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AUSTRALIA'S FUTURE SURFACE COMBATANTS

Brice Pacey

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Researching Australia's Security Challenges

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EXECUTIVE SUMMARY

Force 2030, Defending Australia in the Asia Pacific Century, or the Defence White Paper 2009 announces the Australian Government's intention to acquire a class of eight new Future Frigates, and to consider the need for a fourth Hobart Class Air Warfare Destroyer. These vessels will form part of a larger force used for maintaining freedom of navigation, protecting shipping, and lifting and supporting land forces.

But this has been a contested proposition. At the time the Defence White Paper 2009, was drafted the weight of professional opinion supported a continuing role for surface combatants across a broad spectrum of plausible contingencies. Nevertheless, there was recognition that the main objections relating to the utility and survivability of the vessels would need to be examined in some detail during the period leading up to the next Defence White paper, possibly in 2014.

The Kokoda Foundation hopes that this paper will assist in presenting the main issues in a way that will encourage informed commentary and debate. The purpose of this study has been to examine influences on and options for the shape and size of Australia's future surface combatant force in light of the capability priorities identified in the Defence White Paper 2009.

It is important to note that the most consequential high end scenarios in which surface combatants would be at most risk are unlikely. However, it is a capacity for high-end conflict that underpins Australia's politico-military diplomacy and attempts to shape the security environment in favourable ways. So, any decision to move away from large surface combatants is not to be taken lightly.

The concept of a surface combatant may well undergo significant change during the period in question. There are few naval professionals who think that a balanced force means more of the same. There is a recognition that force developers

may need to think imaginatively, and that Australia may need to relearn the ability to tolerate and manage developmental and programming risk.

Australia has only just begun the detailed analysis of a highly complex capability requirement but the task can better be understood by considering the options for varying the capabilities of the future surface combatant fleet. In particular, adjustments can be made to:

- the capabilities expected of individual surface combatant classes or platforms,
- the balance between classes within the proposed surface combatant force, and
- the balance between the surface combatant force and the total force.

In reality, subsequent White Papers are likely to adjust all three in order to optimise the capabilities of maritime forces designed to operate together in joint and combined operations.

If there is little variation to the current threat assessment, and operations analysis and experimentation confirm the major judgments regarding the surface combatant force, then there may be no need to vary the surface combatant force ahead of the 2014 Defence White Paper. On the other hand, a deteriorating threat assessment and a loss of confidence in warning lead times may lead to a requirement to specify an enhanced surface combatant force including a fourth Hobart Class Air Warfare Destroyer, and a more robust specification for the Future Frigate and Offshore Combatant Vessel.

Should the defensive measures available to the surface fleet prove insufficient to provide a cost-effective counter to emerging threats it may be necessary to make more substantial adjustments to *Force 2030*. This could lead to a reduction in the role of traditional surface combatants in littoral regions. The elements of an alternative future force might include, for example, a greater reliance on maritime patrol and strike aircraft, submarines, and unmanned vehicles.

It is beyond the scope of the current study to provide definitive answers to the issues that have been raised. Instead, the study attempts to identify issues that require greater scrutiny in the period leading up to the 2014 White Paper. These issues are considered within the context provided by the Australian Government's commitment to a program of ongoing rigorous and periodic reviews of the mix and scale of Australia's defence capabilities and their appropriateness to emerging challenges in Australia's strategic outlook.

It seems that the utility, survivability, adaptability and flexibility of surface combatants mean they are likely to remain a potent enabler of sea control as part of Australia's future maritime strategy. Surface combatants have the mobility and endurance to maintain continuous presence which helps to ensure that Australia's economic zones and sea lanes of communication remain open. Surface combatants also enhance Australia's capacity to reach out to and assist friends in the region, and to develop habits of cooperation and mutual reassurance with others.

The challenges are great. If Australia is to develop an effective surface combatant force element within *Force 2030*, it will be necessary to develop a new generation of bold strategic leaders, nimble capability managers and developers, and a responsive procurement organisation able to work closely and cooperatively with industry. Australians may need to accept the overheads of an industrial base that can support the surface combatant fleet not only during peace-time operations but also during periods of extended and possibly intense conflict.

This report is not intended to be the last word on the subject. Readers who wish to discuss and debate aspects are encouraged to do so by preparing either a short commentary or a longer article for the Kokoda Foundation's professional journal, *Security Challenges*. For details on how this can be done, please visit:

<http://www.kokodafoundation.org/journal/New%20Site/author.html>

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AUSTRALIA'S FUTURE SURFACE COMBATANTS

Introduction

Force 2030, Defending Australia in the Asia Pacific Century, or the Defence White Paper 2009, is the most important strategic policy document to emerge from the Defence portfolio in a decade. It is the first Defence White Paper by the Labor Government elected in November 2007. It is also the first since the terrorist attacks in New York and Washington in 2001 and Bali in 2002, and follows Australian commitments to Afghanistan in 2001 and Iraq in 2003.

The Defence White Paper 2009 is also the first by Prime Minister Kevin Rudd, a Prime Minister who has demonstrated a sustained practical and philosophical interest in national security affairs. The priority he attaches to this area of policy is shown by his delivery of *Force 2030* during only his second year in office. In contrast, the Hawke and Howard Governments delivered the 1987 and 2000 Defence White Papers during their second term in office (or fourth year in government).

Force 2030 is also important in that it marks a change from the previous sporadic approach to developing strategic policy, at least in so far as it is articulated in the form of Defence White Papers. *Force 2030* represents the first stage in a new process of ongoing strategic reassessment, with a Defence White Paper to be prepared at intervals not exceeding five years. On the first page of the executive summary of *Force 2030*, the Government declares that these reassessments will follow rigorous and periodic reviews of the mix and scale of Australia's defence capabilities and their appropriateness to emerging challenges in Australia's strategic outlook.

The program of strategic reassessment provides a framework for independent think tanks such as the Kokoda Foundation to engage the official strategic community and to contribute to the strategic debate in a more meaningful way than has previously been possible. Over time, it is hoped that the approach will help overcome a degree of doctrinal inflexibility that may have characterised the periods following some previous Defence White Papers, and to move beyond the intensely partisan debates that have detracted from discussions of a rapidly evolving security environment.

It is within this context that the Kokoda Foundation has chosen to focus on a particular aspect of *Force 2030*, the role of large naval vessels or surface combatants in meeting Australia's future defence needs. Some of the conclusions may have relevance beyond the area of primary focus.

Why Consider Surface Combatants Now?

In preparing this White Paper the Australian Government determined that major surface combatants (destroyers and frigates) will continue to be essential elements in the balanced and joint force required to establish sea control and project power within Australia's maritime environment. *Force 2030* announces the Australian Government's intention to acquire a fleet of eight new Future Frigates, and to consider the need for a fourth Hobart Class Air Warfare Destroyer. The White Paper also foreshadows a new class of approximately 20 multi-purpose Offshore Combatant Vessels. These new combatants will form part of a larger force used for maintaining freedom of navigation, protecting shipping, and lifting and supporting land forces.

The logic of the requirements for these new surface combatants has, however, been contested. At the time the Defence White Paper 2009 was drafted the weight of professional opinion supported a continuing role for surface combatants across a broad spectrum of plausible contingencies. Nevertheless, there was recognition that the

main objections relating to the utility and survivability of new surface combatants would need to be examined in detail during the period leading up to the next Defence White Paper, possibly in 2014.

Additionally, if there is substantial professional support in Australia for the balanced force proposed in *Force 2030* there is also recognition that potential changes in the regional maritime environment and the military forces deployed within that environment are sufficient to justify a period of comprehensive study, experimentation and evaluation.

Force 2030 has been produced at a time when the regional strategic balance may be tilting in favour of East Asia, and the White Paper contains some evidence of equivocation in the main strategic judgments, particularly in respect of China. While China is seen increasingly as a trading partner with which Australia shares a range of economic interests, there is also growing concern over unresolved ambiguities in China's strategic policies. Chinese rhetoric and willingness to engage is welcome, but newly revealed Chinese weapons programs threaten to undermine a common interest in the security of the sea lanes of communication and increase the risk of incidents at sea or worse.

In addition, by 2025 most of the Royal Australian Navy's current surface force will be at, or approaching, life of type. A large part of the fleet will have been operating at a high operational tempo for some two decades, with all of the implications that this has for wear and tear. Indeed, if the current tempo is sustained, decisions about the surface combatant fleet may have to be brought forward.

Looking beyond 2030, Australia will be facing a period of block obsolescence not unlike that it faces now. Thus, replacement surface combatants will remain a high priority if capability and availability are to be assured in the time-frame under consideration in this study.

Finally, while some of the key requirements for the frigates, such as a focus on anti-submarine warfare, are spelt

out in the White Paper, many elements of the logic, strategy and resource allocation have yet to be determined. In particular, the need for a fourth Hobart Class Air Warfare Destroyer and the factors bearing upon a functional specification for the Offshore Combatant Vessel and Future Frigate require further study.

The Kokoda Foundation hopes that this paper will assist in presenting the main issues in a way that will encourage informed commentary and debate. The purpose of this study has been to examine influences on and options for the shape and size of Australia's future surface combatant force in light of the capability priorities identified in *Defending Australia in the Asia Pacific Century: Force 2030*, the Defence White Paper 2009.

Kokoda Foundation Research Focus

The primary issues addressed by the Kokoda Foundation research include the following:

- The nature of the maritime operational environment in 2025-2050.
- The maritime roles and surface combatant tasks likely to be required.
- The impact of technological change on surface combatants and their operations.
- The range of options for future frigates and destroyers.
- The key drivers for the surface combatant force.
- The demands on and implications for the future of naval construction, repair and maintenance in Australia.

Kokoda Foundation Methodology

The Kokoda Foundation's approach is to:

- conduct background research on key issues and evaluate the available literature,
- establish close links with key government and non-government stakeholders, and
- organise closed workshops to discuss key issues in depth.

The workshops are undertaken under the Chatham House Rule with informed participants selected with the assistance of stakeholders. The participants are free to use the information received during workshops but neither the identity nor the affiliation of speakers, nor that of any other participant, may be revealed.

Participation varies between workshops to ensure that the Kokoda Foundation draws upon the full range of expertise available within each of the stakeholder groups. At each workshop, selected participants are invited to present a short working paper, followed by open discussion.

The study does not draw upon official documentation not already in the public domain. No classified material was either sought or employed in the preparation of this paper.

The Force 2030 Surface Combatant Force

In *Force 2030*, the Australian Government makes an explicit commitment to enhancing Australia's maritime capabilities. The Government has undertaken to:

...double the size of our submarine force (12 more capable boats to replace the current fleet of six Collins Class submarines), replace the current ANZAC class frigate with a more capable Future Frigate optimised for anti-submarine warfare; and enhance our capability for

offshore maritime warfare, border protection and mine countermeasures.¹

Further reading of *Force 2030* reveals that the surface component of the maritime capabilities under consideration consists of three classes of surface combatants, described in various levels of detail, although not in any single location in the 2009 Defence White Paper. These classes are:

- Air Warfare Destroyers,
- Future Frigates, and
- Offshore Combatant Vessels.

Although generally understood in the current context, the term surface combatant is likely to evolve during the period covered by this study. Where the term may once have been applied to major fleet units, in the future it is likely to apply to any naval platform (or combatant) that operates on the surface of the sea as part of their normal mode, regardless of size.

For those less familiar with the details of the maritime environment, Annex A outlines some of the factors affecting the key decisions on the platform options for the surface combatant fleet and Annex B outlines the characteristics of a number of vessels that indicate trends in naval design. The vessels identified in Annex B may not have characteristics that precisely match the capability requirements of the Force 2030 surface combatant force. For instance, ships such as the US Littoral Combat Ship will be middle aged designs when the first Future Frigate design is finalised. However, the vessels depicted may assist in visualising future trends and the options that may be available within the planning horizon of the Defence White Paper 2009.

