resolve defects, but we put aside 2 per cent in any case, which was prudent.

The sixth lesson was that a high level risk assessment should be undertaken by experienced personnel at all key stages of the capability development process. DMO again recognised it did not have these skills or experience concerning the procurement and operation of tankers, so professionals were engaged from relevant sectors within the maritime industry. We created a team comprised of experts who brought together the skills from a commercial industry perspective: engaged the classification societies; Briar Maritime Services, which was familiar with the state and Federal legislation governing the use of tankers in Australia; Teekay Shipping, as an operator of tankers in Australia; and design company Australian Marine Technologies (AMT) to do some preliminary design studies.

There were two major phases to the project. The first was the procurement of the baseline ship. The second was the modification of the ship through the provision of government furnished equipment (GFE),³ primarily some of the communications suite and the replenishment at sea (RAS) rig, and then the modification packages that would come from the prime contractor Tenix.

Selecting the Ship

In determining the baseline ship, we undertook initial engineering studies against the OCD, so we had a general idea of the type of ship we were looking for. The OCD defined the capability that was actually required and was initially based on the assumption that the new capability would be similar to the capability of *Success*. The OCD was then modified to what was considered essential, desirable and important, that would fit within the basic ship framework. The initial operational requirements were set to a minimum and, as an example, flight deck operations were not included in this version of the OCD – that came later. It transpired the type of ship we required was very similar to *Westralia*, with about the same capacities. It had to be a modern design, minimally crewed and double-hulled. In the tanker industry, ships are not actually for sale; if they are, then there is something wrong with them. The DMO engaged a ship broker in London and an Australian ship broker to generate a list of possible ships. The list was actually that of ships that potentially could be for sale if the right offer was made. Our ship brokers determined there were 32 ships that might meet our requirements.

On receipt of the list, we needed to gain access to a similar ship to understand its layout and operational procedures; Teekay Shipping was operating the tanker *Barrington* for Caltex and our team examined this ship in great detail. From this inspection we developed an initial Function and Performance Specification (FPS), and this became the benchmark against which to assess the 32 ships. Creation of the initial FPS led to a number of design studies for the naval aspects the RAN would require of a commercial oil tanker. Assessment against the initial FPS enabled us to quickly focus on five ships that could meet our requirements. We then developed the final FPS against which these ships could be assessed.

These five possible contenders ranged from a newly-built tanker from a Chinese shipyard, two newly-built ships from shipyards in South Korea, and two ships that

were currently in service and just over a year old. As we were considering major structural changes to the ship, we included a ship designer in the DMO/industry team who could assess longitudinal strength and stability.

The commercial arrangements for oil tankers differ to those for warships and as the tanker market was volatile, with demand exceeding supply, it might take up to eight years from the time an order was placed until a tanker could be built. None of the five ships assessed against the FPS were actually for sale, so the options we had were to buy a ship that was already in trade, buy a building slot from an owner that already had a contract, or buy a ship from an owner that was just about to be delivered. This final option was the most ideal for us. We envisaged the owner would take delivery of the ship in the morning and we would buy the ship that afternoon, while negotiating the transfer of warranty from the original owner to the Commonwealth of Australia.

Again, the process for negotiating the purchase of an oil tanker is different from that of a warship. First, all ships are bought and sold in London, requiring a London ship broker. There is no face-to-face contact and negotiation; rather it is done by telephone or the occasional exchange of faxes. Our broker would make an offer, which the owner would find unacceptable and would then come back with a price, we would respond and so on. This negotiation took about three days without the exchange of a single piece of paper, and at the end of the three days we were advised that we had bought the tanker, subject to approval from the board. One of the lessons we learnt during this process is that there is a protocol in the industry that you do not negotiate with two owners at the same time. It is a relatively small community, and they all know each other. In order to show a degree of good faith, you had to complete negotiations with one owner before you could approach another. We made some mistakes early on because we thought we could barter the price down with concurrent negotiations.

At the end of the day, we agreed on a price that was subject to board approval, which is a term used in the industry where the shipowner waits to see if they can get a better offer from somewhere else in 24 hours. We negotiated successfully and were able to secure from Tsakos Energy Navigation the MT *Delos* for \$50 million, which was a very good price as within three months they were trying to buy back the ship.

The *Delos* is a standard Panamax-sized double hull tanker at 37,000 dead weight tonnes. The shipbuilder, Hyundai Mipo Dockyard Company in Korea, builds a tanker every nine days and has orders for well over 100 tankers on its books. From a design perspective, whether it is a 37,000-tonne ship, 47,000-tonne ship or a 97,000-tonne ship, they all look the same, and critically they do not do modifications during the build. What is in the catalogue is what is delivered.

Leasing

We were anxious to operate the ship for a full year to shake the ship down and sort out any warranty problems. The 12-month warranty covered the vessel, its parts,

machinery and equipment. Having undertaken extensive negotiations to transfer the warranty, we wanted to operate the ship to identify any faults that would then be repaired under warranty. Teekay Shipping operated the tanker under charter for a 14-month period. This was to enable the RAN to gain some operational experience to inform the design process.

Refurbishing the Ship

The next major step after buying the ship was to consider the equipment that would go onto the ship, which would be provided as GFE. Managing the purchase of the long lead items was critical to meet the deadline for the introduction of the capability into the RAN. In particular, the RAS rig was the critical lead item that had a 12-month lead-time, and was purchased before a decision was made on the prime contractor to refurbish the tanker. There were five possible suppliers of the RAS rig, and all were requested to tender for the contract with the winning company being Rexroth Hydraudyne from the Netherlands, with the contract valued at \$4.9 million.

Tenix Defence is the prime contractor for the design and modification of the ship. The intention is for the ship, to be named HMAS *Sirius*, to operate in limited threat environments, so modifications are necessary to meet RAN capability requirements as the ship will not be operating as a standard commercial tanker, that is, not like the Royal Fleet Auxiliary. There are seven major modification packages, valued at around \$65 million:

- the design and installation of the RAS capability, including the RAS masts, mechanical and electrical equipment and its control centre; this will allow the tanker to receive and distribute fuel water and hard stores to RAN and allied ships
- a helicopter deck was designed and integrated into the stern of the tanker (a scale model was trialled in the wind tunnel at Monash University to ensure ship stability). This was the first time this had been done anywhere in the world with the tanker remaining within its class
- a container deck capable of taking twelve 24-foot shipping containers was added to the existing cargo deck; these containers will carry dry provisions and spare parts for fleet exercises
- two upgraded tanker lifeboats were installed each with a carrying capacity of 70 people; two rigid hull inflatable boats (and associated davits) for boarding parties were taken off *Westralia* and installed on the *Delos*
- the interior of the ship was considerably modified
- the accommodation was extensively upgraded. The ship was originally designed for a crew of 35; Teekay Shipping operated it with a crew of 19, while the RAN will have accommodation for 70 personnel. This increase in size is provision for rescuing people at sea and transporting personnel other than the ship's crew
- installation of a state-of-the-art communications suite. This communications upgrade was the biggest capability enhancement to the ship in cost, complexity and schedule, and was valued at around 20 per cent of the total refurbishment cost.

Project Scheduling

What has been our timeline for this project?

The government approved project funding in the first quarter of 2004. We then set out to identify a suitable base ship, which took about six to eight weeks. Once we had determined the type of ship and capability definition documents, assessed the ships that might be available and gone through Second Pass Approval by government, we acquired the ship in the second quarter of 2004.

Base ship design work started between the first and second quarters of 2004, remembering we had to undertake some early design work before we could select a ship.

Teekay Shipping then operated the ship for 12 months, identifying any problems, and during the later part of that period, early modification was undertaken.

Base ship design work and modifications commenced in the first quarter of 2005 and the detailed design review was agreed in the third quarter of 2005. This occurred quickly because of the cooperation between Tenix, AMT and the project team.

A naval operation, test and evaluation program is planned for the third quarter of 2006, with the ship expected to be commissioned as *Sirius* in mid September 2006.

Planning will then begin for the replacement of *Success*, which is scheduled for 2014.

Conclusion

This project is a demonstration of how DMO can work cooperatively and effectively with industry, particularly when reconciling RAN capability requirements with commercial specifications, to deliver a capability to the RAN and the Australian Defence Force. With *Success* due for replacement in 2014, the lessons learned in replacing *Westralia* will be useful.

The Air Warfare Destroyer Program

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In December 2002, a team headed by Mr Malcolm Kinnaird undertook a major Department of Defence procurement review. The result was the Defence Procurement Review, released on 15 August 2003 and better known as the Kinnaird Review. The Kinnaird Review made a total of 10 recommendations aimed at restructuring the Defence Materiel Organisation (DMO) and improving the way it conducted business with industry and its internal partners in the wider Defence community. Under the changes implemented in response to the review, the Air Warfare Destroyer (AWD) Program is breaking new ground in the acquisition of three AWDs for the Royal Australian Navy (RAN). The program manager's role under the new arrangements is to ensure the agreement held between Chief Executive Officer Defence Materiel Organisation and Chief of Capability Development Group is executed effectively and that the AWD capability is fully realised.

Factors that Shape the AWD Program

Coupled with the Kinnaird Review, two additional key influences have had a major bearing upon the way the AWD Program conducts its business: the Carnegie, Wylie and Company Review of Naval Shipbuilding & Repair and the design-led procurement philosophy developed by DMO in response to lessons learned from past maritime projects.

As a result of the Kinnaird Review a "Two Pass Government Approval" system for Defence projects has been instituted to ensure that government is provided the opportunity to make better informed decisions regarding the procurement of Defence systems.

In considering the procurement of complex Defence capabilities, DMO is now required to evaluate a military-off-the-shelf (MOTS) variant together with an evolved variant as capability solutions and to provide the two fully scoped and costed options to government for its consideration at Second Pass Approval. In the case of the AWD Program, both these options are to be considered in the context of an Australian build. The formal definition of MOTS is "a product that is available for purchase and will have been delivered to another military or government body or commercial enterprise in a similar form to that being purchased at the time of the approval being sought". For the AWD Program, the government selected the Spanish F100 design as best representing the MOTS capability option in March 2004.

In the context of the Two Pass Government Approval requirement, at First Pass, the government agreed that the program should continue to examine, in parallel during Phase 2, the existing Navantia F100 Design, together with an Evolved Design that will be developed by Gibbs & Cox, Inc. Both the Australian Submarine Corporation (ASC) AWD Shipbuilder Pty Ltd and Raytheon Australia, together with the AWD

Program Office, will contribute to the development of both options. To gain Second Pass Approval, which includes the decision on which of the two capability options to pursue, the government will consider business cases developed by the AWD Program Office. The business cases will provide comprehensive detail surrounding capability, cost and schedule together with significant risks and issues associated with both solutions, as the basis for choosing the preferred capability option.

Having achieved First Pass Approval, our budget for activities throughout Phase 2 (predominantly design-related activities) is approximately \$455 million. Spending a significant amount of money early in the program to support design-related activities is also consistent with the Kinnaird principle that a higher proportion of project funds will be spent earlier, to improve project outcomes, and provide greater certainty in regard to project costs and risks.

Another significant Kinnaird Review recommendation stipulated that DMO become a prescribed agency. The DMO achieved this status on 1 July 2005, which in effect provides clear boundaries between DMO's procurement activities and Defence. Prescribed agency status clearly transforms DMO into a supplier of Defence goods and services and not simply a buyer. As a result, the emphasis in DMO is to closely integrate itself with industry to ensure the ADF is supplied with adequate capability on time and on budget. Consequently, DMO is now clearly accountable for the provision of capability. The traditional gap between DMO and industry must be closed if DMO is to deliver on its commitments.

While the Kinnaird Review has been widely publicised, the work carried out by the Carnegie, Wylie and Company Review is less well known. Carnegie, Wylie and Company was appointed jointly by Defence and the Department of Finance and Administration in January 2004 as a specialist commercial consultant, to conduct a high level independent review of the naval shipbuilding and repair sector. Three specific Carnegie, Wylie and Company recommendations, accepted by the government in May 2004, are central to the AWD Program, including:

- the naval sector should be based on a pro-competition model
- the contract for the AWD shipbuilder should be alliance-based
- the contracts for the AWD and Amphibious Deployment & Sustainment (ADAS) ship projects should be completed in a specific order, with AWD proceeding to contract in advance of ADAS.

In essence, these recommendations were the basis for pursuing the selection of the AWD Program's industry participants in the manner demonstrated over the last 18 months.

Both the pro-competition and timing recommendations bring their own significant challenges that continue to be addressed, but amongst the three Carnegie, Wylie and Company issues it is the alliance-based contracting philosophy, coupled with the design-led procurement process mentioned earlier, which have been the most interesting and significant challenges addressed by the program.

Carnegie, Wylie and Company's recommendation to pursue an alliance-based contract was based – and the AWD Program agrees with this – on an understanding

that for a project with the complexity of AWD, it offered significant benefits. These are largely through the alignment of program and industry interests, with a need for both the Commonwealth of Australia and industry participants to focus on meeting a specific target cost for the program. In effect, the AWD Program Office is brokering a marriage between all industry participants and, in doing so, has put itself in the middle of the industrial base required to procure the three AWDs. This focus offers the potential to reduce the risk for cost overruns often associated with conventional fixed price contracts.

Rather than adopting a generic alliance model, the program established a range of cornerstone principles that now form the basis of the program-specific contract model. It has been determined necessary to modify some traditional alliance principles, to ensure that the Commonwealth reserves specific rights to direct the overall program, and to afford protection against catastrophic failure. To recognise these changes, the contracting basis has been entitled an Alliance Based Target Incentive Agreement.

Importantly, the program has retained the fundamental alliance principle that rewards superior performance, or penalises poor performance, with pain-share or gain-share to be divided in agreed proportions amongst all the alliance participants, including the Commonwealth.

The alliance-based strategy brings with it a number of challenges, and will continue to do so in the future. The program, in selecting its preferred industry participants, went to some length to ensure each had a fundamental understanding of the proposed contracting strategy, and the ability to operate within the framework that has been established, including a capacity to carry any risk that might accrue from the contracting model.

As part of the program's efforts to facilitate alliance-based work in integrated teams, especially in the longer term through Phase 3 - the detailed design and production phase - a new AWD Systems Centre has been established in Adelaide. While the Program Office currently occupies temporary premises, an interim centre has been up and running since late February 2006. It is anticipated that the Systems Centre will occupy permanent facilities in close proximity to ASC after Second Pass Approval from government. The collocation of the team will provide significant overall benefits to the program. The AWD Program team recognises the very important challenge of recruiting the appropriate workforce to undertake the program in Adelaide.

The challenges of working in an alliance relationship are not, of course, limited to the industry teams. Public sector and military staff within the program will need to rethink the way they do business, and the manner in which program activity will be progressed in integrated teams rather than the more traditional and adversarial contracting environment. Program staff from the Department of Defence, ASC AWD Shipbuilder Pty Ltd, and Raytheon Australia continue to evolve the business processes that will guide the future phases of the program.

Achievements to Date

Those familiar with the program would be conscious of a major ramp-up in activity since the Federal election in October 2004. The results of some of this activity since then are publicly evident as the AWD Program has achieved a number of significant milestones:

- three days after the 2004 election, the AWD Program sought and was granted permission to release the first Request for Proposal (RFP) for a shipbuilder
- within a week, the second and third RFPs for the Combat System – Systems Engineer (CSSE) and ship designer respectively were approved for release
- in December 2004, responses to all three RFPs were received and proposal evaluations commenced in January 2005
- in the course of 2005 the AWD Program went to the government on five separate occasions to seek six decisions. At each visit the AWD Program came away with a positive outcome, which may be unprecedented for a program of this size and complexity, including:
 - selection of Raytheon Australia as preferred CSSE, ASC AWD Shipbuilder Pty Ltd as preferred shipbuilder and Gibbs & Cox as preferred Evolved Platform Ship Designer
 - announcement of First Pass Approval in May 2005
 - announcement of the AWD Systems Centre in November 2005.

Future Outcomes

An important priority currently facing the AWD Program is the build-up of the Systems Centre in Adelaide. The Systems Centre will draw together Defence and the industry participants in order to ensure the widest possible cooperation and integration between all the stakeholders. The Systems Centre will offer accommodation to representatives from the Commonwealth; ASC AWD Shipbuilder Pty Ltd; Raytheon Australia; Gibbs & Cox, Inc.; Navantia; Lockheed Martin Corporation; and the US Navy (USN). The immediate aim is to ensure the Systems Centre is established and adequately provisioned with key personnel and supporting infrastructure prior to the mid-term review in July this year.

Preparations for the mid-term review are currently being made, where the status of the AWD Program will be assessed by government. With this in mind, momentum continues to build, with the AWD Alliance focused on achieving Second Pass Approval in July 2007 when the AWD Program submits to government two fully scoped and costed AWD Design solutions for consideration and approval, which is a key Kinnaird requirement. Having said this, however, the AWD Program is focused on achieving Second Pass Approval only as part of a greater continuum and not as an end in itself. This is a very important factor. Having built momentum with industry teams, the program must focus on avoiding the protracted pauses that occur between when tenders are submitted, and the contracts are finally signed to undertake work. Often these delays seriously impact the momentum of a project.

Industry Factors

Industry has at times suffered in the past from protracted pauses during tender evaluations and contract negotiations. The Kinnaird reforms are allowing industry to ramp up their operations and build up their skills base through First and Second Pass Approval requirements, which in effect means that industry has not had the time to pause post-submittal of its RFP responses. The construction of three AWDs will be a major project for Defence industry, especially for the maritime sector. Accordingly, companies bidding for the AWD Program were required to include Australian skills and training programs in their tenders, in line with the government's Skilling Australia's Defence Industry (SADI) Program. The team will continue to work with industry, the South Australian Government and Defence to build the skills necessary to undertake this program.

The national impact of the program cannot be underestimated. The AWD Program team conducted a national roadshow of industry information seminars in all major regional centres in October 2005. These seminars were aimed at highlighting to Australian industry the opportunities available to them, and encouraged interested parties to register their interest. A total of 790 organisations were represented with almost half (47 per cent) of these being small-medium enterprises.

The opportunities presented to Australian industry are significant, and the AWD Program would not be on the threshold of building three AWDs if it were not for the maturity of the Australian shipbuilding industry. The successful maritime building programs embarked upon from the mid-1980s including the *Collins* class submarine, the *Anzac* frigate and *Huon* class coastal minehunter programs, created a benchmark industry capability from which the AWD Program will leverage.

At the end of the program when the final AWD is accepted into service in 2017, it is hoped the program will leave two lasting legacies:

- three AWDs capable across the full range of contingencies faced by the ADF in the maritime and littoral environments, including the airspace above them
- contribute to the development and maturity of the Australian shipbuilding industry with a view to leaving it in better shape than it is in today with continued support from the Commonwealth and State governments and the Australian public.

The AWD Program would not be in a position to deliver on these two goals had it not been for the success of the previous shipbuilding programs. Having said this, the program team is fully aware that if the AWD Program is not executed flawlessly there may not be opportunities of this size and complexity for Australia's shipbuilding industry in the future.

Technical Challenges

For a program building the most complex naval surface combatant in Australia's history, there are naturally a number of significant technical challenges. These include:

SYSTEMS INTEGRATION

In the past (and undoubtedly well into the future), systems integration has proved to be one of the more complex challenges in the design and construction of naval platforms in Australia and around the world. The problems confronting projects undertaking complex and leading edge systems integration are legendary and regularly find their way into various audit reports around the world. For a country the size of Australia, and with the budgetary limits set for the program, the team has recognised potential difficulties and consequently selected the proven and highly effective AEGIS combat system for its program.

It gives the program great confidence that the AEGIS combat system has been successfully integrated into six ship classes for five different countries with 82 ships currently fitted with AEGIS, while a further 30 are planned or under construction. For the AWD program, AEGIS will be supplied by the USN through a foreign military sales case with the combat system engineering agency, Lockheed Martin, providing the system and engineering support as it has done for AEGIS programs all over the world. In December 2005 the government approved early procurement of major AEGIS items to ensure the program remains on schedule.

While the core of the combat system capability is delivered by AEGIS, it is recognised that Australia will need to be able to exercise sovereign flexibility in the selection of systems and sub-systems providing unique capabilities required to meet Australia's particular strategic imperatives. To meet these requirements, the program has engaged Raytheon Australia as the CSSE responsible for the integration of non-AEGIS equipment. It is anticipated that the selection of a modern, flexible and open architecture will provide opportunities for Australian-based companies to offer effective and low risk solutions.

PLATFORM CONSIDERATIONS

Although AEGIS will be the core combat system for either of our selected design options, the platforms under consideration will vary. In determining the most suitable platform for this program, thorough and objective analysis of a range of parameters for each solution under consideration will be conducted. Some of the key issues that will be considered amongst others are operational capability, minimum personnel objectives and growth options.

At Second Pass in mid 2007, the program will deliver to government assessments on cost, schedule, risk and capability of both the existing and evolved design options.

CAPABILITY

The introduction of this ship, the most complex and capable surface combatant to ever enter service in the RAN, will pose many challenges. For the younger officers and sailors of the RAN, however, it will be a very exciting time as this capability puts to sea.