¹ Australia. Dept. of Defence, *Defending Australia in the Asia Pacific Century :Force 2030 : Defence White Paper 2009 / Dept. of Defence* ([Canberra]: Dept. of Defence, 2009), 64, http://www.defence.gov.au/whitepaper/docs/defence_white_paper_2009.pdf

AIR WARFARE DESTROYERS

The Air Warfare Destroyer Program is an existing program to build three Hobart Class Air Warfare Destroyers. The Government proposes to enhance the air defence capabilities of the Hobart Class Air Warfare Destroyer, by equipping them with the Standard Missile 6 (SM-6) long-range air defence missile and a Cooperative Engagement Capability (CEC). It is also proposed to broaden the fleet's strategic strike options, by fitting maritime-based land-attack cruise missiles to the Hobart Class Air Warfare Destroyer. Of interest in the context of this paper is a commitment to assess the need for a fourth Air Warfare Destroyer in the future against further changes in the strategic setting.

FUTURE FRIGATES

The Government has also committed to acquire a fleet of eight new Future Frigates optimised for anti submarine warfare operations. These frigates will be larger than the 3,600 tonne ANZAC Class ships that they replace. The proposed frigate design will include an integrated sonar suite, part of which will be long-range active towed-array sonar. Moreover, it will be able to embark both helicopters and unmanned aerial vehicles (UAV). It is also proposed to fit sea-launched land-attack cruise missiles to the Future Frigate.

It is assumed that, like the upgraded ANZAC ships, the Future Frigates will have weapons systems to defend against threats from incoming missiles and close-range asymmetric threats such as high speed boats equipped with heavy weapons.

OFFSHORE COMBATANT VESSELS

The most interesting, and possibly controversial, proposal in *Force 2030* may be the decision to rationalise the Navy's patrol boat, mine counter measures, hydrographic and oceanographic forces into a future single modular multi-role class of around 20 Offshore Combatant Vessels. These new

vessels are described as having a displacement of up to 2,000 tonnes, much larger than the current Armidale Class Patrol Boats which displace 305 tonnes. The White Paper does not address the issue of significantly upgraded facilities that might be required to operate vessels of this size from bases in Darwin and Cairns, especially if a modular payload is adopted.

The White Paper concept for the Offshore Combatant Vessel relies on the use of modular unmanned underwater systems for both mine countermeasures and hydrographic tasks. These systems are envisaged to be containerised and portable modules capable of being used in any port or loaded onto any of the Offshore Combatant Vessels or other suitable vessels.

The future Offshore Combatant Vessel will be able to undertake offshore and littoral warfighting roles, border protection tasks, long-range counter-terrorism and counter-piracy operations, support to Special Forces, and missions in support of security and stability in the immediate neighbourhood. Defence will examine the potential for these new ships to embark a helicopter or UAV, to allow a surge in surveillance and response capabilities without the need to deploy additional ships.

DESTROYERS, FRIGATES AND OFFSHORE COMBATANTS

The replacement surface combatant fleet will be substantially more capable than the current force which consists of four Adelaide Class frigates derived from the United States Navy Oliver Hazard Perry (FFG7) class, and eight ANZAC Class frigates, derived from the German MEKO 200 design. The current Armidale Class Patrol Boats are too lightly armed to fit the definition of a surface combatant used in this paper, although the Huon Class Minehunter Coastal might meet some of the requirements.

The White Paper introduces new terminology for the future surface combatant force in the form of the Offshore Combatant Vessel. There is no doctrinal definition for an

Offshore Combatant Vessel, although there are many examples of minor warfare vessels that might fit the general characteristics of the vessel described in the White Paper.

The Offshore Combatant Vessel is to be a multi-role vessel that could be classified as a large patrol craft or corvette, depending on a level of capability yet to be determined in the light of an evolving threat environment and the balance to be struck within the overall fleet. It is likely to be of an innovative and modular design and may employ an advanced hull form and exotic materials in its construction.

The terms frigate and destroyer are used in a more or less doctrinal sense, although this is not necessarily helpful in that in modern usage there is a large overlap between ships described in these terms.

In NATO terminology, a frigate is a general purpose escort vessel designed to provide air, surface and undersea defence to naval forces and convoys. It is capable, if required, of conducting sustained independent operations to achieve a variety of missions.²

A destroyer, on the other hand is a high speed warship designed to operate offensively with strike forces, with hunter-killer groups, and in support of amphibious operations. Destroyers also operate defensively to screen support forces and convoys against submarine, air and surface threats.

So, the term destroyer is generally used to describe larger and more capable ships, perhaps optimised for air warfare, and the term frigate is normally applied to smaller but still versatile ships, perhaps optimised for anti-submarine warfare. But the terms are used more or less interchangeably. The ships proposed for *Force 2030* are multi-purpose ships, different mainly in the balance struck between systems required for different roles and tasks, and the technological maturity of the systems they carry at launch.

² The ship abbreviations used in this paper conform to the hull classification symbols of the United States Navy, where FFG stands for Guided Missile Frigate, and DDG for Guided Missile Destroyer.

For example, the Hobart Class Air Warfare Destroyer will be the most capable anti-submarine warfare platform in the Australian fleet when introduced into service during the coming decade. Yet it is possible that the Future Frigate will benefit from technological developments in radar, command and control and missile technology to provide greater air defence capability than the Air Warfare Destroyer when it is introduced into service a decade later.

The addition of a sea launched cruise missile land attack capability will lead to an increase in size for all of the main classes of future surface combatants, as the cells required for land attack will necessarily be additional to those required for platform and task group survivability.

New Force 2030 Surface Combatant Force Capabilities

In addition to the characteristics of the individual platforms, *Force 2030* describes a maritime force that is generally more capable in undersea and anti-submarine warfare, surface warfare, air defence and strategic strike. These are among the capabilities which the Australian Government assessed as requiring particular attention for securing Australia's strategic interests. Although implied by earlier investment decisions, two areas identified by the Government stand out as explicit new roles for *Force 2030* maritime forces:

- Strategic Strike, and
- Force Projection.

STRATEGIC STRIKE

The long-range land-attack missiles to be fitted to the Hobart Class Air Warfare Destroyer and Future Frigate will be new capabilities for the surface combatant force, and are likely to complement greatly improved naval gunfire support of increased range and lethality. For example, a Tomahawk land attack cruise missile will be able to deliver a 1000 pound

warhead within a few metres of a target at a distance of more than 1600km. These systems will enable land strike operations against various strategic and operational military targets, such as an adversary's operating bases, staging areas and critical military infrastructure.

FORCE PROJECTION

The surface combatants will also be an integral part of future task groups based on amphibious and sea-lift ships that will provide Australia for the first time with the ability to project significant military power throughout Australia's primary operational environment and beyond.

BALLISTIC MISSILE DEFENCE

A third category of new capability requirements, not yet identified as a new role, may also influence decisions on future generations of surface combatants. There may be a requirement to include ballistic missile defence capabilities to counter weapons of mass destruction. It is notable that the Hobart Class Air Warfare Destroyer already has growth potential in this area.

The Maritime Environment 2025-2050

In important respects, the 2009 Defence White Paper is the first strategic policy document that attempts to overturn the conceptual framework in which Australian security planners have been operating since the mid 1970s.

The typical approach to national security planning during the post-Vietnam era has been to extrapolate current trends and to develop a view of 'most-likely future world'. Such an approach relied on a degree of continuity in world affairs and for change to be slow and predictable.

This enabled policy makers to structure forces on the relatively narrow basis of a likely future, confident that any major change would be preceded by sufficient warning to allow timely and effective adjustments.

In this environment, the Australian strategic community embraced an assortment of comfortable assumptions about national security in relative academic, bureaucratic and political isolation.

These assumptions included the advantages derived from Australia's strategic geography, the powerful US military presence in the Western Pacific region, the preoccupation of the middle powers in Southeast Asia with internal security, and the useful margin of conventional military capability possessed by Australia.

In a significant departure from the defence orthodoxy of that previous era, the 2009 Defence White Paper appears to acknowledge and plan on the basis of strategic uncertainty and the pace of strategic change. *Force 2030* comprehends the possibility that the maritime predominance of the United States and its allies will be challenged, at least in the Western Pacific, and that the margin of conventional superiority possessed by Australia will be eroded by new asymmetrical threats.

It is possible that for the first time in a generation, decisions made in Canberra might have real consequences for Australia's national security. So, decision makers need to get them right, and develop a structure for assessing risks on a regular basis. The new approach to regular periodic reviews and quinquennial White Papers provides a useful framework for ongoing risk assessment.

GEOGRAPHY

When the 1972 Australian Defence Review stated that 'geography has been a compelling influence on Australian security' it did so with the assurance that 'dominant sea and air power was possessed by friendly powers.'³ It is likely that this will continue to be the case but it is no longer as certain as it once might have been.

While the 2009 Defence White Paper confirms a maritime strategy as an enduring feature of Australia's strategic outlook and a sensible response to Australia's strategic geography, the maritime strategy that it embraces is much broader than its predecessors. No longer limited to the geographic determinism and the sea denial strategy of a previous generation, the surface combatant component of *Force 2030* will be able to establish sea control at a distance from Australia when deployed on joint and combined task group operations.

Most analyses of the future maritime environment suggest that in important respects it will be similar to the current environment. Still, there are four main uncertainties in the emerging strategic landscape which might have large consequences:

- the fragility of favourable trends in South and Southeast Asia;
- continuing instability in the South West Pacific;

³ Australia. Dept. of Defence, *Australian defence review* (Australian Government Publishing Service, 1972) page 3

- the possibility of relative US decline, at least in the Western Pacific; and
- ambivalence about the rise of China and its implications.

SOUTH AND SOUTHEAST ASIA

There are many positive signs in Australia's relationship with South and Southeast Asia and it is difficult to see a direct threat to Australian sovereignty arising from within this region in the period covered by this paper. On the other hand, some of the lesser contingencies that could arise could nonetheless be quite demanding.

One of the most striking features of the region is a common interest in stability and a desire to cooperate in dealing with contingencies at the lower end of the conflict spectrum. This is reflected in the high level of engagement being sought by regional navies with the Royal Australian Navy, indicating an appetite for the framing of new strategic relationships.

On a particularly positive note, there seem to be real prospects for a deepening relationship with India that potentially provides balance to the strategic ambitions of East Asian powers. This is substantiated by the growing support for the new Indian Ocean Naval Symposium, modelled on the similar grouping that has been operating in the Western Pacific for some two decades. These Symposia provide a mechanism for regional chiefs of navy or other maritime agencies to consult on matters relating to maritime security with a view to arriving at agreed courses of action.

Security cooperation between Australia and Indonesia is also becoming more broadly based, with increasing cooperation across a range of humanitarian assistance, resource, and border protection activities. The relationship has been enhanced by the Lombok Treaty, which provides a

unique treaty-level framework for addressing traditional and non-traditional security challenges.⁴

However, there may still be weaknesses in Australia's understanding of strategic cultures in the broader region. Australia's diplomatic presence in the region could be strengthened, and there may be a case for Defence to develop a more refined engagement strategy, with Navy playing a lead role.

SOUTHWEST PACIFIC

Events in the Southwest Pacific carry few of the fundamental security risks of events in East and Southeast Asia. However, continuing economic weakness and political instability pose continuing challenges to Australian planners. The threats of climate change and rising sea levels increase concerns about the human costs of failed states and the effects of extreme weather conditions.

The Southwest Pacific is an area of deep historical, political and cultural ties as well as the destination of significant Australian investment. There is a strong expectation that Australia will be able to respond to crises in this region quickly and effectively.

THE UNITED STATES

There can be a mistaken tendency by some commentators to write the US out of the Western Pacific. Pessimistic assessments of US naval capabilities in the region often underestimate three things:

⁴ The *Agreement between Australia and the Republic of Indonesia on the Framework for Security Cooperation* (Lombok Treaty) was signed by Foreign Ministers in Lombok on 13 November 2006. Australian Foreign Minister Stephen Smith and Indonesian Foreign Minister Dr Hassan Wirajuda exchanged notes on 7 February 2008, bringing the treaty into force. The Treaty provides a legal framework for dialogue on a wide range of issues relating to defence, law enforcement, counter-terrorism, intelligence, maritime and aviation security, the proliferation of weapons of mass destruction, and emergency management and response.

- The long standing naval tradition and deep understanding of maritime affairs that will inform research, development and capital investment by the United States in maritime capabilities.
- The presence of major US allies in the region, notably Japan, Korea and Australia, all of which already have advanced naval capabilities of their own and are investing heavily in future maritime capabilities.
- Economic, demographic and geographic constraints on any prospective peer or regional competitor in the first half of the 21st century.

Furthermore, the US has clearly reaffirmed its commitment to regional engagement. While US economic leadership may arguably be under some threat over the longer term, it retains much broader ideological and cultural appeal than any prospective competitor. For the most part, regional states are comfortable with US security guarantees and Washington's well practised leadership.

Not even China would want a precipitous withdrawal of US power from the region. The classical realists in Beijing would not want to upset the balance of forces that has allowed them to concentrate on social and economic reform ahead of military modernisation. For the foreseeable future it will be US and allied naval power which secures the sea lines of communication to vital energy and raw material supplies in the Middle East, Africa, South America and Australia.

CHINA

China has a term 'harmonious oceans', and a seemingly genuine willingness to collaborate and to develop a brotherhood of mariners. There are indeed a great many common interests in the security of the sea lines of communication. The free flow of trade between Australia and China is a shared interest that suggests an opportunity for constructive engagement.

Furthermore, there are good prospects for the peaceful resolution of unresolved sovereignty claims in the region. While there is widespread regional hope that China will move to engage constructively in cooperative security arrangements, deep concerns remain about Chinese strategy, in particular:

- the possibility that Beijing will make more muscular use of its growing military power,
- the destabilising effect of the deployment of new Chinese asymmetrical sea-denial capabilities in the East and South China Seas, and
- the risk of the proliferation of these emerging technologies if the Chinese economy falters.

Indeed, Chinese technological and naval developments are already threatening to undermine Chinese diplomatic efforts aimed at presenting a peaceful and non-threatening image to the region and to the world.

Uncertainties about Chinese intentions have led to a consensus amongst Australian strategic planners that the South China Sea will be a bellwether in helping to judge how China will use its emerging sea power and how regional states will react.

IMPLICATIONS

Notwithstanding a range of benign trends in the regional security environment, one of the more important judgments that appear to have been made in framing the White Paper is that conventional war will continue to be the most important role and force structure determinant for the ADF. If this seems unsurprising, then it should be remembered that perhaps half of the world's navies are structured on the basis of lesser contingencies, including the navies of several regional states.

An equally important inference is that national security planning will have to confront continuing and possible growing uncertainty in the strategic environment. Great forces are at

work across the Asia-Pacific-Indian Ocean region, and it is not yet clear how these will play out.

In the complex and unpredictable maritime security environment in which Australia will operate, it will be desirable to be able to move quickly from one end of the threat environment to the other. There will be a need to undertake concurrent roles and to be able to shift seamlessly up and down the conflict spectrum. There will be challenges in developing capacities to respond quickly to technological and geo-political change.

It is difficult to imagine major maritime operations at the upper end of the threat spectrum that will not be conducted within the framework of the alliance with the United States. Nevertheless, there will also be a large number of challenges short of conventional war that Australia will face either independently or in regional coalitions, possibly in a leadership role, with all of the implications that this has for the future surface combatant fleet.

Maritime Roles and Tasks

The utility of surface combatants in the maritime security environment of 2025-2050 derives in large measure from the wide range of roles and tasks that they can perform in support of Australia's national interests.

Australia is a maritime nation in a region comprising large expanses of open ocean to the east, south and west, and a complex of archipelagic, island and littoral states to the north. The region to the north contains the greatest cluster of strategically significant maritime straits in the world. The economic contribution by way of trade and resource endowment underpins Australian prosperity and Australia's growing integration in the economic and cultural life of the broader Asia Pacific region.

The vital contribution of the sea to Australian prosperity and cultural identity are accompanied by significant challenges for maritime forces. Enforcing good order at sea, especially in Australian territorial waters, is clearly a priority of government, with an expectation that Navy will play a leading role. The challenge of ensuring good order at sea is made more difficult by sharpened community expectations of the ability of maritime forces to be at all places on the surface of the ocean at all times, and to operate with an appropriate level of force or restraint as required under extremely demanding conditions.

AUSTRALIA'S MARITIME JURISDICTION

Maritime forces operate in an increasingly challenging jurisdictional environment as a consequence of changes to maritime law, in particular the 1982 United Nations Convention on the Law of the Sea.⁵

⁵ The Third United Nations Convention on the Law of the Sea is the international agreement that resulted from the third United Nations Conference on the Law of the Sea, which took place from 1973 through 1982. The Law of the Sea Convention defined the rights and responsibilities of nations in their use of the world's oceans, establishing

The conventions put in place limit the activities but not the movement of maritime forces through the region to Australia's north. On the other hand, they also impose considerable responsibilities within Australia's maritime jurisdictional zones. No other nation confronts a larger or more complex combination of littoral and economic zones. The growing complexity of international law means that while old tasks seldom disappear, new ones keep developing.

AUSTRALIA'S MARITIME ROLES AND TASKS

This paper employs the terminology in common usage in Western naval literature, in which the basic tasks of middle power navies are described as being to conduct sea control, sea denial and power projection missions:

- **Sea Control.** Sea control is the ability to use the air and sea for your own purposes, and to deny that use to an adversary. It is generally limited in time and space, often in terms of a specific operation or campaign.
- **Sea Denial.** Sea denial is a related but more restricted concept in which an adversary is denied the ability to use an area of the sea for his own purposes for a period of time. But it does not imply the unrestricted use of the sea for friendly forces, and it does not ensure the safe conduct of trade and other economic activities.
- **Power Projection.** The ability to deliver force *from the sea* is called power projection, and it represents a particular objective of sea control. The level of power can be implied or threatened, as well as asserted. Used skilfully, power projection can be major source of persuasion against littoral states.

guidelines for economic activities, the environment, and the management of marine natural resources.

Maritime forces are highly versatile elements within the total force that have a unique range of applications over a wide span of operations, commonly falling into three roles.

- **Diplomacy.** Diplomatic tasks derive in large degree from the instrumental value of naval forces. Navies can exercise freedom of navigation to achieve a presence denied armies and air forces in situations short of war. They can be used for strategic objectives ranging from coalition building to coercion in ways denied to land power other than in the case of contiguous states. Naval vessels are also emblematic of the wealth and technological achievement of their flag nations
- **Constabulary Operations.** Constabulary operations are those that operate within a framework provided by Australian domestic and international law. They encompass defence force aid to the civil power and community, border protection, environmental and resource management and protection, anti-piracy operations, disaster relief, fisheries protection and quarantine operations and search and rescue.
- **Warfighting.** As is clear from *Force 2030*, high end warfighting continues to be seen as the core task for the Navy, and surface combatants will continue to be central to Australia's maritime capability. It is the capacity for operations at the more demanding end of the conflict spectrum, both real and perceived, that underpin a navy's effectiveness in less demanding diplomatic and constabulary tasks.

WHITE PAPER 2009 ROLES AND TASKS

The Defence White Paper 2009 is unambiguous in stating that the primary obligation of *Force 2030* is to deter and defeat attacks on Australia, with deterrence a fundamental idea behind the range of capabilities specified in the proposed surface combatant fleet and the task groups that they form

with other force elements including amphibious ships and submarines. The grand strategy is described as ‘a fundamentally maritime strategy, for which Australia requires forces that can operate with decisive effect throughout the northern maritime and littoral approaches to Australia, and the ADF’s primary operational environment more generally.’⁶

The strategy is described as ‘a proactive one in which we seek to control the dynamics of a conflict, principally by way of *sea control* and air superiority, and also by defeating hostile forces in their bases, in staging areas, or in transit.’⁷ Where necessary, Australia will use *power projection* in the form of strategic strike and land operations along the maritime approaches in support of that strategy.

Beyond this high end requirement, the Defence White Paper 2009 also requires forces appropriate to the full range of *constabulary* and *diplomatic* functions, including domestic security and emergency response efforts. Some of these roles will involve the provision of support to other services and agencies. Maritime forces may be required to support stability and security operations in the South Pacific and East Timor, in which the predominant ADF contribution might be land forces. Other roles will exploit the unique responsiveness of maritime forces for contributions to military contingencies in the wider Asia-Pacific region and in support of global security.

For these roles and tasks, *Force 2030* is required to provide:

...major surface combatants (destroyers and frigates), submarines and other naval capabilities, supported by air combat (for air superiority and maritime strike) and maritime surveillance and response assets’ ‘to establish sea control, and to project force in our maritime

⁶ Australia. Dept. of Defence, *Defending Australia in the Asia Pacific century: Force 2030 : Defence white paper 2009 / Dept. of Defence* ([Canberra]: Dept. of Defence, 2009), http://www.defence.gov.au/whitepaper/docs/defence_white_paper_2009.pdf.

⁷ Ibid.

environment (including for the purposes of maintaining freedom of navigation, protecting our shipping, and lifting and supporting land forces).⁸

In many respects the emerging operating environment is likely to be fluid and uncertain, the maritime equivalent of US Marine Corps General Charles Krulak's 'Three Block War', in which soldiers may be required to conduct full scale military action, peacekeeping operations and humanitarian relief within the space of three contiguous city blocks. In the maritime sphere, the surface combatant force will need to be able to move quickly from diplomatic through constabulary operations to high end conflict, and back again, with parts of the fleet performing all three roles simultaneously.

⁸ Ibid.

The Threat Environment

It is clear that surface combatants will face new more serious threats in the maritime environment of 2025-2050. These vessels' survivability in some low probability but highly consequential scenarios at the upper end of the threat spectrum may well be problematic. This is a result of both developments in the threat environment and developments in the defensive measures to counter these. This section deals with the first of these two issues, the emerging threat environment of 2025-2050.

There is significant maritime modernisation underway in Australia's region and most of these developments are welcome. Improved regional surveillance and naval combatants now offer greater scope for effective constabulary operations, restricting the scale of criminal activities ranging from people smuggling to piracy. Much of the constabulary activity is cooperative, including the joint patrols by Australia and Indonesia in the resource zones which lie between the two countries, and joint operations by Thailand, Malaysia, Singapore and Indonesia in the Straits of Malacca which have reduced attacks to a quarter of the more than 200 recorded in the year 2000.

Some regional developments are unsettling. China was not identified as a threat in the 2009 Defence White Paper, and on current evidence there is no reason to believe that it will become one. Nevertheless, there has been sufficient speculation in the media about how China might pose a future destabilising influence to justify a closer look at the possibilities. There has been a series of slow revelations over the past two or three years about developments in Chinese military capabilities that raise questions about the strategic intentions of some in the People's Liberation Army over the period 2025-2050.

While there have been promising signs in Chinese military diplomacy, until an apparent disconnection between Chinese declaratory strategy and its developing force structure is fully explained, it is prudent to contemplate some as improbable but still highly consequential futures. Some of these might have significant implications for the composition and disposition of *Force 2030* and the future surface combatant force.