At the heart of these challenges will be the AEGIS combat system. As you would appreciate, the challenges of introducing, operating and maintaining AEGIS will be great, requiring a tremendous effort in the coming years to understand the technology and how best to use it. Its complexity, the enormous capability it brings, and the training demands it levies, are to name but a few of the challenges the program faces from now until the middle of this century in building, sustaining and operating these ships. This will not only impact on the RAN, but also the Australian Defence Force (ADF).

AEGIS is a very complex system that brings an exponential capability improvement over any combat system the RAN has ever operated at sea before. The process of fully understanding AEGIS is starting now within the AWD Systems Centre, but the program will need to look at how to start preparing a wider range of people, for example Principal Warfare Officers and Combat System Operators, for the complexities of AEGIS. This preparation will need to commence prior to the ship's introduction, so that tactics and procedures are in place to best utilise the significant capability AEGIS brings upon delivery. Exchanges with the USN might be a way of increasing exposure to AEGIS to inform the development of tactics and procedures, as well as making maximum use of those with AEGIS experience from previous postings and exchanges. This is to say nothing of the requirement to start the process of preparing the technical officers and sailors who will maintain the system and the SPY-1D(V) radar. This will require a significant undertaking over the coming years to prepare for the introduction of the capability prior to the first ship delivery.

The capability that is delivered in area anti-air warfare (AAW) will also require considerable thought in the coming years about how it will impact on the ADF's involvement and tactics in operations, both at the ADF Task Group level and in coalition operations (one of the key requirements of the ship is that it be interoperable with key allies and regional countries).

The AWD's ability to significantly influence the airspace around it through the capability of the AEGIS combat system will bring a new dimension to maritime AAW that the RAN has not experienced before. The ship will carry a large number of long range missiles that, when combined with the AEGIS combat system, will make the threat reassess whether it really wants to share the same airspace. This potent combination will also bring challenges when operating with friendly aircraft and it will place a new emphasis on the requirements of area AAW coordination. Another challenge, for example, will be how to make maximum use of the AWD in company with the Wedgetail airborne early warning and control (AEW&C) aircraft. This will be facilitated to a degree through data links, but it will require a great deal of exercising to realise the full potential of the AWD in concert with the AEW&C - both new capabilities that the ADF has not operated before. This impressive AAW combination will also require new tactics and procedures, not only in the RAN, but also across the ADF. From this one obvious example, it would also be apparent that the AWD will play a critical role in ADF network centric warfare (NCW).

The complexity of the AWD's weapons systems, and the subsequent training required to ensure their full potential is met, will place greater demands on the Combat System Operators who will need to be constantly training on the system, even when the ship is not employed in the area AAW role. The requirement for this constant training is something new. This is of course to say nothing of the understanding that Principal Warfare Officers will require to make the best use of this complex system. Will the RAN be able to stream officers to gain the understanding they will need to command one of these ships? A further challenge will be when to repatriate training, and how much should be repatriated? To avoid knowledge degradation, the timing of the initial training for the commissioning crew will also be crucial. The demands of the system can best be summarised by the words of an instructor at the AEGIS Training and Readiness Center in Dahlgren who, even with more than 15 years experience in AEGIS, said, "you don't remain a subject matter expert in AEGIS for very long".

There will also be the challenge of operating a ship of this complexity with a ship's company of around the same size of an *Anzac*. The RAN has been operating ships with minimal personnel now for a generation and has gained considerable experience; indeed, the culture has changed between the *Adelaide* class FFGs, the RAN's first minimum-crewed ships, and the *Anzacs*. Old departmental boundaries are disappearing fast, or have disappeared, and the program is well placed culturally to make the next step to the AWD.

Comments coming into the Program Office often refer to AEGIS as legacy equipment. The only piece of AEGIS being purchased by the Commonwealth that bears any resemblance to the AEGIS of 15 years ago is the aerial face. Everything that sits behind that aerial face is state-of-the-art equipment that has benefited from the years of development that the US has invested in AEGIS, and the RAN will directly benefit from that. The ADF is procuring the SPY-1D(V) radar, the latest version of the SPY-1, as well as the latest AEGIS Baseline 7.1, based around commercial-off-the-shelf (COTS) technology. It is well worth noting that the USN itself will only have 22 SPY-1D(V) ships; that is 22 out of the 62 that will eventually be in service in the USN. From all reports, the USN has been very pleased to date with the performance of SPY-1D(V) and AEGIS Baseline 7.1.

Shipbuilding – ASC's Role

The AWD Program is very important for ASC's future. It will be one of the greatest engineering accomplishments in Australia's history. For the shipbuilder there are three main challenges that must be overcome:

- complexity challenges (ability to successfully build and deliver three complex and highly capable state-of-the-art AWDs)
- capacity challenges (drawing on resources nationally to build and deliver the ships on schedule)
- infrastructure challenges (adequate shipbuilding facilities for module construction and whole-of-ship integration of the AWDs).

Australia's AWDs will contain approximately 500,000 parts to assemble. It is anticipated that over 1500 suppliers will be required to complete the shipbuilding task, which will take more than 3 million personnel hours to complete. ASC will draw on its skills and capabilities, developed throughout the life of the submarine building contract and now maintained through submarine through-life support, to meet this challenge. ASC has an existing base of over 1000 employees, more than 250 of whom are highly trained naval engineering and technical specialists.

ASC will build on its current capability and enhance it through direct involvement with key government organisations, universities, specialist technology providers and capability partners. In particular, ASC has engaged General Dynamics Bath Iron Works (BIW) to support their shipbuilding capability. Since the 1950s, BIW has served as the lead shipyard for 10 surface ship classes produced by the USN and is today the most technologically advanced surface combatant shipbuilder in the US. BIW has successfully built and so far delivered 33 out of 34 AEGIS vessels, including 26 *Arleigh Burke* class guided missile destroyers and 8 *Ticonderoga* class cruisers, to the USN on schedule.

Building three AWDs will require a lot of resources – more than any one shipyard can provide. Irrespective of which AWD design is ultimately chosen – Evolved or MOTS – the selected design will be built in 29 independent modules at shipyards around the country before being put together at ASC. ASC plans to share about 70 per cent of module construction work around Australia.

In any shipbuilding program of this size, there are various critical schedule-driven paths that require close management. ASC plans to build the larger, more complex modules and closely manage their construction and integration to ensure the program sticks to schedule, while other shipyards will be given modules to construct that are less likely to impact on program milestones. There is a fantastic opportunity for all Australian shipyards to build modules and it is ASC's intention to engage Australian industry and share the shipbuilding work around the country.

Training will be critical to the success of the AWD Program, and the South Australian Government is establishing a Maritime Skills Centre to ensure the industry has the people it needs, now and into the future. It will be a 1500m² purpose-built facility adjacent to ASC's shipyard at Osborne, South Australia, the primary role of which will be to train the AWD workforce for both ASC and the other Alliance participants and South Australian subcontractors. The centre will provide training for trade, technical and professional employees and will include employee induction, up-skilling, cross-skilling, specialist shipbuilding skills and advanced technical training. Over the life of the AWD build phase, it is anticipated that over 400,000 hours, or 50,000+ days, of training will be delivered to ASC personnel.

Infrastructure requirements pose a significant challenge for building the AWDs. Both ASC and the South Australian Government will be developing infrastructure in connection with the AWD Program, which will support Australia's shipbuilding industry long after the third AWD is delivered. ASC's current modern submarine construction facility will be expanded into a state-of-the-art shipbuilding precinct

supported by the South Australian Government's contribution of a new ship lift (up to 230 metres long), a transfer system and wharf (operated as a common user facility) and dredging of the Port River to berth large vessels, in addition to the Maritime Skills Centre.

Other key features of the precinct include a manufacturing support office beside the new wharf, outfitting workshops, a blast and paint facility, and refurbishment of ASC's steel fabrication workshop. This site, now known as Techport Australia, has abundant land to grow and offers many opportunities for companies wishing to locate themselves in the area and support the consolidation and outfit of the AWDs.

Combat System Systems Engineer – Raytheon's Role

Providing the best capability does not translate into gold-plating. The core of the AAW system has been selected and the AEGIS system, allied to the Standard Missile, is today the most capable AAW system in the world. However, the program has allowed for trade studies to be conducted on other systems for the AWD to ensure that the sensor, weapon and information systems are optimised for Australian operations and resources.

The trade studies are unlikely to be the end of the selection process. It is anticipated that decisions will need to be made between different combinations of equipment fits, as funding is unlikely to stretch to cover everything the operators would like. It is Raytheon's role as the CSSE to integrate all non-AEGIS elements of the AWD's combat system. This is an area where Raytheon can draw from its US experience.

Raytheon has successfully employed the Cost as an Independent Variable process on both the LPD-17 and DD(X) programs to assist the USN make similar capability trade-off decisions. At the end of the trade studies, the RAN can be confident that they will receive the most capable warfighting system possible within the budget allocated by the government.

Turning to technology and ensuring it remains leading edge, the buzz word here is "openness"; and ensuring that the systems are as open as possible is an obvious requirement, but not a sufficient one. While companies are working to make their systems conform to open architecture standards, the latter are not yet uniform and progress in conforming to them is uneven. Raytheon and the AWD Program need to achieve an architecture that will facilitate upgrades of, and to, individual equipment and systems as well as more significant technology insertions. A technique used by Raytheon for the *Collins* replacement combat system was to provide a server that allows for the integration of either existing or potential future systems/subsystems through the operational life of the boats. A further element that will impinge upon technology upgrades and the overall manning requirements is a high-capacity information backbone. This is fundamental to both the efficiency and effectiveness of the ship.

Another challenge is industry's capability to provide through-life support for the systems onboard the AWDs. For the sake of the RAN, the approach to this issue

needs to be grounded in reality. It is not simply a matter of cost-effectiveness of support; it is also about depth and sustainability of skills and knowledge in Australian industry. A lot of attention is being given to the shortage in experienced engineers, technicians and tradesmen to execute major defence programs. However, training is only part of the problem. Companies need to be able to retain such people so that their expertise is available to the ADF for many years into the future. This is a multi-dimensional problem and there are no simple answers. However, the government's SADI initiative is a welcome step in finding a solution to this problem.

Evolved Platform System Design Option – Gibbs & Cox Role

Gibbs & Cox, Inc. is an independent naval architecture and marine engineering firm with the full range of capabilities required to design complex surface combatants. Gibbs & Cox has had a longstanding successful relationship with the RAN going back to the design of the *Adelaide* class FFGs continuing with the FFG Upgrade Program, survivability analysis for the *Anzac* class and development of the RAN Shock Hardening Program.

Gibbs & Cox's experience on the US DDG-51 program is particularly relevant to the AWD Program. In part, this is because the DDG-51 is the basis ship for the Evolved option in competition for the AWD Program, but also because DDG-51 is a program that Gibbs & Cox contributed to throughout all phases, from initial design to final detailed design of the lead ship. The ability to contribute in all phases from concept design to through-life support will be useful should the Evolved option be selected as the preferred option by government at Second Pass in mid 2007.

Gibbs & Cox, Inc. is beginning a significant new chapter in its history with the establishment of Gibbs & Cox, Australia, a wholly owned subsidiary of Gibbs & Cox, Inc. It will be led by an Australian and a core group of current Gibbs & Cox staff members experienced in DDG and other current USN programs are in the process of relocating to Australia. The remainder of the Gibbs & Cox Australia staff will be made up of new personnel. Reaching back to US-based staff will be central to Gibbs & Cox, Australia but, moving forward, an increasing portion of the technical work will be performed in Australia. Gibbs & Cox, Inc. are also subcontracting with Australian firms to assemble the required expertise and team members capable of completing the design, provide through-life support and, should the Commonwealth choose to go down that path, eventually take on future ship design projects.

The fundamental challenge faced by the Evolved Platform System Designer is to develop a solution that maximises capability for the available budget. There is a need to understand the trade space thoroughly in what is quite an aggressive schedule, and to succeed the design must converge quickly. This means there is a need for an efficient decision-making mechanism. The Alliance framework ensures that decisions are considered from all the right perspectives, and it is up to the Alliance leadership to ensure that the process is effective. Among the technical challenges, crew size stands out and Gibbs & Cox will have a substantial focus on this throughout the design phase.

Existing Platform System Design Option – the Spanish Navy’s Experiences with the F100

The performance of the F100 since its delivery has exceeded the expectations of the Spanish Navy. Thanks to the close cooperation between the Spanish Navy and the USN, and between US industry (particularly Lockheed Martin) and Navantia, not only have operational requirements been accomplished, but new capabilities have been identified, opening up new possibilities. The construction of the fifth unit of the class will start very soon, incorporating some lessons learnt and correcting some unavoidable obsolescence.

A key to the F100s capability is its ability to achieve interoperability with other elements of the armada, as well as the USN and other alliance partners. There are four aspects to achieving this level of interoperability.

First, are projection forces such as the amphibious ships, the aircraft carrier and the embarked air wing; together with freedom of action ships like mine countermeasures vessels and submarines, interact with surface combatants (F100s) forming an operational team. Second, is to achieve interoperability with the army and air force to be able to provide the government with a graduated response capability ranging from peacetime operations (disaster relief and the like) to high intensity operations. Third, is the need to qualify the F100 to NATO Standards, including the most demanding ones, those of the NATO Response Force, which involve being ready for high intensity combat missions under nuclear biological and chemical threat. Fourth, the F100 must be interoperable at the highest technological and operational level within coalitions in any part of the world.

Starting from a core capability-based on the experience of Navantia in the development of the F100 combat system, a number of software and hardware packages are being developed to minimise cost and engineering demands and to improve lifecycle costs and, above all, interoperability among units. Key to the interoperability of these ships with naval, ground and air assets is the possibility to implement command, control, communications and intelligence (C3I) systems such as Link 16, and in the near future Link 22, as well as connectivity with the NATO Maritime Command and Control Information System that will evolve in the coming years to become the maritime component of the future Allied Joint Information System. This is the system used in a national or NATO environment, but the ship’s system is flexible enough to implement other command and control architectures in coalition operations. However, Link 11 connectivity has been kept to remain compatible with older ships not fitted with Link 16.

The flexibility of the AEGIS combat system has made possible the integration by Navantia of multiple Spanish furnished components. The introduction of open architecture in the version to be installed in the fifth ship of her class will increase even more the adaptability of the system.

Satellite communications is another essential element of the F100s’ interoperability. The F100s are equipped with a wide range of satellite connectivity including military and commercial super high frequency (SHF) and ultra

high frequency (UHF) systems that are vital for the transfer of data and voice communications securely and reliably, and provide enough flexibility to be able to participate in the specific networks established for each operation. However, none of the systems mentioned above are of any value without effective human interoperability.

Reduced personnel is a paramount concern in the Spanish Navy. It has multiple implications in the way crews are trained and ships are designed, and this is another transformational issue, not just for the armada, but for navies globally. Through the intensive implementation of technology in designing the ships, as well as adapting legacy doctrine in areas such as damage control, the Spanish Navy has been able to reduce the crew of the F100s to 220 persons including the embarked air wing. This was the ship's company of SPS *Álvaro de Bazán* during her recent deployment with the USS *Theodore Roosevelt* Carrier Strike Group.

Thanks to these capabilities, the F100s can be seen as force multipliers in the joint environment, mainly in the AAW arena. Their huge air coverage and C3I capabilities make them an invaluable asset for the integrated air defence system of sovereign territories, as well as in expeditionary operations where exchanging data related to targeting information and task allocation are critical to developing a common operating picture in the network centric environment.

The F100s have already completed a few years operational service, during which they have proved their interoperability at the highest levels within NATO. As a matter of fact, they are being used in four month rotations as flagships of NATO's Standing Naval Group throughout the Spanish command of this force, lasting one year. These experiences have proved a fantastic opportunity to verify the technical, doctrinal and human interoperability of the F100s with the most advanced navies in the world in the most demanding operational scenarios, proving the validity of the recent USN proposal for a 1000-Ship Navy initiative.

This had also been demonstrated by the outstanding results of all F100s in their combat system ship qualification tests conducted side by side with USN units. Interoperability and reliability of the platform and combat systems have been confirmed, both in testing, and by the fact that only limited technical support was needed during the deployment and the ship returned to her home base fully operational after nine months.

Conclusion

Reforms instituted by the Kinnaird and Carnegie, Wylie and Company Reviews are delivering the outcomes that the government, Australian taxpayer and Defence expect. The program currently remains on schedule, on budget and to capability, and though it is still relatively early days, the work and effort being expended by the AWD Program as a whole continues to provide the solid foundation upon which the future success of the Program depends. The successful completion of this program will leave Australia with two legacies. First, an AWD capability for the ADF that will serve Australia well for the next 30 years. Second, a public willing to

embark on future “in country” naval construction ensuring that Australia has the skills and capacity to provide and support its maritime defence needs well into this century.

The Royal Australian Navy in 2030

Sam Fairall-Lee, Kate Miller, David Murphy

Looking through the history of the Royal Australian Navy over the past quarter of a century, it is clear that making predictions about exactly how the RAN will change over the next 25 years is difficult, and attempting a detailed analysis of where we will be in 2030 is not the purpose of this paper. Instead, we will discuss some of the issues we feel are most important in our transition to the RAN of tomorrow. We do not necessarily seek to provide all the answers, but to ask what we feel are the important questions, and by doing this hopefully provoke further thought and debate about where the RAN is going, and how it is going to get there.

Strategy (Sam Fairall-Lee)

As we have seen in Professor Kenneth Hagan and Professor Mike McMaster's recent paper, the past 15 years have brought some fundamental changes in naval strategy. With concepts and buzzwords like "Operational Manoeuvre from the Sea" and "Ship to Objective Manoeuvre" the world's most powerful maritime power, the US Navy (USN), has abandoned the Mahanian decisive battle, and instead is utilising the sea for the projection of power right into critical centres of gravity on land. This approach is gaining recognition amongst other Western navies, and in Australia the RAN has taken on some of these expeditionary principles, reflected in plans for new amphibious ships and in models such as the Army's Manoeuvre Operations in the Littoral Environment concept. As Sir Julian Corbett would surely have agreed, these forward-looking principles reflect the inherent potential of sea power; and I believe they are setting us down the right track towards the RAN of 2030. Yet as we set off down this road, we must keep in mind that warfighting in the littoral is only one part of a bigger strategy - you still have to project these ships across the ocean, and in some cases across vast distances. Control of the sea is still the basic enabler for maritime manoeuvre. Will our future sea control force be adequate for the task? It is a lot to ask of three Air Warfare Destroyers (AWDs). In this sense we must ensure we can walk before we try too hard to run. Surely maritime air power has a significant role to play in a power-projection strategy? And in a high-tempo land battle where victory is won in decision cycles and OODA (Observe, Orient, Decide, Act) loops are our land forces mobile enough for the task?

Although Australian maritime strategic thinkers are beginning to confront these questions, the reality, as Peter Abigail has hinted, is that there is little public appreciation of any overarching strategic guidance. This is reflected in some criticisms of our current acquisition policy, which some commentators believe lacks an integrated approach to any one identifiable strategy. To some, it appears that each Service continues to invent roles for its platforms and units in order to retain them and the associated funding, rather than taking an integrated approach to matching

strategy to capability, and capability to platforms and units. I believe the Australian Defence Force (ADF) requires a more clearly articulated maritime strategy, and with it an integrated acquisition plan, which will give us a better understanding of how we are moving towards 2030.

Maritime strategy is sometimes a difficult business to explain. Arguably, it is a far more subtle and complex affair than the strategy of land and air warfare, and it is far harder to demonstrate – after all, most of our work is done over the horizon; out of sight all too often means out of mind. While Clausewitz is well known and often quoted, Mahan and Corbett require more careful study and are nowhere near as well understood – especially by some influential Australian defence commentators. While the Silent Service traditionally does not like having to explain its rationale, if the community does not understand our role it will be increasingly difficult for us to justify our acquisitions and our activities, and to recruit our future sailors. The community’s understanding of what the RAN does and why, together with a better knowledge of Australia’s maritime heritage, is vitally important to the RAN of 2030.

IDENTITY AND PUBLIC IMAGE

When Australians speak of their history, we generally hear stories of the early inland explorers, about bushrangers and gold rushes, and almost certainly of the ANZACs and Gallipoli. Rarely, if ever, would you hear the man in the street speak of *Sydney-Emden* or *AE2* or the Battle of the Coral Sea. Australian mythology looks overwhelmingly inward, away from the sea and our maritime heritage. Conferences such as this are a valuable facilitator for discussing these issues, but I would assume most attendees already know a bit about what the RAN does; we need to proactively and effectively project that message into the wider community. Is this a difficult ask? Yes, but to quote Admiral Shalders: I believe it is difficult but not insurmountable. Admiral Barrie commented recently on the effectiveness of websites, and I totally agree, but in order to get someone to want to visit our website we have to first spark their interest. I do not have all the answers in this regard, but I have some suggestions. First, the RAN should take a greater interest in its own public relations. Second, the RAN must further engage full-time uniformed public relations professionals to devise and manage initiatives. Third, the RAN must get on the front foot. Too often our public relations messages are about reacting and putting out fires. The former defence minister quoted by Admiral Barrie was right: we need to “get out there and get the community to support [us]”. In doing this the Navy Comprehensive Community Engagement Strategy is one good idea, as is the home-towner approach to engaging the media. Every one of us in uniform can play a role. Let me give you an example. I recently spoke with a patrol boat commanding officer (CO) who told me that, on arriving at work in Darwin not too long ago, he received a letter from a young man who was from the same town as he was, and who had heard about the adventures of this particular captain (possibly through a home-towner article). It so happened that this particular CO was about to fly home

for leave; so he purchased a ship's baseball cap, went to headquarters and acquired some Navy public relations material, and when he got home he drove to the young man's house, knocked on the door, and took the RAN message directly to him. In all likelihood the effects of this gesture will spread beyond this one young man, as he arrives at school sporting a new Navy baseball cap and telling his friends about the warship captain who paid him a personal visit. The couple of hours of effort from this captain have more than likely earned the RAN at least one new recruit.