There may even be a question as to the future viability of large scale forces operating on the surface of the sea, at least in the littoral regions to Australia's north. This argument is given considerable weight by the US decision to limit the DDG-1000 program to three ships and to increase the deployment of ships with extended range air and ballistic missile defences.⁹

While Chinese concerns about the security of the sea lines of communication and its maritime approaches may be legitimate, the way that China is moving to secure these may prove to be unhelpful and may progressively increase the risk of future misadventure or inadvertent and uncontrolled escalation.

SEA CONTROL AND POWER PROJECTION

Since the 50th anniversary of the People's Liberation Army Navy, China has been considering the development of a true power projection capability and the ability to conduct precision strike beyond the first island chain that bounds the maritime approaches to China (see Figure 1). This strategy would rely on the conventional measures of maritime strength including large surface combatants and carrier borne aviation.

⁹ In a Statement before the House Subcommittee on Appropriations on FY10 Department of Navy Posture on 3 June 2009 US Chief of Naval Operations, Admiral Gary Roughead reported that ballistic missile capability is proliferating at an increasing pace, and that non-state actors are also acquiring advanced weapons as demonstrated by the 2006 attack by Hezbollah on an Israeli corvette. Accordingly, Navy decided to truncate the DDG-1000 program at three ships and to restart the DDG 51 production line.



Figure 1. Sea-Denial Capabilities.

The People's Liberation Army's conventional forces are currently capable of striking targets well beyond China's immediate periphery. Not included are ranges for naval surface- and sub-surface-based weapons, whose employment at distances from China would be determined by doctrine and the scenario in which they were employed. After the Report to the US Congress on the Military Power of the People's Republic of China, 2009

<<http://www.defense.gov/pubs/pdfs/070523-China-Military-Power-final.pdf>>.

Towards this end, the People's Liberation Army Navy is beginning experiments with a former Soviet carrier currently deployed with the northern fleet, and increasing its modern experience of distant deployments with a welcome contribution to anti-piracy operations off the coast of Somalia.

It will be a generation before Beijing can rely on the conventional instruments of sea power to stare down Washington and the Western alliance system if that is the objective. This reality is acknowledged by those Chinese scholars who argue that the development of a power projection capability under current circumstances could lead to confrontation before the People's Liberation Army Navy is ready.

Furthermore, the Chinese economy may not yet be in a position to support the sustained investment that would be required for a blue-water fleet without diverting much needed resources away from the problems confronting civil society and more pressing domestic security concerns or peaceful programs designed to enhance Chinese prestige such as the Chinese lunar exploration program.

SEA DENIAL

At its current state of development, China has nevertheless demonstrated the economic and technological strengths required to develop a potentially effective if destabilising strategy of sea denial in the East and South China Seas by employing a range of asymmetric technologies and tactics, including:

- Anti-Ship Ballistic Missiles,
- Anti-Ship Cruise Missiles, and
- Modern Conventional Submarines and Undersea Warfare.

This approach may fit more closely with a national security strategy dominated by the People's Liberation Army.

Historically a continental power, China could be expected to want to insulate its land power from the maritime strengths of its strategic competitors on both sides of the Pacific, while maintaining a capability to project sufficient force to support its policy of coercive diplomacy towards Taiwan.

In addition, an efficient sea denial capability might be seen as helpful in reminding countries with overlapping territorial claims in the South China Sea of China's strategic potential. Vietnam, Malaysia, Indonesia and the Philippines might be encouraged to settle any residual claims on terms favourable to China before an asymmetric capability complemented by modest naval patrols and investments in ports and facilities on Hainan Island undermined the reassurance provided by a Western naval presence.

ANTI-SHIP BALLISTIC MISSILES

One of the more remarkable recent Chinese developments is the testing and planned fielding of anti-ship ballistic missiles. Much of the information available in the public domain was published in March in the Annual Report to US Congress on the Military Power of the People's Republic of China 2009.¹⁰ This added to evidence of capabilities implied by congressional testimony during 2008 and considerable speculation in open source literature including the prestigious journal of the US Naval Institute, *Proceedings*.

The main focus has been on the development of a maritime strike version of the CSS-5/DF-21 Intermediate Range Ballistic Missile. The DF-21 variant in question is a truck mounted solid fuel rocket with a range approaching 2000km. Various reports suggest it may be equipped with

¹⁰ The US FY2000 *National Defense Authorization Act (Section 1202)* directs the Secretary of Defense to submit a report "...on the current and future military strategy of the People's Republic of China. The report addresses the current and probable future course of military-technological development on the People's Liberation Army and the tenets and future development of Chinese grand strategy.

control surfaces for mid-course and terminal manoeuvring, and a form of terminal guidance and target recognition.

If this is the case, then during a typical mission the trajectory might be updated by already deployed networks of strategic over the horizon radars and space based sensors before terminal guidance and automated target recognition are used to complete target acquisition (see Figure 2).

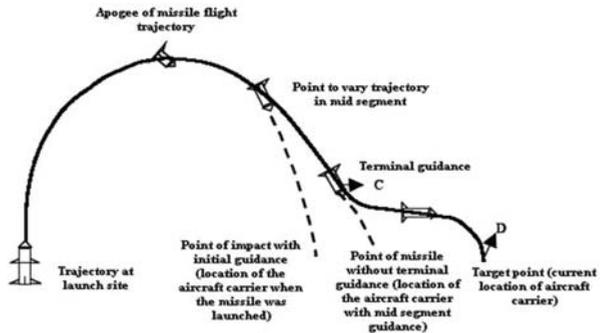


Figure 2. Missile Trajectory - Mid-course and Terminal Manoeuvring. Source: Report to US Congress on the Military Power of the People's Republic of China 2009.

The deployment options are not fully clear, but there are suggestions that an anti-ballistic missile force consisting of two brigades equipped with a total of more than 200 launchers might be planned. The total capital cost of a deployed system could be less than that required to put a single former Soviet aircraft carrier to sea with a complement of aircraft. There are also suggestions that a capability might be ready for test or demonstration within two or three years.

Neither the United States nor its allies have an anti-ship ballistic missile comparable to the CSS-5/DF-21 under development for the Second Artillery Force. A somewhat similar weapon to the CSS-5, the Pershing II, was abandoned with the signing of the Intermediate-Range Nuclear Forces

Treaty between Washington and Moscow in 1987¹¹, and exports of comparable systems are subject to the Missile Technology Control Regime.¹² Beijing is a signatory to neither agreement, although it is committed to the second.

The possibility that China has made progress in developing an effective anti-shipping capability should not be underestimated. Institutions associated with the Second Artillery Group have published articles that suggest confidence in the concept, and significant progress towards its realisation.

The People's Liberation Army Navy literature, on the other hand, tends to recognise the difficulties of locating and tracking a carrier battle group in the open ocean when it talks of deterrence, demonstration and mission kill rather than platform kill when armed with a conventional warhead.¹³

Nonetheless, it can be inferred that the US Navy considers that the threat from a launch without warning may be sufficient to deter task groups not protected by Aegis equipped guided missile cruisers and destroyers. As of the writing of this report, Australia has committed to building only three vessels with the potential to defend against such threats, and none as yet are

¹¹ The *Intermediate-Range Nuclear Forces Treaty* (INF) is an agreement between the United States and the Soviet Union signed in Washington by U.S. President Ronald Reagan and General Secretary Mikhail Gorbachev in December 1987, and ratified the following year. The Treaty eliminated nuclear and conventional ground-launched ballistic and cruise missiles with ranges between 500-5,500 km. The treaty is formally titled *The Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Elimination of Their Intermediate-Range and Shorter-Range Missiles*.

¹² The *Missile Technology Control Regime* (MTCR) was established in April 1987 to restrict the spread of unmanned delivery systems for nuclear weapons with a minimum payload of 500 kg and a minimum range of 300 km. In 1992 the scope was expanded to include unmanned aerial vehicles for all weapons of mass destruction. Membership has grown to 34 nations, with 3 additional nations committing to the guidelines unilaterally. The People's Republic of China is not a member of the MTCR but has agreed to abide by the original 1987 Guidelines and Annex, but not the subsequent revisions.

¹³ Mission kill might be achieved by no more than damaging aircraft on carrier decks, sensors, communications, launching gear and control towers. A mission kill does not require destruction of the platform itself.

to be equipped with the SM-3 missile and enhanced combat system, which might form part of the first line of defence against an anti-ship ballistic missile.

There may not have been sufficient evidence of the existence (let alone the strengths and weaknesses of the anti-ship ballistic missile concept to change the surface combatant force in *Force 2030*) but there is clearly sufficient evidence to justify deep reflection on the implications of a successfully demonstrated and deployed system in the lead up to the 2014 Defence White Paper.

ANTI-SHIP CRUISE MISSILES

The threat to surface combatants is not limited to the ballistic threat. Anti-ship cruise missiles built on mature technologies have been widely deployed on aircraft, surface and sub-surface combatants already deployed in the region. Some new technology anti-ship cruise missiles possess very low signatures and attack at supersonic speeds making their interception and destruction by ship-based defences exceptionally difficult.

For example, China now has four Sovremenny class destroyers each equipped with eight SS-N-22 Sunburn supersonic anti-ship missiles, and a dozen stealthy and capable Kilo class submarines armed with the SS-N-27 Sizzler anti-ship missiles.

SUBMARINES AND UNDERSEA WARFARE

There has been growing interest in submarines in the region, although many of the purchases have been of small off-the-shelf designs with limited capabilities, range and endurance.

The Chinese fleet is the largest in the Western Pacific and consists of more than 50 submarines, including five nuclear powered boats, ten improved Kilo class diesel-electric boats, and some increasingly sophisticated nuclear and conventionally-powered domestic designs. Sufficient progress

may have been made in submarine design and operations to enable one of China's submarines recently to surface undetected in the middle of a US carrier battle group.

Beijing is not alone in acquiring modern and highly capable conventional submarines. A Russian business daily reported in April that Vietnam has agreed in principle to buy six Kilo class submarines from the Admiralty Shipyards in St Petersburg. Ironically, the likely strategic intent is to offset superior Chinese surface forces.

There are modest developmental programs in other Southeast Asian states including Singapore (four boats), Malaysia (two), and Indonesia (two). Thailand has also recently expressed interest in acquiring a submarine capability in response to regional developments.

The Japanese fleet of eighteen boats and the South Korean fleet of twenty are highly capable designs, with the Japanese boats having attributes broadly comparable to Australia's current Collins Class submarines.

COMPLEMENTARY CAPABILITIES

Not all of the threats faced by surface combatants are new, and not all employ high technology. Force protection will continue to be an issue in the archipelagic region where extremist groups can easily obtain explosives and fast vessels or aircraft for suicide attacks, and some straits in the region are sufficiently narrow that even infantry weapons can pose a threat to surface shipping and combatants.

IMPLICATIONS

As a consequence of these developments, there are growing questions about the future survivability of surface combatants in the Western Pacific and South China Sea. Within a few years, naval planners might face difficult choices:

- Abandoning traditional missions,
- Accepting the risk of relying on ship-borne defensive systems, or
- Conducting preliminary operations to reduce or eliminate the immediate threat (pre-emption).

The first might be unacceptable to the United States as long as alliance obligations with Japan and other allies in the Western Pacific are to be honoured. The second depends at a minimum on the continuing and successful development of cruise and ballistic missile defences. And the third carries risks that would warrant consideration in only the most extreme circumstances, as it could require electronic and kinetic attacks on the sovereign territory or national systems of a major regional power.

Surface Fleet Options

The apparent tension between the utility of a surface combatant force and an emerging threat environment that raises questions about surface ship survivability can only be assessed in the context of counter measures and broader force structure considerations.

Many of the challenges facing future maritime forces operating on the surface of the ocean are not unique. Some of the weapons and technologies that will make the surface of the ocean a difficult place to operate will have similar consequences for land based facilities such as airfields, ports and harbours, and forward operating bases, especially in northern Australia and the Southeast Asian archipelago.

Indeed, the great endurance of surface combatants means that they can operate from bases in greater strategic depth than for example; the current and planned strike aircraft. Unlike submarines, surface combatants do not have to rely on a relatively small number of vulnerable and highly specialised facilities for support, repair and maintenance. The vulnerability of these facilities and Australia's fixed northern infrastructure to even low technology threats can easily be understood by anyone doing a search of satellite imagery on the internet using a personal computer.

The evidence for the effectiveness of an anti-ship ballistic missile system is as yet inconclusive, at least on the basis of material in the public domain. None of the publicly available literature suggests that the anti shipping ballistic missiles currently under development have the range to reach Australian territorial waters. Australia is already building new surface combatants, the Hobart Class Air Warfare Destroyer, which will have a significant missile defence in the form of the Aegis Combat System and Standard Missile. Australia has options to build more, and to vary the payload to increase the fleet's ballistic missile defensive options.

Historical experience also suggests that a high proportion of cruise missile attacks will fail to either sink or incapacitate vessels because of the small size of the warheads on many conventional anti ship missiles. There may be scope to reduce vulnerability further by adopting some of the ballistic measures that have made land vehicles much more robust. Conventional submarines are greatly constrained by their patrol speeds, payloads, sensors and communications, even before they compromise their positions by taking offensive action.

Any attempt by naval forces to penetrate the Southeast Asian archipelago will confront a potential adversary with other elements of Australia's *Force 2030* including stealthy strike fighters supported by air-to-air refuelling and airborne early warning command and control aircraft and greater numbers of more capable and stealthy submarines. Additionally, attempts to bypass the straits increases the risk of encountering Western naval forces in open seas where the asymmetric threat posed by ballistic missiles and conventional submarines is somewhat reduced.

Nevertheless, Australia needs look no further than the US decision to truncate the DDG-1000 program on account of its lack of a ballistic missile defence to accept that concerns about the future surface combatant force are real and may have large consequences for *Force 2030*.

Following the decision, the US is turning production towards the DDG-51, a multi-mission surface combatant with an emphasis on air defence. Fifteen vessels in the DDG-51 fleet have been armed with upgraded Aegis software and the version of the Standard Missile optimised for ballistic missile defence, the SM-3.

US Defense Secretary Robert Gates recently endorsed this combination in stating that:

...we now have proven capabilities to intercept ballistic missiles with land and sea based interceptors, supported by much improved sensors.¹⁴

The US Chief of Naval Operations has been more specific in testifying that the:

Aegis ballistic missile defence capability...has an impressive record of success: eighteen of twenty two direct hits on target, of which three of three were successful engagements within the earth's endo-atmosphere.¹⁵

FORCE 2030 VARIATIONS

Just as the US Navy has been confronted with difficult choices about the composition of its future surface fleet, Australians now have to consider the possibility that the new capabilities being deployed in Australia's region are 'game-changers'. A response to these changes could require significant, or even radical, changes in the surface combatant force elements in *Force 2030*.

While calls to abandon investment in surface combatants are premature, there will be considerable value in looking at alternative force structures in much greater detail in the lead up to the 2014 and subsequent Defence White Papers. That is prudent planning, and may reveal options that have yet to be fully appreciated.

Importantly, the proposed surface combatant force already takes some account of the threat posed by asymmetrical sea denial technologies. The Aegis system at the core of the Hobart class Air Warfare Destroyer design has significant

¹⁴ US Department of Defense News Briefing by Secretary Robert Gates and General Cartwright from the Pentagon 17 September 2009.

¹⁵ Statement before the House Subcommittee on Appropriations on FY10 Department of Navy Posture on 3 June 2009 by US Chief of Naval Operations, Admiral Gary Roughead.

growth potential for improved ballistic missile defence along lines similar to those adopted by the United States.

It is Australia's self-evident capacity for high end warfighting that underpins its politico-military diplomacy and attempts to shape the security environment in ways that are favourable to Australia and friendly states in the region. So, any decision to move away from large surface combatants is not to be taken lightly.

Figure 3 represents an attempt to map the decision space and show how a mature *Force 2030* will be preceded by three, and possibly four, Defence White Papers. It shows the time available for key decisions and the way intelligence indicators may identify a need to adapt *Force 2030* to more or less desirable maritime security environments.

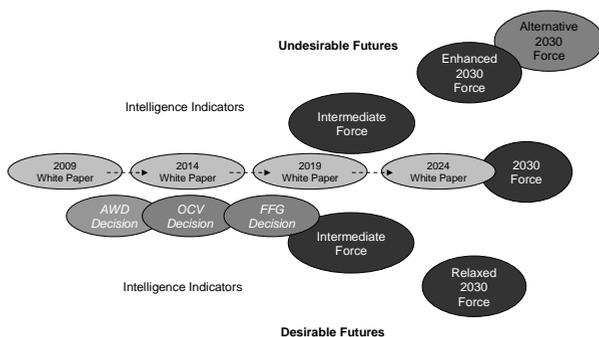


Figure 3. Time Available for Key Force 2030 Decisions.

The Hobart Class Air Warfare Destroyer is the only part of the surface combatant force already in production. There is time for deeper analysis for the remainder of the fleet.

Importantly, there will be two Defence White Papers, in 2014 and 2019, before government confers first pass approval on what is likely to be the largest and most capital intensive component of the *Force 2030* surface combatant force, the Future Frigate program.

The 2009 Defence White Paper provides some high level guidance about the Future Frigate. But a great deal of work is required to confirm the detailed capability requirements and functional specifications of these vessels. Moreover, the Offshore Combatant Vessel exists only as a concept at the time of writing this monograph.

THE NATURE OF MARITIME FORCES

In looking at platform issues, it is important to bear in mind that the strategic centre of gravity for maritime forces will be the fleet, not a particular platform. Survivability will be an integral part of the design, starting with integration into a layered and networked defence system. It is unlikely that a surface combatant will be required to operate outside this system, at least in more demanding conflicts.

It is difficult to imagine the circumstances in which other surface force elements, such as the Landing Helicopter Dock (LHD), could operate in a serious threat environment beyond the comprehensive defensive bubble that only surface combatants can provide on a continuous basis. At any time the LHDs might have embarked a substantial proportion of Australia's combat ready land forces, so the defence of an expeditionary task group will be a national security interest of the highest order.¹⁶

¹⁶ The Canberra Class Amphibious Ship project will provide the Australian Defence Force with the ability to land a force of over 2,000 personnel by helicopter and water craft, along with all their weapons, ammunition, vehicles and stores.

Still, the role of the network in modern warfare does not diminish the role of individual surface combatants as nodes within that system. It is likely that the real estate and electrical power provided by surface combatants will ensure a continuing place as important nodes within that system, especially when deployed to forward theatres.

SURFACE FORCE OPTIONS 2025-2050

The maritime environment, the roles and tasks to be performed in that environment and the design factors affecting new generations of surface combatants, all have implications for the shape and size of the future surface combatant force in *Force 2030*.

Australia has only just begun the detailed analysis of highly complex capability requirements, but the task can better be understood by reducing the path ahead to the consideration of three broad categories of options. Essentially, the capabilities of the future surface combatant fleet can be varied by adjusting:

- the capabilities expected of individual surface combatant classes or platforms,
- the balance between classes within the proposed surface combatant force, and
- the balance between the surface combatant force and the total force.

In reality, successive White Papers are likely to adjust all three in order to optimise the capabilities of maritime forces designed to operate together in joint and combined operations.

For the purposes of this discussion and in the interests of simplicity, the numbers of vessels proposed in the White Paper have been retained, although the White Paper does not reveal the logic underlying these numbers. While these numbers require further analysis and justification they are likely to have been derived in part from the composition of future task groups and the range of independent operations

that might be required. Ideally, these judgments will have been based on extensive experimentation and war gaming.

CAPABILITIES OF INDIVIDUAL SURFACE COMBATANT CLASSES OR PLATFORMS

There are significant methodological problems confronting any attempt to either cost or specify the surface combatant fleet in any detail at this time. Neither the Offshore Combatant Vessel nor the Future Frigate has been through the Australian Government's multiple pass approval process¹⁷.

In the case of the Future Frigate, First Pass may not occur until 2019, at which point approval will be given to the capability requirement, but not specific capability options. The detailed consideration of options will then proceed until Second Pass, at which point the scope is defined and a budget allocated. So, solicitation through a tender process may not begin until beyond 2020, with design to be completed some time after that.

This is too far into the future to make useful cost and capability predictions, and there is little value in looking at existing designs in detail.

The estimation of cost is particularly problematic given the lack of clarity around the capability requirement, itself a consequence of a rapidly changing regional security and threat environment.

There have been some recent attempts to simply extrapolate the cost of major equipments and projects based on historical data. But this approach conceals important lessons for force developers and procurement agencies that can be gained from more careful consideration of the drivers of cost.

¹⁷ Defence Capability Plan 2009, <http://www.defence.gov.au/dmo/id/dcp/dcp.cfm>. p 2.

A significant 2006 RAND study of growth in US Navy ship costs¹⁸ found that economy-driven factors outside the control of government such as labour and material costs gave rise to cost increases roughly comparable to inflation.

The remaining cost escalation derived from customer driven factors that increased design and construction complexity. These factors include the capabilities required from a ship, regulations and standards in shipbuilding costs, and procurement policy.

A statistical analysis revealed that light ship weight and power density (the ratio of power density to light ship weight) correlated most strongly with ship costs. It can readily be seen that ship weight and power density are driven by the systems required to perform maritime roles and tasks.

At the upper end of the threat spectrum, the *Force 2030* Surface Combatant Force will have new roles in the form of strategic strike, force projection, and ballistic missile defence. At the lower end, there will be a more explicit commitment to a broader range of tasks including counter-terrorism and counter-piracy. These expanded roles will necessarily increase the power generation and real estate requirements of the *Force 2030* surface combatant force, and therefore its cost.

The consequences of the new requirements can be hinted at by adding the displacements of all of the ships within the surface combatant force, which might grow from a total of less than 60,000 tonnes in the 2009 force-in-being, to some 100,000 tonnes in the mature *Force 2030*. The displacement of the maritime fleet as a whole is likely to double to some 200,000 tonnes.¹⁹

¹⁸ "Why Has The Cost of Navy Ships Risen?: A Macroscopic Examination of the Trends in U.S. Naval Ship Costs Over the Past Several Decades," Product Page, 2006, <http://www.rand.org/pubs/monographs/MG484/>.

¹⁹ The displacement figures for the current fleet were obtained from the Royal Australian Navy website at <http://www.navy.gov.au/>, while the possible *Force 2030* figures were obtained from the 2009 Defence White Paper (Offshore Combatant Vessel), the Royal Australian Navy website (Air

Notwithstanding these difficulties, the following table is an attempt to put in place a rough guide to the relative size, complexity, and cost of the classes of individual platforms that might be candidates for the surface fleet. Not surprisingly, the greatest range of options may be at the lower end of the capability spectrum, where a reduced emphasis on warfighting might allow the consideration of ships based on innovative commercial designs as well as naval designs.

	AWD	ASW Frigate	General Purpose Frigate	Corvette	Multi Role Vessel	Patrol Boat
Displacement	6000	5000+	5000	2000	1200	500
Power Density	High	High	High	High	Medium	Low
System Complexity	High	High	High	Moderate	Moderate	Low
Cost (\$M)	>1500	1000 - 1500	1000 - 1500	250 - 500	100 - 200	<100

Table 1. A guide to the relative size, complexity and cost of the classes of candidate vessels for the Force 2030 Surface Combatant Force.