RECRUITING THE FUTURE FORCE

Recruitment-wise, when we consider Generation Y and the Millennials (1977-present) we see kids who have been raised with the Internet and mobile phones as part of their daily lives, expect to walk off the street into high paying jobs, and are focused towards instant rewards and away from manual work and strict routines. According to one recent survey, one quarter of the Millennium generation believe they are the next Bill Gates. Attracting these people is a challenge. How do we do it? Well, a need for job security and a sense of contributing to society also figure highly amongst these people, which is a good start. But what they really want is to use their skills of the digital age to innovate and solve problems. To meet this demand we need to dramatically increase the scope for innovation within Service life, especially at the lower ranks, and open our minds to an increasing pace of change. We need to listen to ideas and encourage these people to investigate better ways of doing things. Where possible, we need to reduce limitations imposed by Standard Operating Procedures, and not assume that the way we do things now is necessarily the best way of doing them in the future. On the technology front, digital kids want to work with the newest, best equipment out there - so we have to enable them to do it.

Broadly, the RAN must also better exploit the adventure characteristics of naval service. The "Normal Life" advertising campaign of past years neglected this and reflected an unrealistic view of what people in the RAN do. The current "For the next 30 seconds..." recruiting ads are more along the right lines, and we should expand on them. My division of sailors is very diverse - ranging from a former meat factory worker to an able seaman who is finishing a performing arts degree and enjoys writing plays - but when I ask them what attracted them to the RAN, the common theme is, "I wanted to do something different", "I didn't want to be stuck in an office", "I want to see the world" or simply, "it looked really cool".

I am nearly 26, and so perhaps what appealed to me is no longer as relevant, but a big part of what attracted me to the RAN was the effect, at an early age, of the television series *Patrol Boat*. I distinctly remember watching the adventures of Captain Keating, and I am sure that the images of *Defiance* gallivanting around the oceans were in the back of my mind when I began to consider the RAN as a career. My message here is that we cannot underestimate the value of using the right medium or the right technology in connecting with today's youth.

RETENTION

While the Sea Change program and other initiatives made at the senior levels of the RAN and the ADF are certainly welcome and will continue to have positive effects, they will work only because of how they affect individuals in their daily lives. These strategic initiatives often lose their effect because of inattentiveness in middle management. The RAN's junior officers must be aware in their dealings with their subordinates, that they are a key instrument of retention. Lieutenants and lieutenant commanders especially must be positive about innovations and initiatives from both above and below. It is absolutely essential that these officers contribute to the system of which they are a part and encourage their juniors to do likewise. They must be on the front foot in empowering those they lead to realise their potential and work outside their perceived boundaries. This is true now, and will become ever-increasingly important as Generation Y and the Millennium generation become a bigger part of the RAN.

Along the same lines, engagement and the flow of information between the RAN leaders and the metaphorical lower deck must continue to evolve and expand – most of the time there is far more to a new policy than can be communicated in a signal or illustrated in a poster – the policy might be ground-breaking, but people want to know how it affects them in a real, practical and personal sense. And in a general sense, personal contact can act as a kind of personnel force multiplier – a brief conversation with one of the RAN's leaders will almost always have a far more profound effect on junior members of the RAN than a signal or an email. For those very senior officers reading this paper, your sailors value it very highly when they know that you regard them as part of the team. This is not a new revelation; Nelson stands above all his contemporaries not just because of his famous victories, but because he communicated his ideas so effectively.

As we move further through the information age towards the RAN of 2030, all these elements are important, but communication, in all forms, remains key.

Logistic Support (Kate Miller)

I am convinced that logistic flexibility will be central to the RAN being successful in 2030. But hope must not be our strategy to achieve this. This paper does not map out a strategy but it does raise issues that I think could be resolved through a long-term, coordinated plan.

Acquisition of new platforms is topical in the media, as the Australian public are made increasingly aware of how the Department of Defence is spending their tax dollars. Value for money in acquiring maritime hardware is an enduring principle consideration because the RAN replaces its platforms about every 30 years. It spends billions of dollars at one time, rather than spreading smaller purchases of expensive equipment over time. The cost of sustainment over the life of the ship generally exceeds the initial purchase price. From the public perspective, it is difficult to comprehend the purpose of spending so much money on a ship, especially given

budgetary pressures in this fiscal environment, until the ship is seen to be engaged in defending Australia's interests. Being seen to be value for money is an imperative strategy in planning the RAN's future.

While the RAN might have a highly specialised capability like the *Collins* class submarine, the political, social and economic impact of the acquisition of that platform cannot be underestimated. The RAN has a rare opportunity at this point in time – due to the replacement of several platform types – to revisit the logistic systems, processes and practices that support the current fleet, in the light of future requirements. So far, it has been assumed that all the logistic support features of the current fleet would be included in the design and acquisition of the new ships. This assumption does not take into account the changes in people's expectations or the effects of emerging technology. The opportunity to improve the logistic support inherent in ship design will be lost unless both the overall operational concepts for the fleet, and the logistic support required to meet that operational concept are clearly articulated so they can be acted upon.

The RAN has long adopted the principle that the logistic concept must always follow the operational concept. This principle holds true from the moment that a platform is designed. The logistic support concepts are embodied in that platform, including all aspects of support, from the ability to land a helicopter or replenishment at sea (RAS), to meeting international standards for grey water management. Mutual logistic support is derived from task group operations and is a useful force multiplier, so additional logistic requirements, such as the equipment and processes to conduct resupply at sea, must be considered when operating ships in company. Further, the fleet must also be able to integrate with the other Services where and whenever required. This ability is particularly valuable in situations such as diplomatic or civil assistance roles, and enhances the RAN's image as effective and good value for money. Only good planning of logistic support mechanisms will create this flexibility. I have a quote I would like you to consider:

*As we select our forces and plan our operations ... we must understand how logistics can impact on our concepts of operation ... Commanders must base all their concepts of operations on what they know they can do logistically.*¹

A complex interdependency exists between successful operations and the logistic support provided to those operations. The quote illustrates the point that sound logistic support improves the chances of success in warfare by diminishing the impact of uncertainty inherent in warfare. I see that Australia has achieved very good value for money to date in our current fleet, because the logistic systems practices are extremely flexible, and logistic limitations are well recognised and documented. The logistic systems, processes and conventions adopted by the RAN have been adopted because they increase the certainty of achieving the mission and they are cost effective.

The challenge now is to build new ships, capable of responding to anticipated wide and varied future threats that also have flexibility in their logistic support. It

cannot be assumed that design features in the current ships are a future requirement. There is room for improvement given the advances in technology and changes in community expectation regarding logistics support inherent in ship design. By this I mean technological innovations in the areas of remote monitoring systems, fixed firefighting systems, automated RAS equipment, materiel handling equipment and storing routes, and practical galley design that can withstand the rigours of operating at sea.

Currently, the RAN does not have formal processes to ensure that the logistic requirements are sufficiently defined to inform capability development, and are included in the original platform designs. It is costly and difficult to alter ships once they are built. The impact of not considering these requirements will be evident by increased uncertainty in conducting operations, rather than an increased confidence derived from reliable, known logistic support to the ship and the ship's company. Logistic support should reduce the fog of war for the commander, not introduce more considerations for the commander when engaging the enemy. Current practices do represent value for money as determined within the acquisition framework, but I see that there are improvements that could be made to achieve greater platform effectiveness, or value for money for the future.

If I were to look back in time from 2030, I would like to see a number of initiatives be implemented, to improve the value the taxpayer gets from the investment of significant capital in the RAN. In addition, the RAN will be better prepared to fight in the future warfare environment.

Initially, each project must have an operational concept that is well articulated and produced sufficiently early in the ship's development cycle to be a useful planning document. From this document, logistic features and requirements that maximise flexibility and integrate with other platforms or units can be developed to show how the concept will be supported.

Practising logistics support when experimenting with concepts greatly improves the effectiveness or bang for buck delivered to the government. It costs less than really doing it, and problems can be uncovered before the concept is finalised. It is best to discover that lifting an army brigade of approximately 1000 people and their equipment will sink a ship before the ship is built, or the equipment purchased for the army, or money invested in support infrastructure. For example, sea basing as a concept is gaining popularity. If the RAN wants to pursue this trend and put tanks in ships, there are a number of considerations to be taken into account. These considerations include the wharf space available and its strength, whether the storage available in the ship max out by weight or volume, whether the crane is rated to lift the tanks into the ship, or whether there is a roll-on/roll-off ramp facility available, and whether tank maintenance will be done at sea or ashore. Often these logistic concerns are assumed away when trialling or wargaming a new concept because of the complexities that are introduced. The Young Turks of 1976 commented that:

We believe that there is a need to spell out in more detail our maritime strategy and Concepts of Operations so that all personnel have a greater appreciation of what they are trying to achieve.²

This aspiration holds true now and in the future, and logistic requirements must be broadly expressed as part of a greater maritime strategy. The RAN's logistic practices are, for the most part, passed from supply officer to supply officer. Support concepts, practices and why these practices exist are not sufficiently documented in any doctrine or publication at present. Currently, the RAN requirements, systems, practices and processes are not well enough articulated to be considered substantial enough to influence the preliminary stage of designing or selecting an existing platform to adapt for military use. The cost of not understanding the logistic constraints on the operational concept are not something that is easily expressed, but the impact will be evident in the increased running and maintenance costs for the platform over its life. Also, design requirements need a benchmark and this doctrine could be further refined to inform capability development standards. Work has commenced in this area but it will take a coordinated approach for this series of documents to reach a mature stage.

I envisage that in the future it will be routine practice to take possible advances in technology and logistic requirements into account when decisions are being made on the purchase of platforms. Integration of new ships into the fleet, and with other forces will be very important, because it is this feature that makes the RAN flexible, and useful. I would like the RAN to have an active role in developing the operational concepts and then liaise with the Defence Materiel Organisation (DMO) to design, acquire and sustain the platform according to that concept. There is a wealth of knowledge gained in operational experience that, in the future, would be exploited to feed the operational and logistic requirements to supporting organisations. Ideally these roles would be performed by those people with operational experience but have had additional training and experience in Integrated Logistic Support. If these people were not embedded in the design phase of the project, then I would anticipate a standing panel would be available for project consultation during platform design and acquisition.

Ultimately, it is necessary to consider the interaction of units when working as a task group because that is how the RAN operates most frequently, and it is likely that this concept will be integral to successful operations in the littoral, although the task group may not be modelled on the traditional USN Battle group concept. Defect rectification is more easily achieved when platforms share common systems, as parts are more readily available. This improved effectiveness is also reflected in a reduction in the cost of ownership, but it depends on the identification of common systems, and arrangements that capitalise on the economies of scale that come from commonality. I would like to see the RAN structure reorganised to have sufficient critical mass in logistics expertise to facilitate identification and management of cross class/platform support issues in the design, introduction into service and

in-service phases of the ship's life. The RAN could then be a better customer, and use the expertise of people to articulate the level of support it requires from supporting agencies, be they through partnerships, contracts, standing offers or interdepartmental agreements. Again, all this is possible through clear articulation of the operational concepts and the logistic requirements to support it.

On the tactical level, other practicalities that will limit operations of the future include efficient and effective storing routes to get food and spare parts into and out of the ship. We have fuel and oil systems but frequently neglect the importance of materiel handling equipment and routes. Living and working spaces need to be practical too – frustrations with unreliable equipment and irritation due to everyday inconveniences impact on morale. The RAN is in direct competition for recruitment – it is not good value for money to invest in people only to have them leave because of impractical ship design.

Using the operational concepts and strategies talked about, such as “ship to objective manoeuvre” the RAN will, in order to meet government tasking and public expectation, need to have effective connecting hardware, such as compatible RAS rigs, vertical replenishment points, boat davits; and infrastructure such as wharves, roll-on/roll-off capability that links together pieces of kit, to project power into the littoral. These connectors will, in the future, be seen as a capability in itself and identified and managed as such. Such connectors will provide flexibility when roles change, or new trends in warfare force us to use our platforms and equipment in ways that they may not originally have been designed for. No one would have considered the *Leeuwin* class hydrographic ship could be used in support of operations in East Timor when doing the initial specifications in design. Society's expectation of being able to have things now extends to the military culture too. The role of helicopters is likely to increase. They are an extremely flexible platform that performs a variety of roles from replenishment to search and rescue, and medical evacuation as well as the tactical applications. The speed at which these tasks can be achieved is very appealing and, given expectations, the requirement for helicopters is likely to increase in the future.

I anticipate that there will be considerable pressure applied to achieve government outcomes, and that may mean using ships for roles that they were not specifically designed for. It is important to demonstrate innovation in such situations, because it demonstrates to the public, and government, that the RAN has achieved good value for money in acquiring these ships. However, using ships in this fashion has a sustainment cost. Spare parts are consumed faster than anticipated and maintenance must be done more frequently if usage increases.

The Young Turks of 1976 commented:

*What does it matter if the Mean Time between Failures of an equipment is hundreds of hours if the replacement spare takes 18 months to obtain from the USA – a not atypical figure. We take too much notice of usage in our stocking of key spares and not enough of lead times.*³

Usage is paramount. Mean time between failures is affected by usage profiles. System performance is affected by the usage profiles, and spared accordingly. The *Anzac* tactical illumination radar is a perfect example of this. The system actually performs better than manufacturer specifications, but the RAN usage profile is significantly increased compared to how it was planned to be used, consuming spares at a faster rate than planned. The stocking of key spares is according to predicted usage, and agreed sustainability levels. Lead times are driven by manufacturers, and often by USN procurement arrangements at present. I see that the RAN will rely on the original equipment manufacturer more in the future, possibly through long-term partnerships and will try to source industry support rather than reliance on US Foreign Military Sales where possible. However, given the industry support base in Australia, these long-term original equipment manufacturer partnerships are likely to be with international companies and include in-service support arrangements. The global marketplace is unlikely to show preference just because we are Australian, so I expect that usage profiles and accuracy of predicted requirements will continue to drive sustainability for the RAN.

Emerging technologies will enable further automation of manual processes. We can expect that there will be systems to assist with lifting and materiel handling equipment, automated stocktaking processes and access to support functions through the Internet. I see that there will be a migration of back-of-house administrative functions ashore, which may in turn reduce the number of people required at sea (canteen, finance, pay, etc.), however, a human relations capability is required ashore to conduct the function. That capability is likely to be contracted to a service provider. There are implications here for future personnel issues with recruiting, retention and future RAN workforce requirements, in managing and maintaining the skills people require for older ships, balanced with requirements for new ships, skills and training.

Lastly, I see that there will be one fleet-wide, if not ADF-wide, corporate configuration tool that permits a fleet-wide view of the configuration baseline of all platforms. Our deployable logistic support information system should, ideally, allow people ashore to manage and share unit level information to measure and monitor system usage, and provide information to satisfy government reporting requirements. This system will be both a transactional level system and also one that can serve as a decision support system when allocating fleet-wide tasks and priorities. This will be possible because there will be a shore capability to manage the system and provide some functions that are currently performed at sea.

With these steps, the RAN will be well prepared to meet the challenges of the future, including a range of government taskings. Conversely, without due attention to the issues I have raised, I consider it will become increasingly difficult for the RAN's senior people to gain funding and approval for capital investment. It is only by convincing the taxpayer and government that they are indeed getting the best value for money, because what we buy is flexible, that the RAN of 2030 will be relevant and capable.

AWDs and LHDs Are Not the Only Answer (David Murphy)

Since the Young Turks of 1976, we have found ourselves with more of the same: we have decommissioned six *River* class destroyer escorts and commissioned eight *Anzac* class frigates; decommissioned three *Perth* class DDGs and plan to purchase three *Hobart* class air warfare destroyers, decommissioned six *Oberon* class submarines and commissioned six *Collins* class submarines; commissioned two *Leeuwin* class hydrographic ships; and commissioned six *Huon* class coastal minehunters. The balance of our surface combatant force has remained remarkably similar ... minus a carrier ... but will this balance see us from the calm times of the Young Turks of the 1970s and 1980s well into the future?

The current defence planning will buy the RAN some very capable platforms, AWD, upgrades to the *Anzac* frigates and plans for two *Canberra* class amphibious assault ship (LHDs). This force might be the answer for traditional open ocean warfare where we have freedom of manoeuvre, but with the focus of operations in the post-Cold War era moving back to the littoral, will these high-end platforms – with traditional warfighting command, control, sensors and weapons – provide our forces with the correct tools in a more constabulary or asymmetric environment? The Turks of 1976 commented that they saw, “an urgent need to consider a systems analysis of the whole surveillance task to determine the proper place of space, air and seaborne vehicles”,⁴ which is of course an ever-present issue as technology advances, and I have no doubt will feature in the Young Turks presentation at the RAN Sea Power Conference 2030.

If our new AWDs and LHDs are equipped to employ the coming uninhabited technology – probably the next revolution in naval warfare – we will be far better suited to providing a more robust force in all spheres with small, uninhabited and networked nodes. These networks will plug in to an AEGIS combat system, the LHDs and, most importantly, coalition combat system and would be a huge force multiplier to the Maritime Component Commander, either afloat in his LHD or fused and presented to the theatre commander ashore in a joint headquarters via high-speed broadband satellite links.

The littoral is a cluttered, dirty environment ideally suited for asymmetric attacks against our forces. It is an area where no-warning attacks by shoulder-fired weapons from fishing craft and suicidal terrorists piloting small boats packed with homemade explosives can hold our sailors at great risk. More sophisticated enemies will attempt to deny us access with an array of air defences, advanced quiet submarines, anti-ship missiles, modern torpedoes and mobile mines.

There are troubled parts of the world where we may need to operate close-in for long periods that are not quite war and not quite peace.

For all these reasons, the RAN must scrap old Cold War “ring of steel” tactics and move to a more effective posture that will provide a balanced, protective stance in the littoral. How do we adjust to this new age without being held at risk by enemy forces poised to deny us access? One answer is to provide additional nodes for our

surface combatants and the warfare commander, either at the unit level or remote, to complete the picture.

If we could do that we could seed the enemy's littoral with the tools to hold him at risk over large areas without placing our sailors unduly at risk – we could move to a much more offensive posture with much greater freedom of action. What if those sensors were persistent – not for minutes and hours but for days, weeks and months? We could break from a reconnaissance approach to targeting that involves frequent loss and reacquisition of contact to a true surveillance framework – beginning before hostilities and maintained through engagement.

Not only would our speed of action be radically increased but we could begin to employ powerful techniques to determine patterns, and rapidly bring changes in those patterns to the commander's attention. Imagine if we could quickly fuse information from those sensors in a manner that informs the commander's intuition – that allows him to command instead of hashing through too much data looking for meaning. The caveat is, of course, that this is the hard part, and the fog of war I expect will forever remain.

Imagine we do that with a radically reduced numbers of sailors? What if the "control" part of command and control could be done by the system, responding automatically to the commander's decisions?

What if the numbers of those sensors and weapons, and other effectors like decoys and deception devices, were so great and in such proximity to the enemy that they become pervasive – the enemy perceives them as everywhere and his destruction of a few has little or no impact. Developing a distributed network based on these off-board, unmanned nodes will allow us to stay on the offensive.

For example, in anti-submarine warfare (ASW) this means no more submarine versus submarine engagements, no more ship versus submarine engagements. The current model for ASW is based around multiple platforms equipped to detect, classify, localise, and track or prosecute a target. We presently find ourselves struggling to squeeze the last decibel out of the sonar equation using large aperture arrays and complex signal processing techniques, which are becoming increasingly expensive and burdensome to operate. Add to these, the new dangers of working in the shallow littoral.

What if we could seed the littoral with many intelligent agents that can communicate with each other, localise the target, manoeuvre and see the mission through from detection to prosecution? If we can achieve this, either overtly with ships or aircraft such as the Joint Strike Fighter or by stealth with enhanced *Collins* submarines, we could hold the enemy continuously at risk. This would be a far better way of doing business than conventional doctrines, which do not enjoy much success in the littoral environment against modern, quiet, conventional submarines. Remember, too, that submarines of the future will only become more advanced.

Decoys have always been useful in warfare, and Nulka is a very good one, but imagine the effect of not just one decoy, but scores of organic, high-endurance, uninhabited, mobile decoys that replicated ship signatures with great fidelity? What

if we could incorporate them intelligently into the network of sensors and effectors to optimise our probability of rapid engagement?