AIR WARFARE DESTROYER

The design of the Hobart Class Air Warfare Destroyer program will be finalized by 2010, so here is little scope for major change, at least in the batch currently under contract. So the immediate questions are relatively straightforward.

- Should Australia build a fourth Hobart Class Air Warfare Destroyer?
- Is there scope for an evolution of the existing design to provide a basis for the Future Frigate?

There is a strong case to be made that three Hobart Class Air Warfare Destroyers will be insufficient for protecting Australia’s sea lanes of communication and trade routes. The

Warfare Destroyer), and a modest adjustment to the in-service Anzac to allow for new roles (Future Frigate).

sheer size of Australia's maritime jurisdiction would seem to dictate a requirement for more of these vessels.

A single Air Warfare destroyer deployed with a naval task group might not be able to provide all round air defence in depth, needing additional air defence capabilities from a second Air Warfare Destroyer or a multi-mission Future Frigate with a significant air warfare capability.

Unfortunately, it is too early in the design and build phase of the Air Warfare Destroyer program to be confident that an evolution of the current design would provide a sensible option for the Future Frigate. One factor to weigh is that the Air Warfare Destroyer's propulsion system and standard machinery fit-out has not been optimised for very quiet anti-submarine operations. Nevertheless, the Air Warfare Destroyer will be able to perform a wide range of diplomatic, constabulary and warfighting roles. In particular, the Air Warfare Destroyer will be for some considerable time the most capable surface combatant in *Force 2030* for warfighting at the upper end of the conflict spectrum. The Air Warfare Destroyers will also be a potent symbol of Australia's commitment to national security, and a valuable tool for naval diplomacy.

FUTURE FRIGATE

The Future Frigate program will not receive the final go ahead from government for a decade, so there is substantial scope for changes in the capability requirement and functional specification. At least two major questions need to be addressed:

- Should the Future Frigate be optimised for anti-submarine warfare or a multi-mission frigate with a bent towards air warfare?
- What proportion of the sensors and systems should be placed on the ship, and how much should be placed off board on autonomous and remotely operated vehicles?

The growth in regional submarine fleets would, at first glance, seem to favour the focus on anti-submarine warfare. But there are real questions as to whether a surface combatant is the best way to counter the submarine threat, and the supersonic cruise missiles with which a growing proportion of submarines are armed.

In order to achieve a level of noise reduction required to hunt submarines, some modern anti-submarine warfare frigates employ construction techniques commonly used in submarines themselves, including extensive shock mounting and noise dampening.

These quieting measures can be expensive, and there is some doubt about whether they can be entirely effective on the surface of the sea. With further study, it might be found the margin of investment required for a specialist anti-submarine warfare platform would better be spent on submarines, maritime patrol aircraft, anti-submarine helicopters capable of operating from a variety of less specialised surface platforms, and remotely operated vehicles and systems.

Any conclusions to these questions can only follow a comprehensive net assessment²⁰ of force structure alternatives across a range of plausible scenarios to determine whether it is better to build specialist anti-submarine warfare frigates, or to build general purpose frigates accompanied by a shift in the balance of anti-submarine warfare responsibilities toward other elements of Force 2030.

With regard to the distribution of sensors and systems, there is a suggestion that a future surface combatant might resemble today's light fleet carriers, optimised for the deployment and recovery of unmanned aerial vehicles and other off board sensors and systems. This is because in as

²⁰ Net Assessment seeks to provide a comparative analysis of the military capabilities of potential strategic competitors. For a more complete description of its application to Australian security planning see *The Potential Role of Net Assessment in Australian Defence Planning* by Brice Pacey, Working Paper No. 148. (Strategic and Defence Studies Centre, Australian National University, 1988).

little as ten or fifteen years, unmanned craft might predominate in certain types of maritime operations with surface combatants functioning as nodes and operating bases within a network enabled force.

Looking towards their broader roles and tasks, either a general purpose frigate or a frigate with a focus on anti-submarine warfare will be able to perform a wide range of diplomatic, constabulary and warfighting roles. The number of available vessels, together with their range, endurance and sea keeping, are likely to make these vessels the mainstay of constabulary operations in remote and demanding seas.

Their warfighting roles are likely to include participating in task groups formed for power projection missions, and they will have a major, although not necessarily a lead role in anti-submarine operations as part of measures to prevail against any prospective adversary's sea-denial and power projection capabilities.

OFFSHORE COMBATANT VESSEL

As nominally the least capable vessel in the surface combatant fleet, the Offshore Combatant Vessel may at first glance seem to involve the simplest choices. But the range of options may raise some difficult questions regarding investment priorities.

The 2009 Defence White Paper calls for the Navy's patrol boat, mine counter measures, hydrographic and oceanographic forces to be combined into a future single modular multi-role class of around 20 Offshore Combatant Vessels. In addition, the vessels might be required to undertake offshore and littoral warfighting roles, border protection tasks, long-range counter-terrorism and counter-piracy operations, support to Special Forces, and missions in support of security and stability in the immediate neighbourhood.

They may be required to embark helicopters or unmanned aerial vehicles, to allow a surge in surveillance and response

capabilities without the need to deploy additional ships. Given the broad range of roles, it is not surprising that the vessel is expected to displace up to two thousand tonnes, considerably larger than the current patrol craft they will effectively replace.

The savings thought to be made by using a common hull may, however, prove to be elusive. Constabulary functions can generally be performed quite economically using relatively lightly armed vessels built to commercial rather than military specifications. On the other hand, the costs incurred by enabling a vessel to perform a mine warfare role can be substantial, raising the question of why the entire fleet of twenty vessels should be built to that standard.

Still, the British Ministry of Defence has recently announced a similar program, and the Swedish Navy has been experimenting with related concepts for a decade or more. There are even some conceptual similarities with the US Littoral Combat Ship program, although these are much larger vessels.

There may be options for meeting a slightly more modest range of roles and tasks than those indicated for the Offshore Combatant Vessel at a greatly reduced cost:

- **Replacement Patrol Boat and Specialist Minor Warfare Vessels.** One possible option is to replace the minor warfare vessels in the surface combatant force – the patrol boats, mine hunters and hydrographic vessels – with improved but essentially similar vessels to those in the current fleet. This is likely to be the most economical but least versatile option. A minor warfare fleet structured in this way would have less adaptability, flexibility, endurance and range than the proposed Offshore Combatant Vessel, and prove suitable only for the less demanding constabulary tasks performed by the current fleet rather than the extensive warfighting roles specified by the White Paper.

- **Multi-role Vessels.** The adoption of a multi role vessel built to commercial standards might be a very effective compromise between a patrol boat or corvette option for the Offshore Combatant Vessel. A multi-role vessel based on an Australian fast ferry design, for example, would be larger and more stable than the existing minor warfare vessels and patrol boats, and able to perform a wider range of diplomatic and constabulary functions. But there would need to be an extensive study to assess the warfighting potential of these vessels against the high level requirement for the Offshore Combatant Vessel.
- **Corvettes.** The level of capability currently specified for the Offshore Combatant Vessel is approximately that of a modern corvette. A corvette is a lightly armed warship smaller than a frigate and larger than a patrol boat that can be equipped with small and medium calibre guns, surface-to-surface and surface-to-air missiles, and underwater warfare weapons. Some can accommodate a small or medium anti-submarine warfare helicopter. Corvette class vessels would be able to perform a wide range of diplomatic functions, but would be an expensive option for constabulary operations. Their warfighting capability might prove to be illusory in an increasingly demanding threat environment. Furthermore, studies by the Australian Department of Defence in the mid 1980s found that a much larger vessel is required for sustained naval operations in the sea states encountered in Australia's maritime jurisdiction.

BALANCE WITHIN THE PROPOSED SURFACE COMBATANT FLEET

In addition to changing the capability requirement and specification for individual surface combatants, there is also scope for adjusting the balance between classes within the proposed surface combatant fleet.

Option One

The first option is to continue developing *Force 2030* substantially as envisaged in the 2009 Defence White Paper allowing for some variation as detailed functional specifications and options at the sub-system level become clearer.

It is entirely possible that there will be little variation to the current threat assessment and that operations analysis and experimentation will confirm the major judgments regarding the surface combatant force. It may be assessed that there will be sufficient warning of any new developments to reassure planners that there is no need to vary the surface combatant force ahead of the 2029 Defence White Paper and the Years of Decision for the Future Frigate and the Offshore Combatant Vessel.

In this scenario, it might be possible to limit the Air Warfare Destroyer to three ships, to build either a general purpose or anti-submarine warfare frigate, and to specify the Offshore Combatant Vessel as either a multi-role commercial vessel or a corvette built to naval standards.

	Offshore Combatant Vessel (20)	Future Frigate (8)	Air Warfare Destroyer (3)
Ballistic Missile Defence			
Air Warfare			Specified
Cooperative Engagement			Specified
Surface Warfare	Assumed	Assumed	Contracted
Anti Submarine Warfare		Specified	Contracted
Land Attack		Specified	Specified
Helicopters	TBD	Specified	Contracted
UAV	TBD	Specified	
Mine Clearance	Specified		
Hydrography	Specified		
Oceanography	Specified		

Table 2. Force 2030 and Explicit White Paper Capability Requirements

Option Two

A deteriorating threat assessment and a loss of confidence in warning time may lead to a requirement for a 4th Hobart Class Air Warfare Destroyer and a strengthened Future Frigate and Offshore Combatant Vessel. The Future Frigate might be a derivative or relative of the Air Warfare Destroyer design.

This force structure recognises the role of surface combatants and the need to boost capabilities against asymmetric threats and future conventional threats. But it is based on a judgment that emerging ballistic and cruise missile defensive measures will be sufficient to ensure the future viability of the surface combatant force at a reasonable cost.

In this scenario, it would be desirable to extend the Air Warfare Destroyer program to at least four ships, to build a frigate optimised for air warfare while retaining a substantial anti-submarine warfare capability, and to specify the Offshore Combatant Vessel as a corvette built to naval standards.

	Offshore Combatant Vessel (20)	Future Frigate (8)	Air Warfare Destroyer (4)
Ballistic Missile Defence		<i>New Requirement</i>	<i>New Requirement</i>
Air Warfare		<i>New Requirement</i>	Specified
Cooperative Engagement		<i>New Requirement</i>	Specified
Surface Warfare	Assumed	Assumed	Contracted
Anti Submarine Warfare		Specified	Contracted
Land Attack		Specified	Specified
Helicopters	<i>New Requirement</i>	Specified	Contracted
UAV	<i>New Requirement</i>	Specified	
Mine Clearance	Specified		
Hydrography	Specified		
Oceanography	Specified		

Table 3. Force 2030 adapted to a more demanding threat environment in which regional states have deployed destabilising technologies as indicated and intention for unilateral measures to secure the sea lanes of communication.

Option Three

This force structure recognises a continuing role for surface combatants and a reduced level of concern about asymmetric threats, following favourable trends in the regional security environment. These trends might include, for example, an international agreement to proceed no further with the development and deployment of the more destabilising elements of a sea-denial strategy, particularly anti-ship ballistic missiles, and increased cooperation in the defence of the sea lanes of communication to the mutual benefit of all of the major trading partners in the Western Pacific.

This force structure would require no additional builds, no additional platform capabilities, and a reduced specification for the Offshore Combatant Vessel based on its constabulary rather than warfighting capabilities.

In this scenario, it might be possible to limit the Air Warfare Destroyer program to three ships, to build either a general purpose or anti-submarine warfare frigate without any additional capabilities beyond those already specified, and to respecify the Offshore Combatant Vessel to be either a large patrol boat or a multi-role vessel built to commercial specifications.