Mines are a classic problem in littoral warfare, a very cheap weapon holding expensive platforms at risk, and we have focused principally on improving our ability to find them by looking for their shape and working through the problem in linear detect-to-engage fashion: detection, discrimination, classification and identification. The natural evolution has been to develop better sonar, with a revolutionary increase in the resolution to boost the last three steps. Maybe it is asking too much to use the same sensor to discriminate, classify and identify. Perhaps we could exploit some other characteristic to rapidly locate and classify mines at much greater range? With a fleet of mobile uninhabited underwater vehicles (UUV), the functionalities can be optimised separately.

What if we could georegister the mine with a fleet of small UUVs circling the target for a total picture, and then tag or neutralise the mine. Better yet, what if the Mine Warfare Officer could rapidly neutralise mines without having to locate them at all, such as with an area discrete signature weapon to shut them down before even entering the minefield?

In the conflicts of the future, we will want to deploy smaller, cheaper and more expendable assets. Instead of conventional platforms and placing our sailors at risk, we want to dispatch assets that cost only hundreds or even tens of thousands of dollars. This will require sensors that are far more penetrating and versatile than anything we can field at the present. We want these systems to be uninhabited or lightly crewed. And when we do have to send in our people, we will want to do so with impunity.

New networked approaches will have to include independently intelligent and collectively effective mobile agents that can function as a system in a non-hierarchical way. They must have the ability to be self-configuring and adaptive to the changing behaviour of the enemy. This means getting away from the model of funnelling information back to a mothership for interpretation. The node will interpret and the unit commander will take informed action. It means moving toward low-power, enduring, mobile vehicles, as well as low-power, multi-modal sensing and signal processing.

With a more networked, multiple node force, future engagements will enable our AWDs and frigates to be more lightly crewed and coupled with large numbers of smaller, less expensive, uninhabited vehicles. These would have been a great addition to not only our recent military roles in Iraq, but also a handy addition to the litany of constabulary, diplomatic and humanitarian tasks we have recently conducted, often with warships acting independently. If history repeats, they will be the bulk of our tasks for many years to come. Imagine if Maritime Interception Operations could have been further streamlined by the use of persistent uninhabited aerial vehicles (UAVs) to pinpoint targets to board rather than the sometimes inefficient long range rigid hull inflatable boat (RHIB) operations. Or, even better, patrol boat operations in our north enhanced by long range, real-time surveillance, direct to the boat.

The RAN's greatest expense, and most worthwhile asset, is our people. It is also the asset that is probably the most volatile and vulnerable to downsizing or cost cutting. We number 12,500 and it is questionable as to whether this number will actually ever increase; I contend that it probably would not need to, save for a major conflict. Although a common complaint is "we just don't have the people", doing more with less need not be the case. We will need fewer people to crew our ships in the near future, due to more automation and streamlining or outsourcing of tasks. This can only be achieved, without a loss in morale and consequent separation due to extra workload or mundane tasks, if we embrace the coming technology to fill the roles.

Many of these technologies I have outlined are current projects from defence scientists and industries both here and abroad, and many of you may have heard them before. Of course this is an expensive shopping list, and I expect that many defence companies would welcome a large cheque from DMO. But will these nodes that enable us to enhance our abilities in littoral warfighting, as well as the more likely day to day tasks be employed by the RAN by 2030? While the big ticket warfighting platforms with their traditional systems of the future have been catered for, it is the extras that we must not be as pedestrian and piecemeal in procuring and implementing as we have in the past.

A few examples come to mind. The Young Turks of 1976 may have heard of Link 16 as a new Tactical Data Link; it has now been around for decades as the successor to Link 11. We will finally get it with the Wedgetail airborne early warning and control (AEW&C) aircraft and upgraded *Adelaide* class guided missile frigate, soon enough I expect for it to become overtaken by more net-centric Internet protocol-based networks. A key tool in anti-submarine warfare (ASW), the surface ship towed array has been one of the longest running naval projects we have yet to see come to fruition. Our bridge watchkeepers still grapple with the burdensome task of fixing on paper charts as we have yet to fully integrate electronic navigation and mapping systems, and yet my not very tech-savvy father now has one in his car!

One of the key components of the Sea Change program for our seagoing sailors has been for the reduction in harbour manning or duty watches to allow for more respite. Electronic sensors and surveillance systems, which are very cheap and could easily assist, have been around for years, and we have yet to see them integrated, probably at the cost of a few of our finest. They would of course even assist in reducing staff-intensive force protection tasks.

That next Bill Gates we spoke of earlier may just walk out of the RAN, increasingly frustrated with the lack of technological applications that assist in his everyday life at home, which are not available at the sharp end of the RAN.

I hope we will not repeat the "fitted for, but not with" policies of the 1980s, which did, however, provide us with that awesome weapon, the "paper Harpoon", but, much to the chagrin of many of today's leading seamen, not the "paper quartermaster". I hope we will see the Young Turks of 2030 report that they have all the platforms, weapons, vehicles, sensors and decoys they need to respond to any contingency or daily task they find themselves faced with.

Future Strategic Challenges and Responses to 2025

Stephen Gilmore, Trevor Jones, Nigel Perry, Peter Leschen, Nigel Coates

This panel session will address the strategic challenges that the Royal Australian Navy (RAN) faces over the next 20 years and how we might respond to them in an effective and cost efficient manner. We will use the capability lifecycle; from strategic guidance through capability needs, requirements and acquisition to the conduct of operations as a framework for articulating and understanding the challenges that will face us as we chart a course for the future. I will very briefly outlining the RAN's strategic guidance framework and then articulate capability and organisation challenges that have flowed from the consideration and implementation of that framework.

Setting the Scene (Stephen Gilmore)

As Director-General Navy Strategic Policy and Futures it is my job to understand government and joint guidance and the current and future strategic environment. On behalf of the Chief of Navy (CN), I then must broadly weave his intent within that context into the RAN's strategic guidance. The RAN has developed the framework that appears in figure 1 as a means of achieving these goals.

You will note that the *Future Maritime Operating Concept*, or FMOC – a classified, joint document, led by the RAN and endorsed by the Chiefs of Service Committee

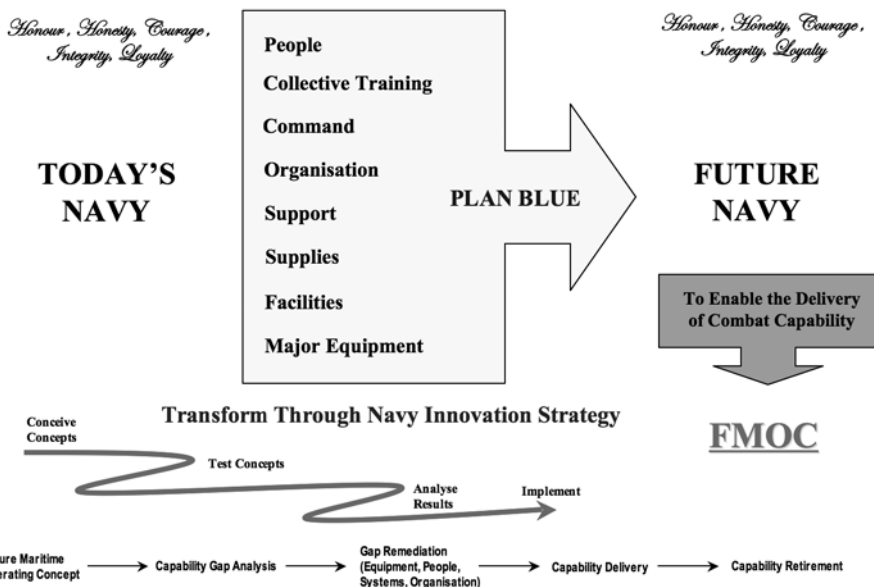


Figure 1: Concept-led Strategic Planning Model

(COSC) in December 2005 – forms the basis of trying to understand the Australian Defence Force’s (ADF) future maritime force combat capability needs. Once we have an idea of what those future needs might be, we can then try to understand what contribution the future navy needs to make. A vision of the qualities the future navy might need and the challenges in achieving that vision can be then described. This is achieved through *Plan Blue – Headmark 2025*. This document is the CN’s strategic guidance for the development of the future navy. *Plan Blue* uses the fundamental inputs to capability as lenses to examine issues in delivering future RAN capability and the CN’s strategic guidance on how we can meet those challenges. You will note that the Navy Innovation Strategy, a concept-led innovation model, is a key methodology for developing our passage plan. The RAN’s strategy and strategic guidance fits within the broader Defence strategic framework as shown in figure 2 – taken from the RAN’s short to medium term strategic plan, *Plan Green* – where the FMO, *Plan Blue* and *Plan Green* fit. You will also note an acronym NFSSG: this is Navy Force Structure Strategic Guidance. The NFSSG attempts to articulate capability gaps and is an input into the Defence Capability Update process.

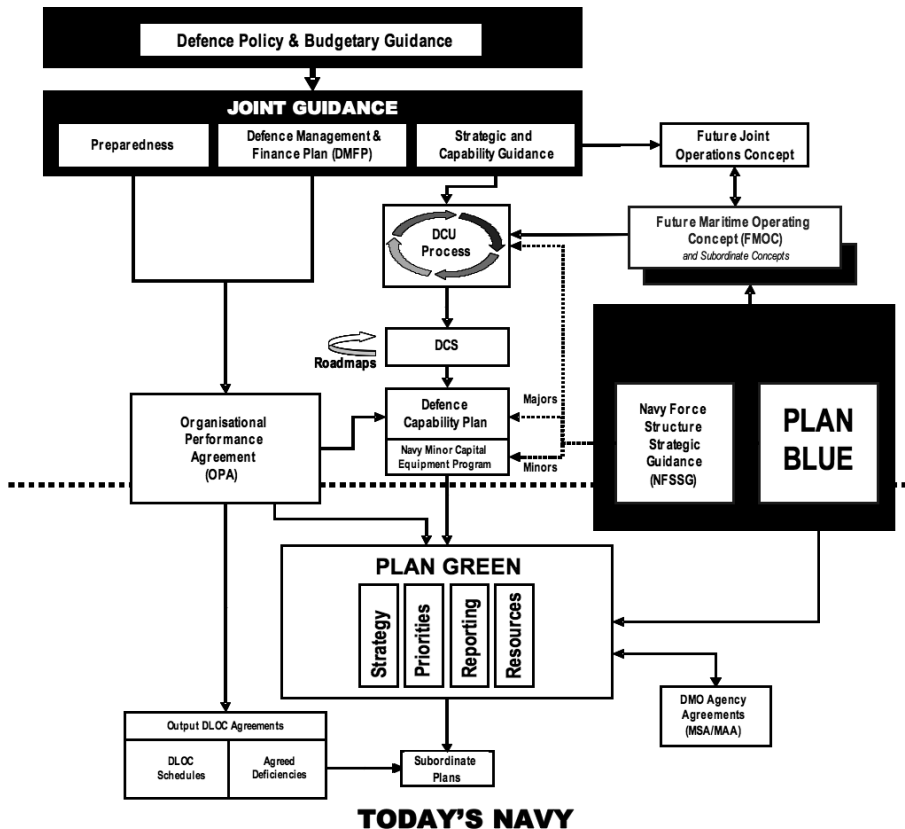


Figure 2: Defence Strategic Policy Framework

Let me now highlight some of the broad warfighting challenges that are envisaged in the FMOC. The RAN's job is to protect the sovereignty of Australia, Australia's interests and Australian citizens. Australia's interests are geographically widespread, our national security strategy is maritime in nature, and our government's approach to global security issues reflects these facts. Therefore, the first enduring challenge is for the RAN to be able to project maritime power at home and offshore, wherever Australia's interests may lie. This trend is accompanied by the requirement to be able to flex our combat capabilities across a range of missions, whether that is in support of coalition combat operations, providing a secure environment in a failed state, keeping our strategic sea lanes open, enforcing Australia's laws in our maritime zones or delivering humanitarian support to regional neighbours.

Another enduring trend is that the military must work with other government and non-governmental agencies to achieve the mission at hand. Further, armed services will conduct combat operations through the application of joint effects. Maritime forces will continue to deliver greater levels of support to the joint force ashore – transporting, projecting, protecting, sustaining and manoeuvring; and providing fire support – the required responsiveness, precision and weight to the joint force ashore.

The future maritime warfighting environment is characterised by lethality. The threat of non-state actors, including elements of transnational crime, enabled by the proliferation of weapon technologies and unrestrained by an obligation to comply with the laws of armed conflict, has diminished the warning time for a potential engagement. The distinction between combatants and non-combatants will further blur. Lethal effects can be delivered by individuals or small groups on an increasingly devastating scale. It is the duration, magnitude and potential warning time of the lethal engagement that will vary, not whether a lethal threat is present or not. Figure 3, taken from FMOC, attempts to illustrate a view of the future mission space and the omnipresence of lethal threats.

As a result of the global trend of urbanisation in coastal regions and the importance of the sea for global trade, I think it is fair to say that the majority of the world's future security issues will have an element either on, or within influence of the sea. Thus we conclude that future maritime force operations will have a littoral emphasis, a complementary deduction to the increasing importance of urban terrain to the land force espoused in future land operating concepts. These are complex operating environments. This is not to say the open ocean will not remain important – it will – but the emphasis we see is shifting further inshore. Another trend from recent conflicts that we see continuing is the problem of access, basing and overflight. Combine this trend with the littoral emphasis of future operations and infrastructure issues and the logical response is to develop the ability to conduct operations from the sea.

On the technology side of warfare, we are seeing the increased use of uninhabited vehicles. Miniaturisation, propulsion technologies, nanotechnology, stealth and material technologies, communications and computing will all play a

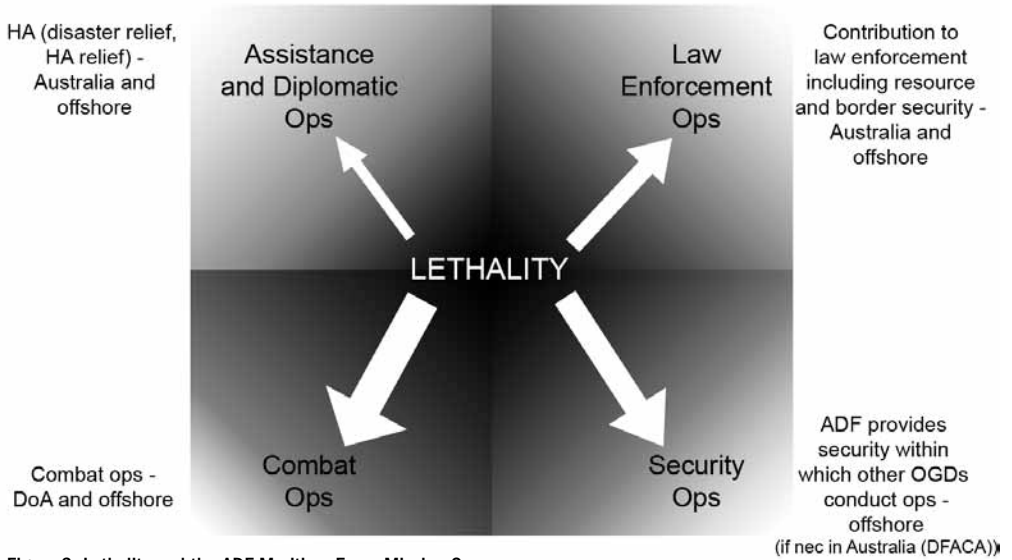


Figure 3: Lethality and the ADF Maritime Force Mission Space

part in increasing the capability of future platform, weapon, sensor and information systems. Missile technologies are proliferating at an increasing rate, sea mines are in the inventories of many maritime nations and it would be reasonable to assert that non-state actors could acquire these technologies. Submarines are entering service with many nations. These issues are particularly applicable in considering littoral operations. Further, the cost of technology is increasing and technology is proliferating at a significant rate. As a result, generating a technological edge will prove to be more and more difficult. Therefore, the skill of our people, superior tactics, techniques and procedures, the smarter application of technology and the delivery of joint effects must drive the future fighting edge.

To top it all off, the future maritime battlespace will be wrapped in a network, linking sensors to shooters and, in theory, facilitating a pervasive situational awareness that will synchronise forces and provide subordinate commanders with the information they need to act independently to implement the senior commander's intent. Decision cycles will be compressed and fires delivered faster to deal with elusive and mobile targets.

Let me move on to organisational challenges. I think it is fair to say that our two largest concerns will be people and finance. Western populations are ageing, yet our economies continue to grow. This places an enormous strain on the RAN's all-volunteer, traditional recruiting base. Competition with industry for the right people will sharpen markedly over the coming decades. Engineering and technical skills will be in particular demand. In our view the RAN, barring strategic discontinuities, may become incrementally smaller with time, yet it must deliver the same, if not a greater, warfighting punch. Careful management and preservation of our most

precious resource, people, will be required to manage workloads, ensure the Service is an attractive career option and, once people are part of our Service, ensure we retain them. As you are all well aware, people are a rare and very expensive asset in which the armed forces make a substantial investment. Regardless of technological prowess, war is a clash of wills, it is a human endeavour and at the end of the day the fighting effectiveness of militaries is all about the quality of their people.

An ageing population, rapidly increasing personnel, health and technology costs and the requirement for infrastructure reinvestment will generate increasing fiscal demand within the budgetary structure of a proportionally decreasing personal tax base. I think the future impact on a medium sized navy is obvious. An expectation of real funding increases in the longer term, while possible, is not likely unless there is a major discontinuity in the world's security situation. So a pretty simple problem to articulate: do our business better with fewer people and fewer resources; yet a tough problem to solve.

These two critical factors, along with the future warfighting trends will generate a range of other issues. I will touch on but a few. Within our ships we will see increasing automation to decrease the requirement for people and help manage the workload of smaller ships' companies. There will be an increasing number of human-machine interfaces and eventually machine-machine interfaces. Decision support systems may be required to implement decisions programmed into them without a human in the loop. Ships will have to stay at sea for longer to maximise greater reliability and availability but somehow we must balance workloads and retain our people. In the future our platforms will continue to have to comply with international treaties to which our governments may be party. Environmental law and occupational health and safety will play an increasing role in ship and submarine design, maintenance and operation. The RAN has recently purchased the double-hulled tanker MV *Delos*, soon to be commissioned as HMAS *Sirius*, so that we comply with the International Maritime Organization MARPOL (*International Convention for the Prevention of Pollution from Ships 1973*) requirements for the transportation of fuels at sea, just as an example.

The eternal drive for fiscal efficiency will see the greater use of contracted support on and off our ships. Contractors will have to be integrated into the way we do our business rather than being seen as simply delivering services. We may find that the armed forces and defence industry effectively share people as the workforce skill base decreases in proportion to demand.

There are numerous other issues, such as the competition for maritime practice areas, with commercial interests and environmental concerns; the issue of whales and sonar has recently been a bone of contention. Increasing merchant traffic and assuring access to commercial ports with a profit focus both at home and overseas will become an issue. Our future leaders will have to be even more skilled corporate managers to meet demanding compliance and fiscal environments. Further integration of the Services and the way we fight will no doubt drive further

structural and command and control changes. There are more, but I think those I have described represent the key issues.

The RAN from Future Maritime Operating Concept to Tactical Development (Trevor Jones)

I will outline one of the principal mechanisms under development by which the RAN seeks to confront the vexing issue of transforming strategic direction into tangible guidance that will appropriately inform capability developers of the optimum force design and construct that will meet our future warfighting vision.

The Chief of Navy, as the Navy Capability Manager, is responsible to the Chief of Defence Force (CDF), the Secretary of Defence and ultimately the government for delivering Defence Output 2 “Navy Capability for the Defence of Australia and its Interests”. This is commonly referred as the “raise, train and sustain” element of capability management and consumes the majority of RAN resources. It is not, however, the limit of the RAN’s involvement in the overall capability management matrix. While the RAN may have no direct responsibility for force development and major equipment acquisition, it nonetheless has an obligation to provide effective defence for tomorrow as validated by the CN’s Charter, which requires him, amongst other responsibilities, to provide to the CDF and the Secretary “timely, accurate and considered advice, in particular on Navy and military capabilities for the force in being and the future”. As the Director-General Navy Capability Preparedness and Plans one of my responsibilities is to support the CN in this process of influencing future maritime capability.

Figure 4 shows the current Capability Systems Lifecycle model, where specific capability development transitions in phases through a number of groups from Deputy Secretary Strategy to Chief of Capability Development Group (CCDG) to the Chief Executive Officer of the Defence Materiel Organisation (DMO).

Under this transitional development model it is conceivable that the arguments and justification underpinning the RAN’s future force structure requirements may

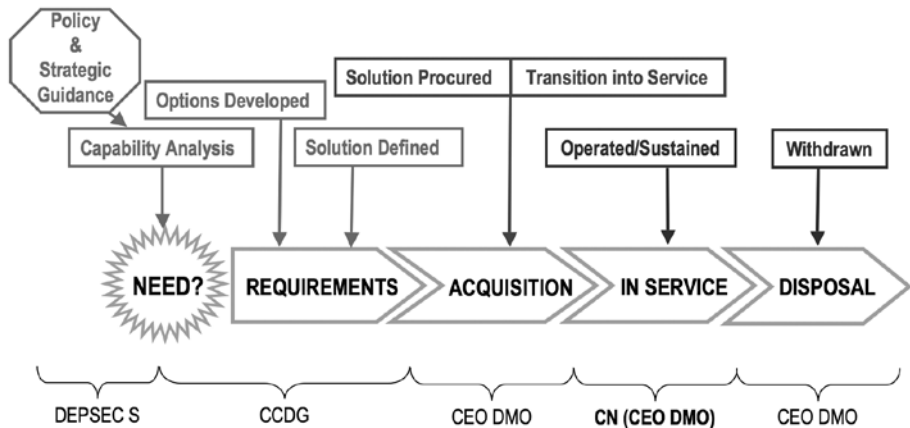


Figure 4: Capability Systems Lifecycle

be misinterpreted or not receive the appropriate level of priority when considering all force options. From an RAN perspective it is essential that recommendations and supporting arguments on future maritime force requirements be clearly articulated, accessible, current and supported by robust experimentation of future concepts. This will ensure that appropriate debate can proceed on force development options resulting in the RAN constructive influence over the shaping of important defence processes. These may include the annual Defence Capability Update and associated outputs, such as the Defence Capability Strategy and Defence Capability Plan (DCP). The RAN's ability to positively influence and inform the capability development process is particularly relevant in the Australian context noting the longevity of major naval platforms. For naval platforms, the period from conceptual design, build, and transition into service can be a lengthy proposition, historically in the order of up to 10 years. This is due to several factors including industrial capacity and the capability planning, development and acquisition approval processes. Due to their complexity, major surface combatants and large support ships represent a long-term capital investment of typically 20-30 years for the ADF. Therefore, the lifetime of a class of naval platform from embryonic concept until disposal may be in the order of 40-50 years. Prediction of future missions, roles and likely operating environments over such a lifespan is problematic.

To ensure that the RAN force structure development is balanced, with whole of force implications being fully accounted for, the CN must be able to inform and influence capability planning, force development and capital equipment acquisition processes, including Capability Road Maps or other Capability Development Group development initiatives. The Navy's Force Structure Strategic Guidance (NFSSG), previously known as the Force Structure Master Plan, is one initiative intended to become the principal vehicle by which the RAN will inform and influence capability development.

Figure 5 provides a graphic representation of where the NFSSG is planned to reside within the RAN's overall capability development model.

The RAN's materiel force structure is realised principally through the DCP for major capital equipment, and to a lesser extent through the Navy Minor Capital Equipment Program. Science and technology, research and development, concept technology demonstration, rapid prototype development and evaluation programs, and emergent essential coalition equipment commonality requirements provide other force development avenues. Capability needs are analysed, developed and refined. They achieve entry into the DCP via a Two Pass process to gain government approval for acquisition.

Government policy and military strategy, as well as driving preparedness requirements, are coalesced annually to produce the Defence Capability Strategy, which provides a strategic framework for capability transformation and annual review of the DCP. RAN strategic doctrine provides an understanding of the RAN's enduring contribution to Australia's national security and lays out the ways and potential means by which the RAN operates jointly in an integrated ADF.

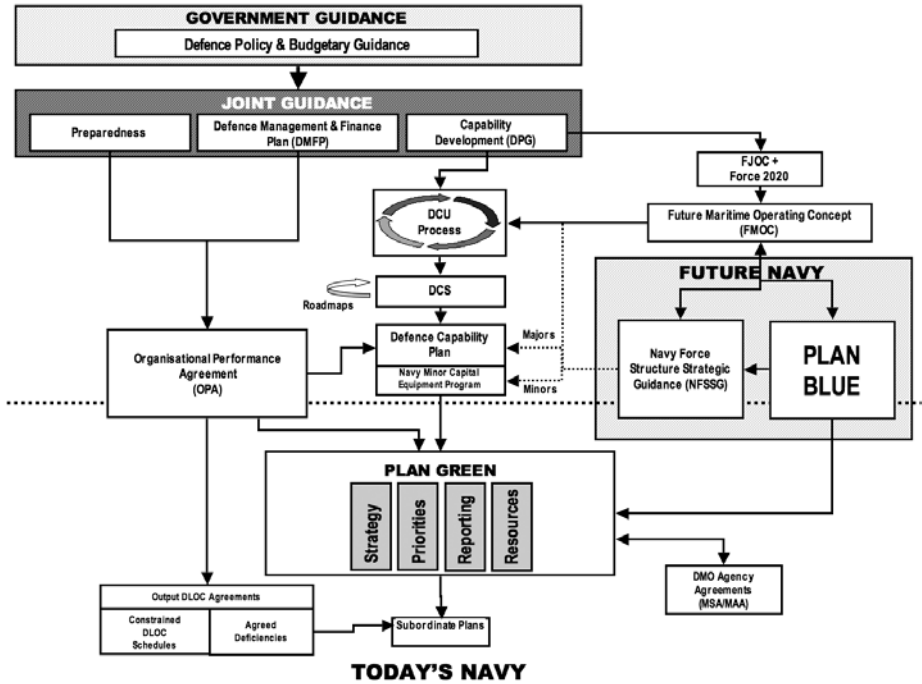


Figure 5: Defence Strategic Policy Framework

Plan Blue – Headmark 2025 is the CN’s strategic guidance for the evolution of the future navy. The RAN’s view of the future maritime operating environment and its challenges supports RAN-led joint experimentation and the development and ongoing refinement of the FMOC. The FMOC asserts how future maritime forces will have to operate and the broad capability sets that future maritime forces should possess. This provides a baseline for RAN capability analysis that subsequently informs the Needs, Requirements, and Acquisitions phases of the Capability Systems Lifecycle. The challenge is converting this broad conceptual direction into tangible guidance.

The aim of the NFSSG is to provide the CN’s strategic guidance for capital equipment needs derived from the concept-led functional analysis, in order to more effectively inform and influence the capability planning, force development and capital equipment acquisition processes. To that end, it will link government policy and military strategy to defined maritime forces roles and capability requirements via joint operating concepts (particularly FMOC). It will not conflict with higher direction but rather provide holistic advice on how the RAN understands the problem. It has also been developed within the context of the CN’s strategic intent articulated in *Plan Blue*. It is intended the NFSSG will collate, within the one document, the fundamental underpinning arguments required to justify the RAN’s force structure requirements. Capability priorities are developed by use of a qualitative analytical

process, cross-checked by professional judgment, to provide a clear understanding of the priorities required to manage identified gaps or deficiencies in the RAN's force structure. The analysis is conducted by considering current force elements and approved capital equipment projects (major and minor) against a concept-derived and effects-based functional requirements set. The resultant functional deficiencies of the entire force provide the requirements to be addressed by unapproved projects before the Second Pass. This should identify unaddressed systems deficiencies within various functional capability areas, such as air warfare and anti-submarine warfare. The latter readily enables input into the increasing suite of Capability Roadmaps being developed by CCDG.

The principal focus for the NFSSG will be the Needs phase of the Capability Systems Lifecycle. Service headquarters and other Defence groups provide input for the development and articulation of strategic guidance, concept development and experimentation, and capability analysis during this phase. Navy Headquarters (NHQ) would coordinate Navy group stakeholder input and collaborate with the Director-General Maritime Development to define the scope of proposed Navy major capital equipment acquisitions for Capability Development Group's consideration for Defence Capability Plan entry ("Zero Pass") and programming.

The NFSSG is intended to be a living document, allowing proposed amendments to be captured via the Maritime Domain of the Defence Deficiency Database. It also allows them to be considered along with results of navy experimentation, FMOC revision, operational lessons learnt, higher strategic guidance and higher committee decisions during formal biannual review and updates.

The challenge that faces the RAN now and into the foreseeable future is striking a manageable balance between needs and resources. The DCP is fully subscribed. Future funding pressures on the DCP may arise given the comparative scope of large programmed projects, such as AIR 6000 (Joint Strike Fighter), SEA 4000 (Air Warfare Destroyer), JP 2048 (Amphibious Ships) as well as the identified needs of other Services to address major force structure gaps or deficiencies. Cost versus capability trade-offs within major projects remains a very real possibility, requiring a more flexible and coordinated use of other capability procurement options, such as the Navy Minor Equipment Program, where practicable.

A continuous improvement strategy - whereby sufficient adaptable platforms are available to undertake "high end" contingencies, which can be modified or upgraded incrementally as threats and technologies evolve - represents a lower strategic risk than maintenance of a less capable or reduced sized force. Hull, superstructure, propulsion systems and survivability attributes are long-term legacies in ships, whereas combat, sensor, communications and weapons systems can be shorter to medium term prospects. Experience has shown that the strongest exponents of maritime power projection have been the most adaptable to changing strategic circumstances and least susceptible to mission obsolescence. Open architecture platforms that enable alternative mixes of aircraft and weapon payloads are central to future mission flexibility.

In conclusion, it is intended that the NFSSG, in conjunction with other documents such as the Navy Workforce Plan, form the basis by which the CN will inform and influence the maritime capability development within the ADF. It will provide timely, accurate and considered advice on RAN and military capabilities for the future force to the group executives responsible for capability planning, force development and capital equipment acquisition.

Future Capability Development and Acquisition Challenges (Nigel Perry)

Let me open by saying that, in the main, Australia's maritime capital equipment future is in pretty good shape. The Air Warfare Destroyer (AWD) and amphibious ships (LHDs) – provided they achieve Second Pass Approval through government – upgrades to the *Anzac* class frigates and the *Collins* class submarines, airborne early warning and control (AEW&C) aircraft, and the replacements for the P-3C Orion maritime patrol aircraft and helicopters, all provide a sound foundation for the future maritime force.

However, the greatest challenge we face from a capability perspective is an old but an enduring one, and is highlighted in *Defence Update 2005*. This is to provide for both the needs of today and the possibilities of the future, while simultaneously juggling the 30-year life span of major platforms with increasingly rapid technology refresh cycles.

The future strategic environment will be challenging and complex and, while it is not possible to predict exactly how it will look, it is possible to identify some of the trends that will shape the future. The growth of regional economies allows for greater spending on defence; globalisation facilitates the rapid transfer of ideas and technology; and we are engaged in a broader range of whole-of-government tasks further afield. The increasing complexity we face is created by adversaries operating concurrently in multiple domains while the expansion of the information domain enriches the development of interrelationships between domains.

While much effort has been placed in the development of the physical domain – because we are used to it and it is tangible – we are coming to grips with the requirements of the information domain, as we recognise it is not just about networks but also the networker. The cognitive domain is relatively untouched. To achieve a balance in our capability planning, and position ourselves to exploit emerging opportunities, we must improve our awareness of all domains and their interrelationships.

Getting the balance right, to maintain the capability edge against what is good enough to do the job, is a significant challenge.

MEETING THE CHALLENGE – A TOP DOWN APPROACH

The fundamentals of the Capability Lifecycle of the Needs, Requirements, Acquisition, In-Service and Disposal phases have not changed. They have, however, become more challenging with technological advancement occurring in a greater

frequency and with cost escalating at a greater rate than the non-farm deflator allows. Value for money within a finite budget will be increasingly challenging if we do not understand our cost drivers.

We now have a top-down approach to force structure planning. The Defence Planning Guidance will frame strategic assessment for both the near and longer terms. Future Operating Concepts help us understand future needs and issues. The Defence Capability Strategy will provide the capability guidance and priorities to the Capability Development Group.

The release of *Defence Update 2005* builds upon successive reviews of global and regional security. This review continues the theme that Defence capability is a valuable instrument of national power in support of the nation's security interests. To meet this need, the ADF must be a networked joint force that is able to operate in complex and ambiguous environments, increasingly with other government agencies, and against adversaries with increasingly lethal and non-traditional capabilities.

The challenge is to have a defence force that maintains the capability edge against credible adversaries, a force that can be applied across a range of contingencies derived from the government's strategic direction. To achieve this vision the strategy must insure against strategic uncertainty rather than optimise capabilities for a single predicted future. This means military capability is not developed to meet a specific adversary or threat, but aims to provide a versatile range of capabilities for a range of contingencies. Underpinning the capability strategy are five key capability drivers: versatility, networking, integrated capability, interoperability and industry capability. These drivers further shape our thinking about needs and provide discriminators when assessing the value of capability decisions.

The Kinnaird Review has had a host of positive outcomes. Formation of the Capability Development Group (CDG) has allowed a 3-star officer to be dedicated to capability development, relieving the Vice Chief of the Defence Force of that burden. The refocusing and professionalisation of DMO is already paying dividends.

The Two Pass process provides a sound structure for Defence decision-makers and ultimately government, but it has shortcomings. Some of our processes are too complex and, arguably, the amount of detail required at First and Second Pass is too great. Conversely the more rigorous commercial and financial examination now being conducted will pay dividends in the long term. It will avoid many of the difficulties that projects have encountered in the past: too much detail required at First Pass; thirst for finite costings, which stifles innovative solutions; and the danger of being risk-averse in areas where we may need to be at the leading edge. The challenge again will be getting the balance and processes right.

Embedding DMO staff in CDG from the outset, in a similar way that capability staff have been provided to the AWD and amphibious ship projects, will help ensure the requirement rigour and minimise the prospects of DMO inheriting our dead cats.

However, despite substantial progress in the capability development process, there are still significant challenges.

GETTING WHAT GOES INTO THE DEFENCE CAPABILITY PLAN RIGHT

The difficulty when considering the capability program is adjusting our expectations to the budget. Australia is arguably undergoing one of the most substantial military reforms in its history. Not only is this a period of significant renewal, but we are venturing into areas that we have never been in before. They include uninhabited aerial vehicles, dedicated air-to-air refuelling aircraft, AEW&C, purpose built amphibious ships, etc. Not only is there the direct cost of procuring these technologies but there are additional costs, such as increased satellite support needs and different thinking in how to employ them. To be able to exploit them a different workforce structure is required, and new training and maintenance philosophies need to be changed or developed. The technical sophistication of these projects also invariably means greater support costs, typically in maintaining the software.

Defence financial management will remain under close scrutiny and, if we are to meet our obligations to government, we must pay more heed to through-life costs. We must understand our net personnel and operating costs upfront and consider all the fundamental inputs to capability when developing project proposals and costings. Any shortfalls cannot be absorbed by the Service Chiefs or Sustainment Offices as they may have been in the past, and government will rightly be unforgiving when we get this equation wrong.

Another challenge is the conflict between forecasting project costs 10 years in advance for Defence Capability Plan entry against rapidly changing technology and capability solutions. Once a figure is attached to a capability in the DCP, it is difficult to change.

I mentioned at the beginning that Australia's maritime defence future was on a firm foundation. The major pieces are in place and gaps are, to some extent, in the margins. The new amphibious ships will represent an enormous investment in financial and human capital when deployed. This brings new challenges to ensure they can be deployed safely. The RAN's mine warfare capability centres on coastal minehunters that are slow to deploy. Our ability to understand and exploit the environment is limited and major fleet units lack force protection systems to counter the asymmetric threat. The undersea domain has been neglected for far too long.

MAINTAINING AND PAYING FOR THE TECHNOLOGICAL EDGE

Commercial-off-the-shelf (COTS) technology and open systems architecture go hand in hand, and the benefits are obvious. Dedicated military specific equipment does not need to be developed, so the initial investment is less. The technology improvements in the commercial market cannot be met in terms of investment by defence industry alone; leveraging off the civilian technologies and their application in the defence sector reduces technical risk and cost.

However, unless we recognise and cater for some of the through-life costs of COTS, we will get caught out. COTS technology will require refreshing on a regular basis, but it will not be at a consistent rate as different components will go out of

production out of synch with others. Not only is a consistent level of investment required but it also needs constant monitoring to ensure we are not left with obsolete and unsupportable components. On the plus side, large long-term inventories are not required.

Opening up systems architecture allows more defence manufacturers into the game, rather than keeping us hostage to a limited number of proprietary companies and high systems integration costs. This is crucial to remaining at the leading edge through regular technology refreshes.

Under a spiral development banner we have taken this approach with the *Collins* Replacement Combat System and Heavyweight Torpedo under Armaments Cooperation Programs, where we pay our contribution to ongoing system development and receive the benefit of regular upgrades. Unfortunately we have not taken a whole-of-life view in funding this approach in our capability development and acquisition. The initial periods are funded but the ongoing ones are not. Our capability development proposals must make provision for this ongoing level of investment if COTS solutions and spiral development strategies are to succeed. This must be reflected in the initial DCP bid.

Another challenge is to understand, upfront, the implications of introducing commercial-style platforms. The rapid building schedule and introduction into service of the *Armidale* class patrol boat, while very successful, has highlighted a number of regulatory issues. We are now better informed in how to approach *Sirius* and the LHDs downstream and CDG is working on getting a common acceptance regime in place.

A PLATFORM VIEW

The repair and maintenance cycle for each of our platform types considers how we can keep these platforms operating through their planned life-of-type. In the past we have not taken a life-of-type approach to maintaining capability. Typically we bought a platform and midway through its life it underwent a major upgrade. This was fine when technology turnover was relatively long and stable, and the systems were provided by one source, such as the US Navy. Meeting changing strategic challenges and unique system mixes requires a different approach.

Life-of-type plans are required for all major systems. To provide acquisition agility we must break the high cost of integrating proprietary systems. On the software side, COTS will drive us some way down this path anyhow, but we must match it with similar hardware strategies. The *Collins* Continuous Improvement Program is a plan along this path, but such projects do not sit well with the post-Kinnaird approvals process, and we need to look at how we can streamline approvals, while still delivering rigorously evaluated project plans, and appropriate government oversight.

A CROSS-PLATFORM VIEW

Maritime projects have typically been managed on a platform basis and, on their own, have generally met the operational requirement sought at the time. However, rarely do individual platform types operate in isolation and a cross-platform system view needs to be developed to ensure that each of the warfighting capabilities remains current. The NFSSG seeks to look not only at the platforms but also the systems, and the capability roadmaps being developed for network centric warfare; intelligence, surveillance and reconnaissance; and airlift and anti-submarine warfare that will provide coherency across these capabilities.

Operational and Capability Challenges for the Fleet (Peter Leschen)

Thomas Edison said, “Genius is one per cent inspiration and 99 per cent perspiration”. I will leave the question of genius hanging but, for the RAN in 2006, there is inspiration to be had in new AWDs and amphibious ships, as well as a range of other new and upgraded capabilities. There has also been plenty of perspiration to get to this point, and much more to come in the management of their introduction.

I will begin by looking at issues that Maritime Command’s Force Element Groups will have to deal with in introducing these capabilities, such as logistics support and maintenance, manning concepts, and operational test and evaluation.

I will then offer some thoughts on the operational employment of these new capabilities. Simply employing them in the same way as our current ships and aircraft will not realise their potential as part of a network enabled defence force. We must be innovative and, for this reason, an underlying theme throughout this presentation is the importance of operational analysis and tactical development. I note that this was an issue for the Young Turks in 1976, and was expounded by Lieutenant Sam Fairall-Lee this morning, so there is continuity in the theme of dealing with strategic and technological change.

I am not going to go into current fleet operations, except to say we are still operating at a significant tempo. We have major fleet units in the Northern Arabian Gulf and doing border protection tasks. We have a steadily increasing fisheries protection task, and new augmented security patrols of our northern offshore oil and gas infrastructure. The Commonwealth Games take place in March 2006 and we have a busy regional engagement and exercise program.

This is business as usual, and we are continuing to perform all these tasks well. At the same time, however, we must dedicate the time, thought and effort necessary to arrange for the optimal introduction of new and upgraded capabilities over the coming decades.

INTRODUCTION OF NEW CAPABILITIES TO THE FLEET

As we have already heard, over the next decade a major enhancement of fleet capabilities will occur. The *Armidale* class patrol boats are already with us, but we will also get upgraded Seahawk and new Super Seasprite helicopters, upgraded

frigates and submarines, the new tanker HMAS *Sirius* and, of course, the AWDs and LHDs.

Introducing all these capabilities into operational service is going to be a major challenge for Maritime Command, particularly the Force Element Groups. Logistic support, maintenance, training and crewing philosophies will all be affected.

Armidale Class Patrol Boats

With its increased size and range, ability to operate up to sea state five, improved command, control and communications suite and weapons system, and greatly enhanced boat capability, the *Armidale* will provide a substantial increase in capability and flexibility over the *Fremantle* class patrol boats they replace. Moreover, a fully contracted in-service support program, combined with multi-crewing, will require significant cultural change to accept and then maximise the benefits of the new support arrangements. The new boats will continue to join the fleet through 2006 and into 2007.

Latest Upgrades

There are also a number of significant upgrades to combat, communications and weapons systems currently underway, including the frigate and submarine forces and Seahawk helicopters.

These upgrades bring some key challenges. First, while significant numbers of ships and aircraft are undergoing concurrent upgrades, they are unavailable at a time of high operational tempo. This represents a substantial programming challenge over the next few years. Second, the upgrades provide an operational test and evaluation and tactical development challenge as we come to terms with the new capabilities, such as Link 16, torpedo detection and defence, and the Standard Missile 2 (SM2)/Evolved Sea Sparrow Missile (ESSM) combination.