	Offshore Combatant Vessel	Future Frigate	Air Warfare Destroyer
	(20)	(8)	(3)
Ballistic Missile Defence Area Theatre			
Air Warfare Point Area			Specified
Cooperative Engagement			Specified
Surface Warfare	Assumed	Assumed	Assumed
Anti Submarine Warfare		Specified	Contracted
Land Attack SLCM NGS		Specified	Specified
Helicopters		Specified	Contracted
UAV	To be determined	Specified	
Mine Clearance	Specified		
Hydrography	Specified		
Oceanography	Specified		

Table 4. Force 2030 adapted to a relatively benign environment in which the threat of interstate conflict has receded and confidence building measures and cooperative behaviour have been strengthened.

BALANCE WITHIN THE TOTAL FORCE

There is potential to look at the scope for adjustments not only at the platform or surface combatant force level, but at the level of the total force, leading to an additional option that could match changes to the surface combatant force to other components of the joint maritime capability.

Option Four

The case for Option Four could follow asymmetric developments within (or leading to) a deteriorating threat environment resulting in a decision to shift the balance in the total force away from surface combatants towards a variety of force structure options including strike aircraft, submarines and maritime patrol aircraft. In this environment it may be judged that even if a defence against new generation cruise and ballistic missiles is feasible, large surface combatants may no longer be a cost effective means of achieving sea control. Sea control may become simply unattainable leaving denial the only realistic, if not entirely satisfactory, alternative.

Should the defensive measures prove insufficient it may be necessary to make more substantial adjustments to *Force 2030*, perhaps by reducing the traditional role of large surface combatants in the seas to Australia's north, while retaining a sufficiently large surface combatant force to operate in the open ocean areas to the east, south and west. The elements of this alternative future force might include a greater reliance on:

- an expanded fleet of maritime patrol and strike aircraft,
- an increase to the submarine fleet,
- unmanned vehicles in the air, and on or beneath the surface, or
- an enhanced and higher technology Offshore Combatant Vessel.

The numbers contained in the table are purely illustrative.

	Offshore Combatant/ Mine Warfare	Future Frigate	Air Warfare Destroyer	Submarines/ Maritime Patrol Aircraft
	(14/6)	(8)	(3)	(18/40)
Ballistic Missile Defence			<i>New Requirement</i>	
Air Warfare			Specified	
Cooperative Engagement			Specified	
Surface Warfare	Assumed	Assumed	Assumed	
Anti Submarine Warfare		Specified	Contracted	Specified
Land Attack		Specified	Specified	Specified
Helicopters	TBD	Specified	Contracted	
UAV	TBD	Specified		
Mine Clearance	Specified			
Hydrography	Specified			
Oceanography	Specified			

Table 5. Alternative to Force 2030, in which the threat to surface combatant has led to a shift in the total force structure towards air and sub-surface operations, and a fundamental change in the roles and composition of the surface force.

Key Issues for Further Study

It is beyond the scope of the current study to provide definitive answers to the issues that have been raised. Instead, this study attempts to identify issues that require greater scrutiny in the period leading up to the 2014 White Paper, in a context provided by the Government's commitment to a program of ongoing rigorous and periodic reviews of the mix and scale of Australia's defence capabilities and their appropriateness to emerging challenges in Australia's strategic outlook.

The utility, survivability, adaptability and flexibility of surface combatants mean they are likely to remain a potent enabler of sea control as part of Australia's future maritime strategy. Surface combatants have the mobility and endurance to maintain continuous presence which can help prevent escalation during periods of hostility short of war, and ensure that Australians can go about their business as usual in their maritime jurisdiction, in their economic zones, and along their sea lanes of communication. Surface combatants will be critical to Australia's capacity to reach out to and assist friends in the region, and to develop habits of cooperation and mutual reassurance with others.

It is important to note that while the most consequential high end scenarios in which surface combatants are most at risk are the least likely, it is Australia's capabilities for high end conflict that underpin its politico-military diplomacy and attempts to shape the security environment in ways that are favourable to Australia and friendly states in the region. So any decision to move away from large surface combatants is not to be taken lightly.

Yet the concept of a surface combatant may well undergo significant change during the period in question. There are few naval professionals who think that a balanced force means more of the same. There is recognition that force developers

may need to think imaginatively, and there is a need to learn again to tolerate developmental and programming risk.

In a recent speech to the Australian New Zealand School of Government the Minister for Defence observed that:

...cutting edge technology is more sophisticated and more complex than ever before, and the speed of change is accelerating. If the ADF is to maintain a warfighting edge, it needs to take some risks, and then manage those risks professionally and tightly.²¹

This philosophy will be important if we are to ensure the future utility and survivability of a surface combatant fleet.

If Australia is to meet these challenges, national security planners will need to assess if there has been any erosion of the industry capabilities over the past decade which might be needed to deliver the future surface combatant force, such as naval architecture and advanced composite ship construction. It is clear that Australia can adapt surface ships to future requirements more quickly than other platforms only if it has the strategic infrastructure required to do so.

An equally important conclusion is that national security planning will have to confront continuing and possible growing uncertainty in the strategic environment. Great forces are at work, and it is not yet clear how these will play out.

There is a pressing need for continuing engagement between Australia, China and other Western Pacific naval powers, because of the economic and political crises that would follow any disruption to maritime trade or resource extraction in the region. In particular, there would value in dissuading East Asian states from deploying destabilising weapons systems in the South and East China Seas before entering into more cooperative ways to secure their maritime approaches and access to markets and raw materials.

²¹ A speech by the Minister for Defence, Senator John Faulkner to the Australia and New Zealand School of Government, Sydney, 13 August 2009.

There are some very positive developments that have emerged in the new White Paper process including:

- The adoption of a more systematic approach to formulating strategic policy.
- A growing recognition of the dynamics of the regional security environment.
- A reaffirmation of the role of the Service Chiefs as Capability Managers.
- A strong commitment to improving the underlying logic of the next White Paper, and communicating the rationale for defence investment.

On the other hand, there is a need to recognise that:

- The strategic planning task is difficult, and that the Australian Defence Organisation will not always get investment decisions right.
- There may be a gap between the strategic priorities of the capability managers and the financial priorities of the procurement staff.
- There is no clearly articulated logic underlying strategic industry policy, including in the naval shipbuilding and repair sector.

A high priority should therefore be attached to revisiting some of the apparent assumptions in Australia's capability development and procurement policies in the light of a rapidly evolving regional security environment. Some of the following questions need to be answered before Defence advances much further towards the development of the next generation of surface combatants:

- Does the possibility that regional powers might soon have a capacity to conduct extended sea denial operations mean that there is a need to be concerned about the strategic disconnection between Australia

and its major sources of equipment in North America and Europe?

- If the technologies being developed in the region continue at the pace of recent developments, will Australia be able to obtain its materiel needs from a functioning defence market, and will Australia have unrestricted access to the best technology available in that market?
- Is Australia's strategic depth of diminishing value, and should Australians be concerned about the concentration and lack of protection of key strategic industries, especially those relating to naval shipbuilding and repair?

The following issues need to be addressed before any sensible decisions can be made in relation to the more innovative aspects of the four options indicated above:

- *Force 2030*, and in particular the surface combatant force, needs to be subjected to a rigorous program of operational analysis, experimentation, and prototyping.
- There needs to be much more open analysis and discussion of survivability issues, particularly those relating to ballistic missile defence.

There are constants in the surface combatant that need wider understanding:

- Modern surface combatants are amongst the most complex machines built by man, and are increasingly required to be at the leading edge of a wide variety of technologies.
- Engineering margins are critical to ensuring that surface combatants can be adapted to new and emerging roles and threats through service lives that are measured in decades.

- New designs and new builds are expensive, so there is a need for careful consideration of whether there is scope for an evolution of the Hobart Class Air Warfare Destroyer into the Future Frigate, and whether that program should be built on the basis of batches in order to overcome the stop-start nature of naval construction in Australia and to build on the lessons learned on earlier batches.
- Similarly, there should be careful consideration of the possibility of adapting Australia's competitive advantage in fast vessels into baseline designs for the Offshore Combatant Vessel, particularly now that Australian shipbuilders have gained deep experience of US naval programs such as the Littoral Combat Ship. The Offshore Combatant Vessel may be a case where it is sensible to employ commercial design standards.
- Shipyard labour is only one third the cost of a vessel, and the differential in labour costs for a warship are much less than for commercial vessels where economies of scale and scope are more easily found. So any argument for an overseas build of future surface combatants needs to be balanced against the need to maintain critical skills and infrastructure for operational repairs and maintenance in-country.
- Learning starts to flatten out after the third ship in a naval construction program, but the skills are degraded if the gap between ships exceeds two years. This raises significant questions about the logic underlying the apparent build program for the Offshore Combatant Vessel and Future Frigate. The Defence Capability Plan 2009 is unhelpful in explaining the rationale for the proposed schedule.

Australia needs also to invest much more in customer funded research and development, currently low by the standards of advanced industrial economies. Where possible, Australia should exploit its world-leading expertise in:

- Solid state radar and open systems architecture.
- Advanced hull forms.

In addition, there is a need to closely monitor:

- Developments in off board systems.
- Modular weapons systems such as vertical launch systems.
- Hybrid electric drive for efficiency and power growth.
- Technologies that reduce manning and through life costs.

If intelligence indicates a deteriorating security environment, Australian national security planners will need to prepare for the rapid building and repair of vessels in times of tension or conflict as an insurance against battle losses. This would be a challenge that has not been taken seriously for decades. A combination of continuous batch building and a shorter hull life might enable the faster adaptation of new technologies and capabilities, while yielding lower overall costs. This could be summarised as 'buy big, buy bulk, and buy often', but it would require a significant shift in a procurement culture apparently dominated by financial rather than strategic interests.

Collectively, this means Australia can no longer accept a bureaucratically intensive but analytically weak approach to option evaluation if national security planners are to meet the Government's objectives of rigorous and ongoing strategic reassessment.

If Australia is to develop an effective surface combatant force element within *Force 2030*, it will be necessary to develop a new generation of bold strategic leaders, nimble capability managers and developers, and a responsive procurement organisation able to work closely and cooperatively with industry. Australians may need to accept the overheads of an industrial support base that can support the surface combatant fleet not only during peace-time operations, but also during periods of extended and possibly intense conflict. *Force 2030, Defending Australia in the Asia Pacific Century* is an exploratory step in the right direction.

Annex A. Factors Affecting Platform Options

Some of the factors affecting the key decisions on the surface combatant fleet are outlined below.

THE CHARACTERISTICS OF FRIGATES AND DESTROYERS

Size

There is a strong professional naval view that size matters. Beyond the understood advantages of improved stability, sea keeping characteristics and additional speed achievable from a greater waterline length vessel, there are warfighting and survivability advantages that come with larger vessels. While mass alone may not ensure platform survival, it allows space for damage control systems and redundancy which contributes to battle worthiness, that is, the ability to sustain battle damage to ensure mission and platform survivability. Mass, margins and redundancy are part of a design philosophy that allows surface combatants to deal with much greater combat damage than aircraft and submarines.

Size allows real estate for the installation of weapons systems and for the positioning of sensors, in particular the space required for the vertical launch tubes required to deliver the expected land attack capability in a hostile threat environment that will also require a high level of assurance against asymmetrical threats such as anti ship ballistic missiles and cruise missiles launched from land and modern conventional submarines.

Size also makes it easier to achieve the endurance that will be expected from a vessel designed to operate in a jurisdiction as large as Australia's and with obligations spread across a region as vast as Southeast Asia and the Southwest Pacific, let alone wider alliance obligations.