I should also mention the changes to the management of our people through the Sea Change program, aimed at improving conditions of service. We are conducting a flexible crewing trial in HMA Ships *Arunta* and *Warramunga*. This trial must address the development of a crewing philosophy that will apply across the frigate and destroyer force, including the new AWDs, and which will continue to work throughout a ship's operational cycle. For example, when a ship proceeds on operations, particularly where there is a real threat, it may seem desirable to "freeze" a worked-up ship's company for the duration of the operation, but this may not be consistent with the regular change out of personnel envisaged in flexi-crewing. We must ensure we structure for war and adapt for peace, and not the other way around.

Air Warfare Destroyers

Moving now to the AWD, the introduction of these ships is going to be as significant as the introduction of the *Perth* class guided missile destroyer (DDGs) some 40 years ago. They will have systems we have never used before, such as the SPY-1 phased

array radar, AEGIS and the SM2 missile in particular, and we will need to make sure that our people are trained to be able to use these systems safely and effectively. The AWDs will also come with a significant logistics support bill throughout their life, and pose significant logistic support, maintenance and personnel challenges.

Amphibious Ships

The new amphibious ships will bring with them a different but equally sophisticated set of challenges. Managing the introduction into service of a truly joint capability of this scale is a significant test for the ADF and the RAN. Our ability to realise the new amphibious capability expeditiously rests with a number of important decisions that are currently under consideration across the ADF. These include determining what mix of equipment will be regularly or permanently embarked in the ship, what changes to single Service training regimes need to occur to develop a coherent joint training cycle, and a number of workforce implications. The amphibious exercises we conduct today are of central importance to this effort.

SUMMARY

These new and upgraded capabilities, therefore, represent a significant logistic, technical, engineering, workforce and capability management challenge. This is a challenge for the ADF, the RAN and Maritime Command. Moving on, however, the operational and strategic challenges are at least as significant.

STRATEGIC AND OPERATIONAL ISSUES

Constabulary Operations

Constabulary operations have been around for a long time but, it is true to say I think, the scale of the fisheries and border protection tasks around Australia has increased markedly over the last decade or so. We have also been regularly involved in maritime security and maritime interception operations as well as supporting peacekeeping operations. These tasks must be performed in the more complex environment resulting from the threat of terrorism, which has added another dimension to the force protection of our ships at sea and in harbour, and to the protection of our offshore infrastructure. The protection of Iraq's oil terminals in the Northern Arabian Gulf has become the focus of our frigate deployments to that region. In fact all our current maritime operations are constabulary in nature.

It seems inevitable that the increased capabilities of the *Armidale* will be fully utilised in meeting this expanding tasking. Moreover, as their capability matures in service, I expect we will look at broadening their employment beyond our immediate region. To use a current example, and notwithstanding that it is a long way for any patrol boat to go, it is quite conceivable that the *Armidale* could be used effectively for the sort of infrastructure protection, maritime security and interception operations being undertaken in the Gulf.

Concepts for TG/TF Operations

I would now like to move on and look at some of the challenges presented by the higher level capabilities we are acquiring: specifically the AWD, with its force protection capability, and the LHD amphibious capability. To focus on these two platforms, however, would be to miss the point. The *Defence Update 2005* talks about robustness, jointness and integration, and developing the ADF as a network enabled force. The major ships that will be the centrepieces of tomorrow's RAN do not mean nearly as much alone as they do when considered in conjunction with other RAN capabilities, and with battalions, tanks and Tiger and MRH 90 helicopters, and with Joint Strike Fighters, AEW&C aircraft, air-to-air refuelling, and maritime patrol and surveillance capabilities. Taken together, these capabilities will "extend the assured reach of the ADF and allow for the deployment of larger and heavier forces, as well as providing an additional capability for humanitarian assistance".¹ The challenge for the RAN is to develop concepts of operations for maritime task groups centred on the AWD and LHD, but supported by or operating in support of the army and air force capabilities I have mentioned. The amphibious transport (LPAs) have taken us in this direction, and the presence of USS *Boxer* in Exercise TALISMAN SABRE 2005 gave us a better understanding of the capability represented by an LHD. The ADF has operated jointly for many years, but the new capabilities taken together will enable us to operate as an independent joint force in a way that we have not experienced to date.

Our current development of an Amphibious Concept of Operations and our program to develop an Amphibious Ready Group are central to realising this capability. Exercises TALISMAN SABRE and SEA EAGLE indicate we are making steady progress.

Advance Force and Direct Support Operations

Another key issue is the development of concepts and tactics for advance force operations and for forces operating in support of a task group. Over the last two years, including TALISMAN SABRE 2005, significant efforts have been put into developing and trialling Advance Force Operations tactics by mine countermeasures, hydrographic and Special Forces, and into considering how these forces can be protected while they perform their essential tasks. Additionally, the use of our submarines in direct support operations is going to be greatly enhanced by improved communications systems over the next few years – although the *Collins* submarines will never be able to remain in transit with a task group in the way a nuclear submarine can. A lot has been achieved but more needs to be done, especially with respect to AEW&C, the joint strike fighter and other new capabilities across the ADF.

Command and Control

Achieving these objectives will be heavily dependent on the command, control and communications capabilities central to a network enabled force. My focus today is at the tactical level, rather than on strategic and operational level command and

control arrangements here, although they are obviously crucial. At the tactical level, the AWD and LHD will both bring major command and control capability improvements, with the AWD focused on the war at sea, and the LHD focused on amphibious operations. Of the two, the LHD perhaps represents the greater challenge, as it is a capability that we have only begun to come to terms with in the LPA. It provides the potential to command forces ashore from the sea, at least in the early stages of an operation, thus reducing the initial footprint required ashore. This is technically demanding in terms of the systems required to support it, but it also requires cultural change across the ADF. We will have to develop and accept new ways of exercising command and control of forces at sea, in the air and on the land.

All the challenges I have mentioned require continual emphasis on both operational analysis and tactical development, and we have made big strides in both areas in the past few years.

CONCLUSION

I hope I have painted a convincing picture for the future of a fully integrated joint force, operating independently or in coalition in a very wide range of operations, from humanitarian assistance through peacekeeping and enforcement to combat operations at sea and over the shore: a balanced, flexible force as mentioned by Admiral Barrie in his keynote address. We have to introduce and integrate these new capabilities while sustaining current operations. This will require much intellectual and physical perspiration, but the end result has the potential to be inspirational for the ADF, for our people serving today and those who will join in the future.

The RAN as an Employer in Modern Society (Nigel Coates)

We have heard from several speakers that people are a fundamental input to maritime combat capability. We have also heard of the plans to improve force structure to equip the Royal Australian Navy with platforms and equipment for delivery of maritime capability across a wide spectrum of operational contingencies. This is most welcome, but as VADM Shalders recently observed:

All of those good things that are coming down the pike towards us will mean absolutely nothing if we don't have the required officers and sailors, in sufficient numbers, with the right training, and in the right places around the country, when we need them. People are critical to what we do and they are my highest priority.

We acknowledge that we are facing, and will continue to face, major challenges to remain a competitive employer in modern Australian society. These challenges confront the whole of the ADF, not just the RAN, leading to the CDF's recent

statement that recruiting and retention are the Department of Defence's largest strategic priority for the next decade.

So, what are the drivers of the major workforce challenges we anticipate?

FUTURE CHALLENGES

Emerging Technologies

We had some very interesting sessions on networked operation and on the AWD, and the application of emerging technologies such as these will cause a reorganisation of many components of naval work, with changes to individual jobs and responsibilities and some reorganisation of workforce design. We will need to recruit individuals with different skill sets and capacities. The content of our training, and how and where it is delivered, will need to evolve to match.

National Skills Shortages

The pressure of national skills shortages and the global competition for talent was well canvassed by Admiral Barrie in his keynote address. Our competitiveness to recruit, develop and retain the talent we need is likely to be tested severely over the coming years and decades.

The Ageing Australian Population

The ageing of the Australian population, combined with a recent trend for early retirement, is adversely impacting the size and balance of the workforce. Additionally, fewer, inexperienced workers will not completely replace the skills lost with the mass departure of older workers, further exacerbating the national skills shortage. This will demand increased human relations productivity and evolutionary human relations reform across all industries, including Defence.

The Aspirations of Emergent Generations

The employees of tomorrow will demand flexibility in their workplaces and careers. They will expect choice and the freedom to exercise it. They will aspire to a work-life balance that is acceptable within their terms.

Their aspirations and expectations will challenge some aspects of the RAN's traditions, culture and ways of doing business. Since Generation X entered the workforce in the 1990s and saw the RAN as a stepping stone to other opportunities, we have struggled and continue to struggle with retention. Indications are that Generation Y is even more independent and autonomous. They are entering the workforce at a time of high labour demand. They know their scarcity and value in the job market and are afraid neither of demanding what they want nor of swapping jobs to maximise personal returns. They are more likely to be loyal to their lifestyle than to their job.

ADDRESSING THE CHALLENGES NOW AND INTO THE FUTURE

Before I go any further, it is important to emphasise that this is not necessarily a bad news story. Members of Generation Y value training highly and enjoy belonging to teams. They want to work with other people, to be engaged and to be appreciated. They crave opportunity, responsibility and the potential for promotion. They like challenging and meaningful work, and are able to network and multi-task to an extent not seen before in the Australian workforce. These attributes match well with what the RAN has to offer.

What are we doing about these issues today and for the future? The RAN's current focus in the personnel area is concentrated on the Sea Change program, a complex and wide-ranging set of over 240 initiatives that address concerns expressed by RAN personnel. It focuses on improving individual choice and better leadership and management of our people and their careers to provide increased stability, certainty and satisfaction.

However, large and ambitious as the Sea Change program is, it is not a universal panacea for all our workforce challenges. One reason for this is that addressing current issues does not itself include all of the changes we need for the personnel environment of the future navy.

Key to future success in recruiting and retention will be meeting the workforce satisfaction priorities of emergent generations. Recruiting and retention are two sides to the same coin. As important as recruiting is, this battle for people will be won in the retention arena. For every person we keep, that is two or three we do not have to recruit. Having highlighted some of the future challenges, what are we doing about them? Already, we are planning for research and development of concepts beyond the scope and time horizon of Sea Change to address the key issues that I have mentioned and I will talk about these now. The first is work-life balance.

Work-Life Balance (Flexibility)

Skill shortages and limited workforce supply mean that embracing flexible work-life balance practices will be imperative in attracting and retaining talent.

The RAN has made some inroads with flexible working arrangements and alternative crewing practices. Today, we are running a multi-crew regime in hydrographic ships, establishing a similar program for operating the new *Armidale* class patrol boats and trialling flexi-crewing for the junior sailors in the *Anzac* class frigates. The intent is to improve certainty for our personnel in the planning and management of their work, training and respite. Will these initiatives be successful? Early evaluation shows positive trends but it is too early to draw firm conclusions. What we do know is that we need to continue to find ways to improve stability, certainty and satisfaction for our workforce. To that end we will continue to expand flexible conditions of employment where the nature of naval work allows.

Workplace Culture (Community)

The second key workplace attractor is the culture of the workplace. Belonging to a community is important for younger generations. The RAN is already a distinct community, but we will have to continue to exhibit values that accord with those of the wider community for future generations to want to belong. An example of the types of policy changes required to keep in step with societal attitudes is the recent improved recognition of the same-sex relationships of ADF members, thereby providing greater access to partner entitlements. Meanwhile, recent initiatives to reinvigorate the divisional personnel “ship” and management system are aimed at improving our internal community.

Leadership Style (Accessibility)

Younger generations show a preference for leadership styles that allow consultation and access. They will expect coaching, guiding and nurturing. Sea Change has initiated mentoring programs, broad-based focus groups, “fire-side chats” and electronic feedback pathways aimed at improving two-way consultation. Means for ongoing two-way vertical dialogue will need to continue beyond the Sea Change horizon. However, we need to be aware that striking a balance between hierarchical military structures, inclusive leadership styles and the maintenance of discipline will not be easy. This issue may crystallise around enhanced network centric operations where it is expected that information sharing will become increasingly horizontal and decision-making may need to be devolved.

Job Content (Variety)

With respect to job content, younger members of the workforce will want challenging, meaningful and varied employment. No great change there. The RAN already offers interesting and unusual jobs, and we will continue to ensure that all members are employed in meaningful work. Initiatives under Sea Change are refining the content of jobs and improving work practices. These initiatives are likely to be only the start of a rapid evolution of many aspects of workforce design and work distribution; an evolution accelerated by the emerging technologies mentioned earlier.

Training (Employability)

Younger generations are attracted to the value of training as a tool to improve their employability. There is already an ongoing program that links naval training to civil accreditation. In recent recognition of the importance of education to younger generations we have increased the budget for the program that assists members to undertake further education and professional development. Additional increases are anticipated. These will allow us to encourage and reward member loyalty with educational opportunities.

SUMMARY

In summary, the challenges for the RAN as an employer are coming from many directions. Enhanced networked operations will require changes to the type and skills of the individuals we will wish to recruit and vitally retain. The marketplace in which we will compete is tightening due to the ageing of the Australian population, national skills shortages and globalisation. In these conditions employees will be a scarce and valuable commodity whose aspirations and desires must be heeded, regardless that they might not accord with the traditional notions of career and service.

The key message is that for the generations closer to the start of their working life than the end, a balanced life outweighs a single successful career. The RAN has the potential to maintain attractiveness and relevance as an employer to future generations, but we must listen to their needs.

CONCLUSION

I began by saying that people are a fundamental input to capability. They can also be a limitation to it. As the reliability and availability of ships and systems has improved, at the same time personnel have become increasingly reluctant to work for extended periods away from family and social networks. This means that personnel availability is becoming the key constraint to the delivery of capability.

We have recognised for some time that many of our traditional personnel policies and practices will no longer sustain us: Sea Change has now given these matters a whole-of-RAN focus, visibility and momentum that must be sustained if we are to secure our future.

To successfully navigate into that future we must keep one eye on the horizon, while being careful to preserve, enhance and market our current strengths. The RAN will need to apply sustained commitment and attention to becoming a more proactive, flexible and adaptable employer. In this way we can meet and beat the challenges that the developments and requirements of the future will bring.

Notes

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- 42 Admiral Mullen became the 28th CNO on 22 July 2005.
- 43 Admiral Mullen's remarks to the National Defense Industrial Association (NDIA) Expeditionary Warfare Conference, Panama City, Florida, 26 October 2005, <www.navy.mil/navydata/leadership/quotes.asp?q-11>, viewed on 16 December 2005.
- 44 Admiral Mullen's remarks to students and faculty of the Naval War College, Newport, Rhode Island, 31 August 2005, <www.navy.mil/navydata/leadership/quotes.asp?q-11>, viewed 16 December 2005. For a participant's history of the Navy's riverine warfare in Vietnam, see: T.J. Cutler, *Brown Water, Black Berets: Coastal and Riverine Warfare in Vietnam*, Naval Institute Press, Annapolis, 1988.

- 45 M. Mullen, “What I Believe: Eight Tenets That Guide My Vision for the 21st Century Navy”, *Proceedings*, January 2006, pp. 12-16. See also: “CNO speaks at SNA Symposium”, *Navy News*, 11 January 2006, <www.military.com/features/0,15240,85132,00.html>, viewed 17 January 2006.
- 46 J.T. Manvel, Jr, “Better Big and B(u)Y the Dozen”, *Proceedings*, January 2006, pp. 22–25.
- 47 P. Donahoe and L. McCabe, “Controlling the Rivers”, *Proceedings*, January 2006, p. 27.
- 48 For Zinni, see: T. Clancy with T. Zinni and T. Koltz, *Battle Ready*, G.P. Putnam and Sons, New York, 2004.
- 49 General Dwight D. Eisenhower was the first Supreme Allied Commander Europe from December 1950 to May 1952. He used the position as a launching pad to the US presidency.
- 50 *Joint Publication 1, Joint Warfare of the Armed Forces of the United States*, describes overseas presence as: “Overseas presence includes permanently stationed and rotationally or temporarily deployed forces forward in regions of particular importance for advancing and defending US interests”, <www.dtic.mil/doctrine/jel/new-pubs/jp1.pdf>.
- 51 Department of the Navy, *Report to the Congress, Fiscal Year 1991*, 1990, p. 30.
- 52 Department of the Navy, *Report to the Congress, Fiscal Year 1991*, p. 10.
- 53 C.L. Symonds, *Decision at Sea: Five Naval Battles That Shaped American History*, Oxford University Press, New York, 2005, pp. 296–297.
- 54 D.B. Crist, “Joint Special Operations in Support of Earnest Will”, *Joint Force Quarterly*, Autumn/Winter 2001–02, p. 16. Boghammars were small boats, Swedish-built, manned by Iranian Revolutionary Guards and armed with 107mm rockets, RPG-7s and machine guns.
- 55 J. Sweetman, *American Naval History: An Illustrated Chronology of the US Navy and Marine Corps, 1775–Present*, 3rd ed, Naval Institute Press, Annapolis, 2002, p. 261.
- 56 Symonds, *Decision at Sea*, pp. 266–297.
- 57 An Amphibious Ready Group (ARG) is comprised of three or more amphibious warfare ships and an embarked Marine Expeditionary Unit Special Operations Capable (MEU (SOC)). The MEU (SOC) consists of approximately 2200 Marines organised in a combined arms Marine Air-Ground Task Force. Today the Expeditionary Strike Group operates with a three-ship ARG with embarked MEU (SOC) and a mix of cruiser and destroyer escorts. Carrier Battlegroups, now referred to as Carrier Strike Groups (CSGs), are task-organised to the mission assigned. A typical CSG may consist of an aircraft carrier, a guided missile cruiser, two guided missile destroyers, an attack submarine and a supply ship.
- 58 “The History of the USS *Enterprise*”, <www.pbs.org/wgbh/pages/frontline/shows/navy/enterprise/enterprise2.html>, viewed 12 December 2005.
- 59 Department of the Navy, *Report to the Congress, Fiscal Year 1991*, p. 4.
- 60 Department of the Navy, *Report to the Congress, Fiscal Year 1991*, p. 10. In the aftermath of Hurricane Hugo, US Ships *Clifton Sprague*, *Stephen W. Groves*, *Semmes*, *Pensacola*, *Gunston Hall*, *Austin* and USNS *Neosho*, provided emergency services to residents of Puerto Rico and the US Virgin Islands.
- 61 Department of the Navy, *Report to the Congress, Fiscal Year 1991*, pp. 32–33.
- 62 Department of the Navy, *Naval Doctrine Publication 1, Naval Warfare*, 28 March 1994, p. 23.
- 63 Chambers, *The Oxford Companion to American Military History*, p. 544.
- 64 The Commander of this Joint Task Force was responsible to Commander in Chief, US Central Command, General Norman Schwarzkopf.
- 65 Department of the Navy, *Fiscal Years 1992–1993 Report to Congress*, 1991, p. 5.
- 66 Department of the Navy, *Fiscal Years 1992–1993 Report to Congress*, p. 5.
- 67 Department of the Navy, *Naval Doctrine Publication 1*, p. 23.
- 68 G. Sieminski, “The Art of Naming Operations”, *Parameters*, Autumn 1995, pp. 81–98.

- 69 T. Franks, *American Soldier*, Harper-Collins, New York, 2004, p. 199. Combatant commanders exercise command authority over assigned forces and are directly responsible to the President and Secretary of Defense for the performance of assigned missions. *Joint Publication 0-2*, p. vii; Commander of the Naval Component Command for Central Command is dual-hatted as Commander, Fifth Fleet; General Tommy Franks became the seventh Commander in Chief of Central Command on 6 July 2000.
- 70 Department of the Navy, *1993 Posture Statement*, March 1993, p. 39.
- 71 Department of the Navy, *Vision Presence Power 2004: A Program Guide to the US Navy*, pp. 169-70.
- 72 W.E. Kretchik, R.F. Baumann and J.T. Fishel, *Invasion, Intervention, "Intervasion": A Concise History of the US Army in Operation Uphold Democracy*, US Army Command and General Staff College Press, Fort Leavenworth, 1998. Positioning army helicopters on carriers for special operations forces and 10th Mountain Division during this operation was the first operational test of the concept of adaptive joint force packaging, which the Chairman of the Joint Chiefs of Staff, General Colin Powell, had directed to be developed.
- 73 Department of the Navy, *1995 Posture Statement: The Navy Marine Corps Team*, pp. 9-10.
- 74 Department of the Navy, *1995 Posture Statement: The Navy Marine Corps Team*, p. 10.
- 75 "5th Fleet History", <www.cusnc.navy.mil/Pages/History%20page.htm>, viewed 4 November 2005.
- 76 "The 5th Fleet Mission", <www.cusnc.navy.mil/Pages/Mission%20page.htm>, viewed 13 December 2005. CENTCOM is a joint command and has its headquarters at MacDill Air Force Base in Tampa, Florida. Fifth Fleet is also US Naval Forces Central Command and has its headquarters in Bahrain in the Persian Gulf.
- 77 The mission coming to an end was a continuation of the many UN operations in Somalia that included the 3-4 October 1993 disaster in which two US Army Blackhawk helicopters were shot down and 18 American Servicemen were killed. M. Bowden, *Blackhawk Down, A Story of Modern War*, Atlantic Monthly Press, New York, 1999.
- 78 LHAs and LHDs are amphibious assault ships. They are the largest of the amphibious warfare ships and resemble a small aircraft carrier.
- 79 D. Porch, "The Taiwan Strait Crisis of 1996: Strategic Implications for the United States Navy", *Naval War College Review*, Vol. 41, No. 3, Summer 1999, <www.nwc.navy.mil/press/Review/1999/summer/art1-su9.htm>, viewed 20 December 2005; *The Oxford Companion to Military History*, pp. 116, 711. In 1958 the People's Republic of China bombarded the Nationalist-held islands of Quemoy and Matsu in an apparent prelude to an invasion, and in response, the US Seventh Fleet alerted 140 ships for possible action in the Taiwan Strait.
- 80 P. Stone, "Desert Fox Target Toll Climbs Past 75 Iraqi Sites", <www.defenselink.mil/news/Dec1998/n12181998_9812182.html>, viewed 21 December 2005.
- 81 Secretary of Defense, *Annual Report to the President and Congress*, Washington, DC, 1999, p. 198.
- 82 US Congress, Senate, Committee on Armed Services, Statement of Admiral Vern Clark, USN Chief of Naval Operations, 25 February 2003. USS *Kitty Hawk* deployed with only a portion of her air wing and embarked a variety of special operations helicopters. US special operations forces would be staged into Afghanistan from *Kitty Hawk*.
- 83 Franks, *American Soldier*, pp. 265-266.
- 84 Franks, *American Soldier*, pp. 265-266.
- 85 Briefing on Military Operations in Iraq, General Tommy Franks, 22 March 2003. Military objectives were: "First, end the regime of Saddam Hussein. Second, to identify, isolate and eliminate Iraq's weapons of mass destruction. Third, to search for, to capture and to drive out terrorists from that country. Fourth, to collect as much intelligence as we can related to terrorist networks. Fifth, to collect as much intelligence as we can related to the global network of illicit weapons of mass

destruction. Sixth, to end sanctions and to immediately deliver humanitarian support to the displaced and to many needy Iraqi citizens. Seventh, to secure Iraq's oilfields and resources, which belong to the Iraqi people. And last, to help the Iraqi people create conditions for a transition to a representative self-government."

- 86 US Congress, Senate, Committee on Armed Services, statement of Hon. G.R. England, Secretary of the Navy on Department of the Navy Posture, 2 March 2004.
- 87 Statement of Hon. G.R. England, Secretary of the Navy on Department of the Navy Posture, 2 March 2004.
- 88 US Congress, Senate, Committee on Armed Services, statement of Hon. G.R. England, Secretary of the Navy, 3 March 2005.
- 89 Statement of Hon. G.R. England, Secretary of the Navy, 3 March 2005.
- 90 Commander of Expeditionary Strike Group One and a portion of his staff provided command and control for the US Military Disaster Assistance Center in Islamabad, Pakistan.
- 91 Chairman of the Joint Chiefs of Staff, *Joint Pub 3-07, Joint Doctrine for Military Operations Other Than War*, Washington, DC, 16 June 1995, p. III-1.
- 92 Approved in a Department of the Navy notice dated 6 September 2005.
- 93 "Navy Expeditionary Combat Command Stands Up", 14 January 2006, <https://navcms.news.navy.mil/search/display.asp?story_id=21962>, viewed 19 January 2006.
- 94 "Navy Expeditionary Combat Command Stands Up".
- 95 "CNO Speaks at SNA Symposium", 18 January 2006, <www.dcmilitary.com/dcmilitary_archives/stories/011806/39148-1.shtml>, viewed 19 February 2006.

Technology Revolution and the Challenges for the Future Maritime Force Capability Edge

- 1 *The Economist*, 1 July 2003.

Coalition Interoperability: How Much is Enough and How to Quantify It

- 1 J. Morgan and C. Martoglio, "The 1000-Ship Navy: Global Maritime Network", *Proceedings*, November 2005, pp. 14–17.
- 2 Thucydides, *The History of the Peloponnesian War*, Henry Regnery Company, New York, 1948 and V.D. Hanson, *A War Like No Other: How the Athenians and Spartans Fought the Peloponnesian War*, Random House, New York, 2005.
- 3 D. Alberts, keynote address at the 7th Annual International Command and Control Research and Technology Symposium, 16 September 2002, Washington, DC, <www.dodccrp.org>.
- 4 Chief of Naval Operations and Commandant of the Marine Corps remarks at the 10th Expeditionary Warfare Conference, 25–27 October 2005, Panama City, Florida.
- 5 R. Natter, Interview, *Combat Systems Clips*, Summer 2002.
- 6 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 UK and the US.
- 7 M. Mattis, remarks at the 10th Annual Expeditionary Warfare Conference, 25–27 October 2005, Panama City, Florida.
- 8 *The National Military Strategy of the United States of America: A Strategy for Today; A Vision for Tomorrow*, US Government Printing Office, Washington, DC, 2004.
- 9 USN battle formations are most often deployed as Carrier Strike Groups (CSGs) 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 short take off and landing aircraft and helicopters.

- 10 P. Mitchell, "Small Navies and Network-Centric Warfare: Is There a Role?", *Naval War College Review*, Spring 2003, pp. 83-99.
- 11 Mitchell, "Small Navies and Network-Centric Warfare", pp. 88-89.
- 12 P. Mitchell, "Small Navies and Network-Centric Warfare: Is There a Role? Canada and US Carrier Battlegroup Deployments", briefing presented at the 8th International Command and Control Research and Technology Symposium, Washington, DC, 17-19 June 2003.
- 13 Department of Defense, *Military Transformation: A Strategic Approach*, Washington, DC, 2003, pp. 1-36, <www.oft.osd.mil/library/library_files/document_297_MT_StrategyDoc1.pdf>.
- 14 The Technical Cooperation Program: TTCP document DOC-SEC-3-2005, *A Beginner's Guide to the Technical Cooperation Program*, 1 September 2005, <www.dtic.mil/ttcp/>.
- 15 TTCP, *Beginner's Guide to the Technical Cooperation Program*.
- 16 Importantly, some of this qualitative work has addressed coalition operations, confirming the importance of networking in the multilateral operations. See, for example, D. Gompert, et al, *Mind the Gap: Promoting a Transatlantic Revolution in Military Affairs*, National Defense University Press, Washington, DC, 1999; J. Thomas, *The Military Challenges of Transatlantic Coalitions*, Aldelphi Paper No. 333, International Institute for Strategic Studies, London, 2000; G. Adams, "Strength in Numbers: The European Allies and American Defense Planning" in C. Williams (ed), *Holding the Line: US Defense Alternatives for the Early 21st Century*, MIT Press, Cambridge, 2001; and G. Adams, et al, *Bridging the Gap: European CAISR Capabilities and Transatlantic Interoperability*, Defense and Technology Paper No. 5, National Defense University Press, Washington, DC, 2004. These studies, and others like them, emphasise the importance of coalition operations and, by extension, coalition partners operating in a networked fashion.
- 17 While little quantitative work on network centric operations has been done based on from-the-ground-up modelling and simulation, the US Assistant Secretary of Defense for Networks and Information Integration, under the auspices of the Command and Control Research Program (CCRP), has reviewed the results of both exercises and wartime events to draw some quantitative results regarding the value of networking. MAR AG-1 and AG-6 reviewed this CCRP material in evaluating "best practices" for the conduct of their studies, and this CCRP work informed much of the group's work. See <www.dodccrp.org> to access the totality of the CCRP effort, including several books that describe these early efforts to quantify the benefits of networking.
- 18 C. Davis, et al, *Key Issues in Coalition Network-Centric Maritime Warfare*, TTCP TR-MAR-10-2003, January 2004.
- 19 M. Hazen, et al, "The Analysis of Network-Centric Maritime Interception Operations (MIO) Using Queuing Theory", presentation at the 8th International Command and Control Research and Technology Symposium, Washington, DC, 17-19 June 2003.
- 20 Hazen, "The Analysis of Network-Centric Maritime Interception Operations (MIO)", pp. 8-9.
- 21 Admiral W. Doran, remarks at the "West 2005" Conference, San Diego, California, 2 February 2005.
- 22 R. Klingbeil, et al, "Utilizing Network Enabled Command and Control Concepts to Enhance ASW Effectiveness", presentation at the 9th International Command and Control Research and Technology Symposium, Copenhagen, Denmark, 14-16 September 2004.
- 23 For a careful examination of the definitions and concepts of SA and SSA, see: A.A. Nofi, *Defining and Measuring Shared Situational Awareness*, CNA Research Memorandum, CRM D0002895.A1/Final, November 2000.
- 24 US Joint Forces Command, Multinational Experiment III, 2003, <www.jfcom.mil/about/experiments/mne3.htm>.
- 25 K.M. Sullivan and I. Grivell, *QSIM: A Queuing Theory Model with Various Probability Distribution Functions*, NUWC-NPT Technical Document 11,418, 14 March 2003 (updated by I. Grivell, December 2003).

- 26 Klingbeil, et al, "Utilizing Network enabled Command and Control Concepts to Enhance ASW Effectiveness", pp. 17-18.
- 27 *Joint Net Centric Capabilities*, Office of the Assistant Secretary of Defense for Networks and Information Integration, Washington, DC, July 2003.
- 28 D. Galligan, et al, "Net Centric Maritime Warfare - Countering a 'Swarm' of Fast Inshore Attack Craft," presentation at the 10th International Command and Control Research and Technology Symposium, McLean, Virginia, 13-16 June 2005.
- 29 M. Bucchi and M. Mullen, "Sea Shield: Projecting Global Defensive Assurance", *Proceedings*, November 2002, pp. 56-59.
- 30 Three types of FIAC threats were modelled, and these types represented the generally accepted FIAC types described in the naval literature on the subject. Type 1 FIAC are those represented by a jet ski or Boston Whaler with rocket-propelled grenade weapons or a large-blast bomb used in a suicide attack. Type 2 FIAC are those represented by larger "Boghammar" type boats with unguided multiple-launch bombardment rockets or with larger anti-tank guided weapons. Type 3 FIAC are those represented by small fast patrol boats typified by the Super Dvora, with smaller anti-ship missiles or torpedo armament.
- 31 For this scenario, the US ESG would include three amphibious assault ships (built around a large-deck command ship), one cruiser, two destroyers, three littoral combat ships and one attack submarine. Australia would contribute two frigates and one amphibious transport ship. Canada could send up to a task group (including a destroyer, two frigates and a replenishment ship). NZ would send one auxiliary ship and one frigate. The UK would send one aircraft carrier and one frigate.
- 32 V. Clark, "Sea Power 21: Projecting Decisive Joint Capabilities", *Proceedings*, October 2002, and R. Mayo and J. Nathman, "FORCEnet, Turning Information Into Power", *Proceedings*, February 2003, for two of the earliest articles in the open literature regarding Sea Power 21 and FORCEnet. The capitalisation of "FORCE" while "net" remained in small letters was done purposefully by the CNO. This was done to emphasise that FORCEnet was about providing a warfighting capability to the naval *force*, and was not about "the net".
- 33 V. Clark and M.E. Hagee, "FORCEnet: A Functional Concept for the 21st Century", 8 February 2005, <www.enterprise.spawar.navy.mil/getfile.cfm?contentId=816&type=R>.
- 34 D. Alberts and R. Hayes, *Power to the Edge: Command and Control in the Information Age*, Department of Defense Command and Control Research Program, Washington, DC, 2003.
- 35 The body of work, produced by the Department of Defense Command and Control Research Program, provides much of the theoretical, conceptual and analytical basis for network centric operations as it is generally understood and practised by military units.
- 36 *FORCEnet: A Functional Concept for the 21st Century*, Naval Network Warfare Command, pp. 12-19.
- 37 Office of the Chief Engineer, Space and Naval Warfare Command, *FORCEnet Architecture and Standards*, Vol. I (Operational and Systems View) and Vol. II (Technical View), SSC San Diego, 2005.
- 38 *FORCEnet Architecture and Standards*, Vol. II (Technical View), clearly defines the objective that the technical community must achieve in designing FORCEnet: "develop a naval networking infrastructure and integrated applications suite with full interoperability among the service components, joint task force elements, and allied/coalition partners. The FORCEnet Architecture will ensure that design decisions made by component programs are consistent with the FORCEnet blueprint and incorporate common engineering, information, protocols, computing, and interface standards across various computing environments and platforms. This blueprint will be based on joint and commercial standards, with development and implementation coordinated with transformational initiatives, the Army, Air Force, and Coast Guard, as well as Joint commands and allies."

- 39 SSC San Diego scientists and engineers have briefed the Composeable FORCENet concept to literally hundreds of military, industry, and academic professionals over the past several years. See, for example: G. Galdorisi, et al, *Composeable FORCENet Command and Control: The Key to Energizing the Global Information Grid to Enable Superior Decision-making*, Proceedings of the 2004 Command and Control Research and Technology Symposium, June 2004.

Netting and Navies: Achieving a Balance

- 1 This theory originated with the late Col. John Boyd, USAF, who used it very memorably – and convincingly – to explain the suddenness of the French defeat in 1940, an event unexpected by contemporary observers. In effect the proof that it was an OODA loop collapse was the frequently repeated reports of the Germans popping up unexpectedly, meaning that the French were no longer able to understand what was happening, and kept projecting ahead German movements from some days past. Boyd associated the disaster with the fact that the French headquarters had only a single telephone line, but it was really a disaster of excess time taken to absorb a set of reports of enemy position and movement.
- 2 Some years ago, when I was lecturing on network centric warfare at Naval Surface Warfare Centre China Lake, an engineer asked what the centre of gravity of the People's Republic of China might be. The answer would surely depend on detailed knowledge of China (which the lecturer lacked), but then one might ask for the centre of gravity of the United States. Is there any such thing? Years earlier, the same question might have been asked in the context of nuclear targeting. How could strategic vulnerability be assessed? At the time, the most attractive *deterrent* strategy against the Soviet leadership seemed to be the threat of direct attack, a policy called decapitation. However, that was not a golden bullet, because it seemed likely that it would buy only a short period of confusion while the leadership regrouped. Nor were there other golden targets: any modern country has so many fungible resources that it can rebuild after a big attack (unless it has been blanketed by so many weapons that nothing is left alive – a surprisingly difficult operation). If massive nuclear weapons cannot reliably disable a major country, how can 1000-pound precision warheads?
- 3 There may also be sensors either sown or placed on the land. Examples are the seismic and acoustic sensors, which broadly resemble sonobuoys and the small mobile electro-optical sensors now being developed by the US Army. They add more dimensions and more need for reference data. Seismic and acoustic sensors, for example, detect and (en masse) track vehicles, but as is well known from anti-submarine warfare, identifying those vehicles requires some signature data.
- 4 Dr J. Sumida seems to have been the first to associate the need for armoured cruisers with a crisis in Royal Navy (RN) finances, in his *In Defense of Naval Supremacy*. Other writers, such as Marder, had noted a British naval panic when the French and the Russians began building protected and armoured cruisers, but they did not identify the reason for that panic – it was merely one more type of ship that had to be matched. The British cruiser program roughly coincided with the need to pay off the bonds used to finance the 1889 naval program. Sumida also found that, at least initially, Admiral Fisher was far more interested in the battlecruiser than in the *Dreadnought* battleship, because it could provide both trade protection and a measure of battlefleet capability (conversely, the high-speed of the battleship could give it some battlecruiser capability in trade protection). It appears that no one else has yet suggested that networking explains why the battlecruiser could actually solve the financial problem of trade protection. Dr N. Lambert discovered the origins of the war room associated, in my view, with the use of battlecruisers for trade protection, and with Admiralty operational control of the fleet. On a bare bones level, the war room concept may actually go back much further. In the 1889 manoeuvres, for the first time, the RN used a clearing house in London to sift intelligence information from stations around the country, a concept described then as having been strongly advocated for some time. It is not clear that any plot was involved, but the lessons of the exercise included the comment that the information required more than intelligence

personnel to interpret it. Later the RN built up a global system of intelligence sub-stations that sent sifted information to London. As Commander in Chief Mediterranean, Admiral Fisher was famously successful in building and using an informant network, and this experience may have translated into the war room.

- 5 Fisher's view seems to have been that the North Sea could be dominated by torpedo craft, which could be vectored to attack any enemy ships attempting to cross it (or could blockade enemy bases). From about 1904, destroyers no longer operated with the battlefleet due to increased torpedo ranges; instead they were based separately, intended to operate as independent units led by scout or light cruisers. The battleship fleet was in effect a back-up against the possible failure of blockade or vectoring based on intelligence. To some extent Fisher grudgingly accepted it because his more conservative colleagues (rightly) doubted that his radical concepts would work; to some extent, too, the battle fleet was an invaluable deterrent that could not be abandoned on the basis of very secret wartime operating concepts. Because Fisher seems not to have explained his reasoning (all of this is deduction from what he did), it did not survive his downfall in 1910. This shift is evident in official correspondence describing the war plan, in which the fleet or fleets would cruise in the North Sea awaiting the Germans. About the same time experiments began to see how destroyers could operate in support of the battle fleet, the problem being what we would call IFF: once despatched against the enemy fleet, the fleet's destroyers could not return to their battle line without being fired upon as potential attackers. Only in 1913-14 did tactical plotting make it possible to use destroyers flexibly, both to attack the enemy fleet and to defend the British fleet. This development seems to have been unique to the RN. It entailed another kind of tactical netting, associated with later developments such as the operations room. As for the fleet proper, the view seems to have been that vectoring, if indeed it was possible at all, would work only at the outbreak of war, when agent networks might still be functioning. If (as was the case) the Germans chose not to come out at the beginning, vectoring would be impossible, and the fleet would have to cruise awaiting them. It seems to have taken the loss of HMS *Audacious* to make clear the dangers of cruising. Fortunately radio intercepts indicating the December 1914 raid on Hartlepool showed that vectoring was practical. Perhaps the important point is that this combination worked only because the vectoring concept already existed in the RN – and, moreover, probably because by late 1914 Admiral Fisher had returned as First Sea Lord. As for the trade war room, Dr Lambert has pointed out that it was key to the World War I blockade of Germany, since the Admiralty knew exactly which ships were carrying contraband long before they approached the North Sea. In much the same way the USN's ship-tracking system, developed to deal with Soviet naval targets, was key to the embargo of Iraq in 1990-91. Presumably ship-tracking was also necessary for British Intelligence to keep track of the movements (necessarily by sea) of anti-Empire subversives, a major concern in the 19th and early 20th centuries.
- 6 The RAN actually conducted this type of operation during World War II. For a time in 1940-41 Australian cruisers were widely dispersed, while their naval commander occupied a shore station. Given earlier British thinking, which would have been extended to the RAN, it seems clear that for anti-raider operations an intelligence-driven picture of raider operations was used to vector the cruisers. In this case radio made it possible for the raiders' victims to indicate where they were being attacked (the famous "RRR" signal). The overall picture was necessary because simply sending a cruiser to the position of the last merchant ship loss would gain little, as that datum would have been quite stale by the time the cruiser arrived. It was necessary to estimate the raider's course by taking into account successive attacks and also other intelligence, such as transmissions by the raider. Note that the destroyers of the original RAN fleet were consistent with Fisher's concept that torpedo craft could suffice for defence. As for the RAN fleet built up between the wars, it seems that the two Treaty Cruisers were in effect lineal successors of the battlecruisers, at least in their trade protection role. They no longer needed patrol lines of destroyers because they had reconnaissance aircraft onboard.

- 7 For the messages, see: E.W.R. Lumby (ed), *Policy and Operations in the Mediterranean, 1912-14*, Navy Records Society, London, 1970.
- 8 Lest it be imagined that somehow only the Germans were foolish enough to use centralised submarine command, the reader should be aware that it was effectively inescapable; the Allies also had centralised systems. The US version had an ingenious twist. US naval intelligence discovered that Japanese convoys (and, presumably, important merchant ships) reported every noon in a low-grade code, giving their positions and also describing any attacks the previous night. These reports, rather than transmissions by the submarines, were used by the US submarine force as a feedback comparable to the Germans' U-boat transmissions. For example, knowing the habits of the individual submarine commander, Pearl Harbor could guess how many torpedoes had been fired to achieve the number of hits the Japanese reported the next day, and how many more torpedoes were still onboard. The US wartime submarine operating concept is described in some detail in W.J. Holmes, *Double-Edged Secrets*, Naval Institute Press, Annapolis, 1979. To a considerable extent satellite communications can dramatically reduce the possibility that communication will give away a ship's position. For the Soviet use of Doppler in satellite down-links to geolocate ships, see: N. Friedman, *Seapower and Space*, Chatham, London, 2000. It appears that the Argentines used this technique, independently discovered, to track the British task force heading for the Falklands, and thus to locate it for a major air strike before it reached the islands. During the last decade of the Cold War, the USN shifted heavily to satellite communications in the belief that it could communicate covertly and thus promote deceptive techniques to deal with the Soviet ship-location system. When the Soviet satellite technique was discovered, it seemed that this effort had been in vain; satellite communications techniques had to be changed to make geolocation largely impossible. Many navies, particularly those relying on commercial systems, are probably still quite vulnerable to geolocation.
- 9 It was always argued that this was particularly the case for nuclear submarines, which had to run their machinery whether or not they were operating at high-speed. This advantage presumably more or less vanishes for newer submarines, which have very quiet low-power operating modes.
- 10 There is some evidence that highly-centralised control promotes deception, because those controlling forces are very aware of the pattern their deployments make – or can seem to make. The Soviets were apparently very successful in deceiving the Germans as to their force dispositions in 1941, and their efforts may explain some of what now seem to have been irrational deployments. For some of the effects of Soviet deception, see: D.M. Glantz, *Soviet Military Deception in the Second World War*, Frank Cass, London, 1989. Glantz found that the Soviets very successfully concealed their retention of large mobile armoured forces deep behind their border, with which they hoped to flank the incoming German blitzkrieg. Although the deception worked remarkably well, the Soviet army – badly battered by Stalin's purges, and due to poor equipment (it was in the process of changing tanks, for example) – was unable to exploit this advantage. Glantz derived his rather surprising conclusions largely by comparing German and Soviet maps of force dispositions as of 21 June 1941 – something that no one had previously done.
- 11 As quoted from a contemporary report in R.F. Cross Associates, *Sea-Based Airborne ASW 1940-1977*, a formerly classified report for the USN dated 28 April 1978 and declassified in 1993.
- 12 During a class at Point Mugu, an officer commented to me that, although many were reluctant to fire on the basis of such data, his CO felt differently – and thereby bagged a carrier in an exercise.
- 13 Many of these measures were apparently not suspected during the Cold War, presumably because they were practised only in areas not susceptible to continuous surveillance. The visual confirmation by reconnaissance bombers comes from a 1992 Ukrainian account of the tactics of a "Blinder" unit, tasked with attacking the Sixth Fleet in wartime, on the Black Sea coast. The account of Soviet-era shipboard over-the-horizon (OTH) radars comes from Russian sources, beginning with a 1996 book summarising R&D achievements for the 300th anniversary of the Russian Navy, and later confirmed by extensive advertising for the current version of the Band Stand system, Mineral (which is associated with the Moskit missile). Note that Plank Shave is

associated with the current Indian long range missile system on the *Talwar* class, and that the Chinese Navy uses Band Stand in association, apparently, with Moskit. During the Cold War, Band Stand in particular was often characterised as a data link, and even when the USN obtained a *Tarantul* class missile boat equipped with Plank Shave, the radar was not described as an OTH set. Band Stand initially used tropo-scatter to achieve a range of about 100 nm, and Plank Shave is a ducting radar (effective range probably about 40 nm). The current Mineral has ducting and tropo-scatter antennas back-to-back, according to its advertising brochure.

Maritime Support in a Rapidly Changing Environment

- 1 K. Henry, "Australia's defence to 2045: The macro-economic outlook", *Defender*, Spring, 2005, p. 24.

Classification and Project Risk Management: Providing Effective Support to Procurement and Upkeep

- 1 A.W. Watson, "Corvettes and frigates" in *Selected Papers on British Warship Design in World War II*, Transactions of the Royal Institution of Naval Architects, Conway Press, 1983. D. Brown (ed), *The Design and Construction of British Warships 1939–1945, Vol. 2, Submarines, Escorts and Coastal Forces*, Conway Press, 1996. For the sake of clarification the British Corporation was another classification society, considered at the time to be less conservative, which became part of Lloyd's Register of Shipping in 1948.
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- 4 *Rules and Regulations for the Classification of Naval Ships*, Lloyd's Register, 2005.
- 5 R.R. Whyte, *Engineering Progress Through Trouble*, Institution of Mechanical Engineers, 1975.
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- 7 N. Rattenbury, "Selection and Use of Standards for Naval Ships", International Naval Engineering Conference, 2004.

Canada's New Defence and Naval Policy: *Déjà Vu* All Over Again?

- 1 J. Tasseron, "Facts and Invariants: The Changing Context of Canadian Defence Policy", *Canadian Military Journal*, Summer 2003, pp. 19–29; especially the comments on p. 28.
- 2 "Stephen Harper Releases Plan Rooted in Canadian Values", Conservative Party of Canada, 13 January 2006, <www.conservative.ca/EN/2590/>.
- 3 *Stand Up for Canada* states the intention to "Acquire equipment needed to support a multi-role, combat-capable maritime, land and air force. Fundamental capability requirements are national surveillance and control, counter-terrorism, air and sea deployability, and logistics supportability."
- 4 *Stand Up for Canada* states the plan as being to "Recruit 13,000 additional regular forces and 10,000 additional reserve forces personnel. Increase spending on the Canadian Forces by \$5.3 billion over the next five years, beyond the currently projected levels of defence spending." Current funding levels (from the previous Liberal Government) are about \$12.8 billion over the next five years. The new plan wants to see the five-year defence budget at \$20 billion. The increase in strength from 62,000 to 75,000 would be 21 per cent.
- 5 D. Rumsfeld, Secretary of Defense, at the National Defense University, 31 January 2002.
- 6 P.J. Dombrowski and A.L. Ross, "Transforming the Navy: Punching a Feather Bed?", *Naval War College Review*, Vol. 56, No. 3, Summer 2003.

- 7 The gunnery requirement for Korea was met because the fleet destroyers still had the capability as many of the officers had taken part in gun actions during World War II and knew what to do.
- 8 For a more complete explanation see: P. Haydon, “Canadian Amphibious Capabilities: Been there, Done it, Got the T-shirt!”, *Maritime Affairs*, Winter 2001.
- 9 Some will argue that another transformational moment existed with the evolution of the fully automated command and control systems beginning with those incorporated into the Iroquois (DDH 280) class destroyer leaders that entered service in the 1970s and continued on through a series of innovations, leading to the excellent systems now at sea in the *City* class frigates and the modernised DDH 280s.
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- 13 D. Bercuson (ed), *In the Canadian Interest? Assessing Canada’s International Policy Statement*, Canadian Defence and Foreign Affairs Institute, Calgary, 2005; R. Gimblett, “The Defence Policy Statement: Implications for the Canadian Navy”, *Royal Canadian Military Institute Commentary*, May 2005.
- 14 *A Role of Pride and Influence in the World*, Government Policy, Department of Foreign Affairs and International Trade, Ottawa, 2005, p. 3.
- 15 *A Role of Pride and Influence in the World*, p. 4.
- 16 Requirements for harbour defence had almost entirely gone by the mid 1950s.
- 17 An example of the vulnerability of such emptiness is the setting-up of a remote weather station on the Labrador coast in 1943 by a German U-boat.
- 18 J.J. Sokolsky, *Realism Canadian Style: National Security Policy and the Chrétien Legacy*, Institute for Research on Public Policy, Montreal, June 2004; D.N. Mason, *Canadian Defense Priorities: What Might the United States Like to See?* Center for Strategic and International Studies Policy Papers on the Americas, Vol. XV, Study 1, March 2004.
- 19 The parliamentary process by which such decisions are now made can quickly get bogged down with the minutiae of the process rather than be ready to make tough decisions – things politicians try to avoid. Despite the logic of creating a better national security decision-making structure, I fear it will only happen when a major national security crisis occurs in Canada. Some things have begun to change, but as one can guess, there are tasking problems because there are not enough vessels or aircraft to meet all requirements.
- 20 The Department of Fisheries and Oceans has the responsibility for ensuring that fishing regulations are observed and have dedicated fisheries inspection officers who embark in navy and coastguard ships that patrol the fishing grounds.
- 21 Department of National Defence and the Canadian Forces, *Backgrounder: The Joint Support Ship Project*, 16 April 2004, <www.forces.gc.ca/site/newsroom/view_news_e.asp?id=1346>.
- 22 E. Lerhe, “Taking Joint Capability Seriously”, *Canadian Naval Review*, Vol. 1, No. 2, Summer 2005, pp. 9–13; K.P. Hansen, “Starting Over: The Canadian Navy and Expeditionary Warfare”, *Canadian Naval Review*, Vol. 1, No. 1, Spring 2005, pp. 20–24.
- 23 L.R. Mader, “Avoiding a Future Dieppe: Improving Canadian Army Amphibious Operations Planning”, *Canadian Army Journal*, Vol. 3, No. 3, Summer 2005, pp. 36–45.

- 24 For a more complete discussion of Canadian submarine requirements and issues, see: P.T. Haydon, “The *Chicoutimi* accident: lessons learned and not learned”, *Canadian Military Journal*, Vol. 6, No. 3, Autumn 2005.

Securing the Littoral: Issues for a New Maritime Power in the Pacific

- 1 C.S. Gray, *The Geopolitics of Super Power*, The University Press of Kentucky, Lexington, 1988, p. 49.
- 2 See, for example: J. Moore, *Sea Power and Politics: From the Norman Conquest to the Present Day*, Weidenfeld and Nicolson, London, 1979, pp. 140–161.
- 3 R.F. Staar, *The New Military in Russia: Ten Myths That Shape the Image*, Naval Institute Press, Annapolis, 1996, p. 52; G. Jacobs, “Growth in Strength of Soviet Pacific Fleet”, *Jane’s Defence Weekly*, 8 July 1989, p. 34.
- 4 Data is collected by the author.
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- 6 *Jane’s Fighting Ships 2002*, Jane’s Information Group, 2002, pp. 567–616; International Institute for Strategic Studies, *The Military Balance 2001–2002*, p. 92; data collected by the author from *Krasnaya Zvezda* and *Morskoi Sbornik*, issues 2002.
- 7 Several Tu-22M-3s were transferred to the Pacific from the Russian Black Sea Fleet.
- 8 N. Khmel’nov, “Rossiiskiy VMF: Na Poroze Chetvertogo Stoletiya” [The Russian Navy on the Threshold of the Fourth Millennium], *Morskoi Sbornik*, No. 8, 1996, p. 17.
- 9 V. Aleksin and E. Shevelev, “O Reformirovanii Nashego VMF” [On the Reform of our Navy], *Morskoi Sbornik*, No. 3, 1995, p. 17.
- 10 “Kakoi Flot Nuzhen Rossii” [What Navy does Russia Need], *Krasnaya Zvezda*, 23 November 2000, p. 1.
- 11 “Morskaya Doktrina Rossiiskoi Federatsii na Period do 2020 Goda” [Maritime Doctrine of the Russian Federation until the Year 2020], *Morskoi Sbornik*, No. 9, 2001, pp. 11–12.
- 12 There is a speculation that the *Nerpa* together with another unnamed *Akula-II* class SSN (under construction at the Amurskiy shipyard in Komsomolsk-na-Amure) may be leased to the Indian Navy for the period of up to 10 years.
- 13 The majority of Russia’s natural strategic supplies are contained in the country’s east: 84 per cent of all Russian resources of crude oil; 85 per cent of natural gas; 81 per cent of all diamonds and 90 per cent of all gold deposits; 95 per cent of discovered tin and many others. M. Nikolaev, “Vostochny Potentsial” [Eastern Potential], *Nezavisimaya Gazeta*, 26 January 2000, p. 8.
- 14 A.M. Rusi, *Dangerous Peace: New Rivalry in World Politics*, Westview Press, Boulder, 1998, p. 108.
- 15 The principal ice-free ports are Vladivostok, Nakhodka, Vostochny and Khasan (comprising the two ports of Posiet and Zarubino).
- 16 “Otsiuda Rossiya Nachalo Beret” [Russia Starts Here], *Krasnaya Zvezda*, 20 June 1998, p. 7.
- 17 M. Gareev, *If War Comes Tomorrow? The Contours of Future Armed Conflict*, Frank Cass, London, 1998, p. 36.
- 18 L. Ivashov, “Rossiya i Aziatsko-Tikhookeanskiy Region: Ne Pora li Menyat Orientiry?” [Russia and the Asia-Pacific Region: Is it Time to Change Orientation], *Voenny Parad*, January–February 1997, p. 17.
- 19 P. Rainow, “If War Will Come Tomorrow” in S.J. Cimbala (ed), *The Russian Military into the Twenty-First Century*, Frank Cass, London, 2001 pp. 43–44.
- 20 I. Khmel’nov, “Sokhranenie Boevogo Yadra TOF – Fundament Ego Dal’neishego Razvitya” [Preservation of the Pacific Fleet Combat Nucleus is the Foundations of its Further Development], *Morskoi Sbornik*, No. 4, 1996, p. 4; “Vizhy Tikhookeanskiy Flot Obnovlennym” [I see the Pacific Fleet Restored], *Morskoi Sbornik*, No. 9, 1996, p. 19.

- 21 In wartime, the operational activity of the Russian Pacific Fleet will be limited to sea control operations in the immediate littoral zone.
- 22 For example, the *Hotel* class SSBNs had to be positioned near the US west coast (several hundred kilometres) due to limited range of SLBMs they carried, while the improved *Yankee* class were able to run more distant patrols at distances of around 2000 km.
- 23 P.L. Podvig (ed), *Strategicheskoe Yadernoe Vooruzhenie Rossii* [Russia's Strategic Nuclear Armament], IzdAT, Moskva, 1998, pp. 250–258.
- 24 Podvig, *Strategicheskoe Yadernoe Vooruzhenie Rossii*, p. 262.
- 25 I. Kapitanets, "Voenno-Morskaya Nauka i Perspektivy ee Razvitiya" [Naval Art and Perspectives of its Development], *Morskoi Sbornik*, No. 5, 2002, p. 37. For a more detailed discussion, see: Gareev, *If War Comes Tomorrow?*, pp. 93–125.
- 26 Kapitanets, "Voenno-Morskaya Nauka i Perspektivy ee Razvitiya", p. 36.
- 27 Department of the Navy, *Forward ... From the Sea: Preparing the Naval Service for the 21st Century*, Washington, DC, 29 September 1992, p. 5.
- 28 V. Clark, "Sea Power 21: Projecting Decisive Joint Capabilities", *Proceedings*, October 2002, pp. 33–34.
- 29 Clark, "Sea Power 21: Projecting Decisive Joint Capabilities", p. 35.
- 30 For a more detailed analysis of the new US naval strategy, see: C.A. Meconis and B.N. Makeev, *US–Russian Naval Cooperation*, Praeger, Westport, 1996, pp. 57–64.
- 31 The *Virginia* class attack submarines are a 30-ship class of specially designed units for offensive littoral operations. Submarines will be equipped with vertical-launch land-attack cruise missiles and swimmer delivery vehicles for special forces operations against the shore. The DD(X) is a new 32-ship class of large land-attack surface combatants of the USN (to date, only five units are planned to be built).
- 32 Before the introduction of strategic nuclear weapons, long range cruise missiles and a new generation jet carrier-borne strike aircraft with in-flight refuelling capability and an array of strike weapons (including anti-ship missiles), the offensive capabilities of the most powerful navies were limited to the littoral areas (Zone 1, Table 1). These technological limitations offered large countries territorial "safety havens", which could not be hit because of their distance. The larger the country, the more strategic depth it carries. Consequently, large nations with vast territories – among others Russia, US, China – are supposed to enjoy full advantages of strategic depth.
- 33 Continental powers (France and Germany) and maritime powers (the US and the UK) are part of one military-political alliance: NATO.
- 34 V. Aleksin and E. Shevelev, "Sud by Rossii i Flota Nerazdelimy" [Fates of Russia and the Navy are Inseparable], *Morskoi Sbornik*, No. 6, 1996, p. 11; "My – Derzhava Okeanskaya" [We are an Ocean Power], *Krasnaya Zvezda*, 27 July 2002, p. 1.
- 35 Aleksin and Shevelev, "O Reformirovanii Nashego VMF", p. 16.
- 36 N. Amelko, "Problemy Stroitel'stva Voenno-Morskogo Flota Rossii" [Problems of the Development of the Russian Navy], *Morskoi Sbornik*, No. 4, 1994, p. 5.
- 37 Aleksin and Shevelev, "O Reformirovanii Nashego VMF", p. 16.
- 38 Khmel'nov, "Rossiiskiy VMF: na Poroge Chetvertogo Stoletiya", p. 13.

The Royal Malaysian Navy: Adapting to Non-Traditional Security Challenges

- 1 "Economist Intelligence Unit, Country Report: Indonesia", *The Economist*, November 2005 p. 26. According to C. Raghavan, "World Trade Grew Despite WTO Seattle Debacle", *Third World Network*, 30 November 2000, world trade value in 1999 was estimated at US\$5.47 trillion. According to the World Trade Organization World Trade Report 2004, the growth of the world trade since the

- 1990s was estimated at the average of 4.5 per cent. Hence, the total trade in 2004 was estimated at US\$6.46 trillion.
- 2 I. Gatsiounis, “Malacca Straits: Target for Terror”, *Asia Times*, 11 August 2004.
 - 3 2002 Annual Report of the Department of Fisheries Malaysia.
 - 4 P. Mukundan, “The Scourage of Piracy in Southeast Asia: Can Any Improvements be Expected in the Near Future?” in D. Johnson and M. Valencia (eds), *Piracy in Southeast Asia: Status, Issues and Responses*, Institute of South East Asian Studies, Singapore, 2005, p. 38. On 10 August 2003, MT *Penrider*, a Malaysian palm oil tanker was hijacked off Penang by a gang of eight Indonesian armed pirates. Having ransacked the vessel, the pirates took the Master and Chief Engineer for ransom. They were released after the ransom was paid.
 - 5 N.A. Baharuddin, “Pirates give up after stand-off”, *The New Straits Times*, Kuala Lumpur, 15 June 2005. On 13 June 2005, MT *Nepline Delima*, carrying palm oil from Port Klang to Mynmar was boarded by pirates off Langkawi, Malaysia. One of the ship’s crew was able to escape using the pirates’ boat and alerted the Marine Police. Immediately, the police dispatched its patrol boat and after six hours’ negotiation, the 10 Indonesian suspected pirates surrendered. Two crew members of the hijacked vessel were also detained for being suspected of aiding the pirates by providing information on the position of the vessel.
 - 6 A very large crude carrier of 200,000 tonnes normally carries about 100 million litres of crude oil and the environmental effect could be worse than the *Exxon Valdez* (95,000 gross register tonnage), which ran aground at Prince William Sound, Alaska, on 24 March 1989, spilling more than 42 million litres of crude oil.
 - 7 “Indonesia, Malaysia, Singapore Launch Coordinated Patrol of Malacca Strait”, *The Jakarta Post*, 20 July 2004.
 - 8 “Fewer Pirate Attacks in the Straits”, *The New Straits Times*, Kuala Lumpur, 10 November 2005, p. 32.
 - 9 R. Halloran, “Navy launches vast maritime security plan”, *The Washington Times*, 9 May 2004.
 - 10 The call was made during the Conference on Regional Cooperation in Maritime Security, Singapore, 2 March 2005.
 - 11 “Malaysia rejects US help to guard Malacca Straits against terrorists”, *Asia-Pacific News*, 4 April 2004.
 - 12 N.T. Razak, at the IISS Shangri-La Dialogue 2005, “Fifth Plenary Session: Enhancing Maritime Security Cooperation”, Singapore, 5 June 2005.
 - 13 C.Z. Raymond, “Malacca Straits: A High Risk Zone?”, *IDSS Commentaries*, Institute of Defence and Strategic Studies, Singapore, 4 August 2005.
 - 14 Based on the past sea robbery incidents compiled by Malaysia’s National Maritime Enforcement and Coordination Centre, the high-risk areas (defined as the most number of robbery incidents reported) are off Langkawi Island in the north, off Perak, in the vicinity of Pulau Perak, outside Port Klang’s Port Limits and the stretch between Port Dickson to Johore in the southern-most part of the Straits of Malacca.
 - 15 Earlier tactics such as the use of fast craft mingled among fishing boats are not effective because the craft are not fitted with radar and have limited endurance. The other tactic is the stationing of several craft on standby at pre-determined areas to provide immediate response when required.

The HMAS *Westralia* Replacement Project: from *Sirius* to *Success*

- 1 Defence Materiel Organisation, *Project Sea 1654: Replacement of Afloat Support Capability*, <www.defence.gov.au/dmo/adas/sea1654/sea1654.cfm>
- 2 Australian National Audit Office, *Amphibious Transport Ship Project*, Audit Report No. 8, 2000-01, Canberra, September 2000.

- 3 A number of sub-systems were procured independently by the Commonwealth of Australia and then issued to the prime contractor for integration and installation as government furnished equipment.

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- 1 A.M. Gray, Jr, *Marine Corps Gazette*, July 1987.
- 2 The Young Turks, “The Needs of the RAN 1985 to 2000”, *Journal of the Australian Naval Institute*, Vol. 3 No. 2, May 1977, p. 8.
- 3 The Young Turks, “The Needs of the RAN 1985 to 2000”, p. 8.
- 4 The Young Turks, “The Needs of the RAN 1985 to 2000”, p. 7.

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- 1 Department of Defence, *Australia's National Security: A Defence Update 2005*, Defence Publishing Service, Canberra, 2005, p. 23.

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