Power

There is also a consensus that a future surface combatant will have to be a 'power station at sea', to meet the power requirements of future sensors, particularly the high power radars required for emerging missile threats. This is an important lesson learned from existing programs. The power generation capacity of the Future Frigate over the longer term may well be much greater than might be needed at launch, in order to meet the engineering margins required for fitting future electronic sensors and systems. It is likely that future surface combatants will adopt electric drive, to gain the benefits of fuel efficiency, signature reduction and flexibility in layout that electric propulsion promises.

Engineering Margins

Together, an increase in size and power generation affords engineering margins to improve the adaptability to emerging threats and roles during the twenty to thirty year life of hulls. A shorter hull life might be planned if the Commonwealth adopted a process of continuous batch building rather than the highly disruptive build and refit strategies of a previous era.

CHARACTERISTICS OF AN OFFSHORE COMBATANT VESSEL

There is scope for building a vessel that will be networked, fast, stealthy, manoeuvrable and versatile. They may be manufactured using exotic materials and advanced hull forms and propulsion systems. They could use the superior situation awareness enabled by the network together with speed and manoeuvre to seize and maintain the initiative in a wide variety of tactical scenarios. Cooperative engagement will allow small ships to contribute to and even direct the massed effects once associated with much larger vessels, in much the same way as Special Forces operate today on land.

Speed of Reaction

The emergence of catastrophic terrorism is just one of the reasons that crises can arise in the region with little or no warning. The first 24 to 48 hours can be critical for the treatment of the victims of casualties sustained in a terrorist attack or natural disaster, the more so because these events often occur in locations where the local facilities are not of a scale or sophistication to handle mass and unusual casualties.

Many locations in the region have limited transport infrastructure. Fast sealift may well be the only means of deploying sophisticated and well resourced emergency response and medical facilities on the scale required, even if a local airfield can be kept open for heavy or medium airlift operations. Furthermore, the 2004 Indian Ocean Tsunami demonstrated both the scale of humanitarian relief and the geographical dispersion of the required response following a natural disaster; a logistics problem reinforced by recent events in Indonesia and Samoa.

While the Landing Helicopter Dock might provide an ideal platform in the longer run, a fleet of only two means that there may not be a Landing Helicopter Dock available for timely deployment, so there is scope for a smaller and higher speed sealift capability to be incorporated in the Offshore Combatant Vessel design.

At the lower end of the conflict spectrum, speed of reaction depends as much on the ability to load a vessel and the relative position of bases as the speed of the vessels themselves. A larger number of vessels deployed in more locations further to the north may assist a more timely response if appropriate supporting infrastructure is available.

In the event of incidents at the upper end of the conflict spectrum, speed can be important to match or exceed the operational tempo of an adversary's own operations in the littoral or to elude conventional submarines.

Economy of Logistic Effort

Future conflicts across the spectrum are likely to involve larger and more sustained operations by Special Forces, demonstrably an area of Australian competitive advantage based on recent conflicts. Special Forces often involve temporary lodgments to support limited military objectives. Often reliant upon firepower delivered from the air and sea, these forces tend to rely on the concentration of effects, not the concentration of force.

The move to effects based operations may mean that the logistics footprint of forces deployed over the shore would need to be kept to a minimum, so that the volume of materiel does not inhibit or slow highly mobile forces.

One way to do this is with high speed sealift vessels, and the envisaged modular design of the proposed Offshore Combatant Vessel might make it highly suitable. The availability of several of these vessels would increase the velocity of logistics support to achieve the desired operational tempo, and to support concurrent operations spread across a wider area.

Stealth

One of the key challenges for modern maritime forces operating in the threat environment anticipated in the archipelagic region and the South China Sea, or for any vessel operating in harm's way is susceptibility to detection. Traditionalists might argue that true stealth is difficult at sea. Modern sensors make avoiding detection very difficult, and improved target acquisition and terminal guidance increase the possibility of being hit once detected. The lethality of modern weapons means that a hit can achieve a mission kill, even when the crew and platform survive.

Still, a range of systems is being developed to reduce the signature and likelihood of detection including the increasing use of passive and off board sensors and stealthy construction materials and techniques.

Advanced composite construction offers special advantages, already acknowledged by the widespread use of composites to minimise sound and magnetic signatures in mine warfare vessels, including Australia's Huon Class boats. The Swedish Skjold and Visby class vessels and the United States Littoral Combat ships take this further by using advanced composites and structural forms to reduce their radar and thermal signatures. Future "intelligent" composites with specially tuned reflectance characteristics potentially offer further signature reductions.

NETWORK ENABLED WARFARE AND COOPERATIVE ENGAGEMENT

Increasingly, intelligence and surveillance sensors are networked across the total force and the data is exchanged routinely with allies and coalition forces. Digital data from Australia's long range over the horizon sensors will increasingly be combined with Australian and allied intelligence gathering sources. New generations of satellites and unmanned aerial vehicles will provide real-time data including streaming video to Australian platforms, to be combined with unmanned underwater vehicles and acoustic sensors to provide real time surveillance and damage assessment.

The distributed sensor architecture and network enabling of the Offshore Combatant Vessel might allow comprehensive situational awareness in a much smaller vessel than in the past. Australian advances in radar technology will also allow very capable active sensors to be fitted to much smaller vessels at greatly reduced cost to the extent that the limiting factor may prove to be not the data flow but the people required to interpret it.

Modularity

Ideally Australia would have the flexibility to respond to a range of widely dispersed and simultaneous attacks, while retaining the ability for timely and tailored response. The

operational versatility of the Offshore Combatant Vessel will be enhanced by the use of modular unmanned underwater systems for both mine countermeasures and hydrographic tasks. These systems are envisaged to be containerised and portable modules capable of being used in any port or loaded onto any of the Offshore Combatant Vessels or other suitable vessels.

But the concept could be taken further, with additional modules developed to assist:

- Incident response capabilities for chemical, biological and radiological incidents.
- Maritime patrol and response.
- Specialised intelligence and surveillance packages.
- Medical support, humanitarian assistance and disaster relief.
- Special Forces operations and commando raids.
- Indirect fire support for the delivery of specialist effects.

Still, while modularity would seem to offer many advantages, there is a need for further experimentation and prototyping to confirm the concept. People are not easily modularised, and there is a risk that modularity will encourage attempts to require a single crew to undertake a broader range of tasks than it is feasible to maintain competence in. There are also limits on the extent to which one can reduce crew sizes even with the greater use of robotics.

Disposition

The relatively larger number of Offshore Combatant Vessels combined with air-portable and pre-positioned modular payloads will support a flexible basing strategy that has the potential to further increase the responsiveness of the fleet. This flexible response could enable rapid backup if a first response by air is possible or the initial response where no

serviceable airfield is available because of, for example, terrorist action or natural disaster.

Limitations

There are some important counter arguments. Payloads are more easily modularised than crews. This can be partly overcome by manning the mission modules separately to the vessels. There are also arguments that smaller vessels may be less battle worthy, and should not be considered for use in some more demanding contingencies, even if crewed and operated in a manner analogous to aircraft. It may also be difficult to achieve the endurance required for operations in Australian jurisdictional waters let alone the wider region. And there are legitimate concerns that some specialist payloads, such as mine warfare modules, will necessarily drive up the platform cost for the entire minor warfare vessel fleet.

These are all matters deserving more detailed and careful independent system analysis prior to locking in the design specifications for these new systems.

Annex B. Trends in Naval Design

The following vessels may not have characteristics that precisely match the capability requirements of the Force 2030 surface combatant force. For instance, ships such as the US Littoral Combat Ship will be middle aged designs when the first Future Frigate design is finalised. However, the vessels depicted may assist in visualising future trends and the options that may be available within the planning horizon of the Defence White Paper 2009.

UNITED STATES LITTORAL COMBAT SHIP (LCS)

The US Littoral Combat Ships are designed to defeat sea-denial and asymmetric threats, such as mines, quiet diesel submarines and fast surface craft, in littoral regions such as that found in the archipelago to Australia's north.

Larger than Australia's proposed Offshore Combatant Vessels, and lacking the air warfare and land attack capabilities of the Hobart Class Air Warfare Destroyers and the Future Frigates, the ships nevertheless illustrate trends in naval architecture that might influence the Force 2030 surface combatant force.

The two designs are very different, but both weigh approximately 3,000 tonnes at full load, achieve sprint speeds in excess of 40 knots and can transit distances of over 3,500 nautical miles. They have a helicopter deck capable of supporting operations by manned and unmanned aircraft and are capable of launching and recovering watercraft. Accommodation is provided for up to 75 ship and special mission crew, with provisioning for up to 21 days operations without replenishment.

The ships will be fitted with modular packages, called Mission Packages, supported by manned and unmanned vehicles and sensors in support of mine, undersea and surface warfare missions. The mission modules will be able to be changed, tested and working within 24 hours.

The mine warfare modules will include remote minehunting systems, sonar mine detecting sets, airborne surface influence sweeps, airborne laser mine detection systems and airborne mine neutralisation systems. The anti-submarine warfare modules will include a range of acoustic sensors with semi-submersible vehicles and network centric communications. The surface warfare package will include 30mm and 57mm guns and precision attack missiles.



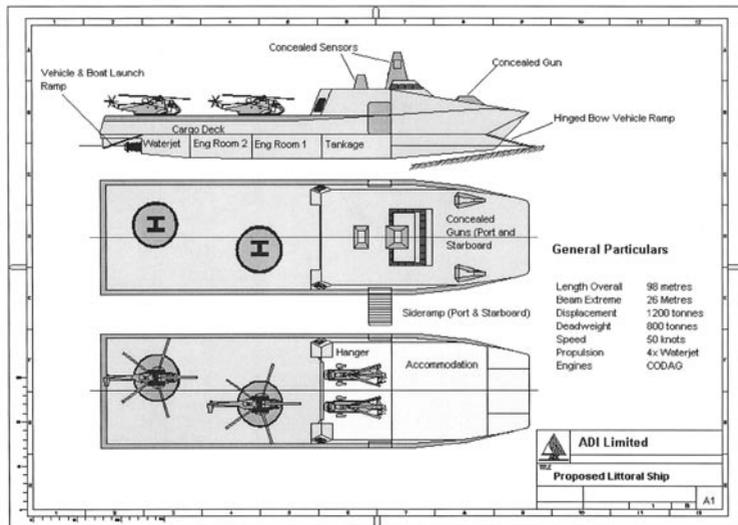
The Lockheed Martin design is a high speed semi-planing monohull based on a Ficantieri designed commercial vessel.



The General Dynamics design is a trimaran with a slender stabilized monohull. The sea frame is based on an Austal design for a fast car and passenger ferry.

2003 PROPOSAL TO THE JOINT STANDING COMMITTEE ON FOREIGN AFFAIRS DEFENCE AND TRADE

In 2003, ADI Pty Ltd proposed the development of a high speed catamaran multi-role vessel for operational test and experimentation, with a view to determining the operational requirements and specifications for a future Australian littoral ship program, a similar concept to the Offshore Combatant Vessel. Intended to be more modest than the US program, the Australian proposal was for a vessel of some 1200 tonnes, which would have enabled the operation of helicopters under a wide variety of conditions. The intention was to exploit Australia's comparative advantage in fast ferry and minor warfare vessel construction. The full ADI submission can be obtained from the Parliament of Australia web site at: http://www.aph.gov.au/house/committee/jfadt/maritime/ms_subs.htm



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AUSTAL MULTI-ROLE VESSEL

Smaller than the LCS competitors and the 2003 ADI proposal, and closer to the Offshore Combatant Vessel requirement, the Austal Multi-Role Vessel is a concept based on the use of a commercial platform as a configurable sea frame which can be fitted with a variety of mission modules to perform constabulary, diplomatic and minor warfare tasks. It is proposed to have a multi-mission helicopter capability and a large flexible mission and logistics deck.



HOBART CLASS AIR WARFARE DESTROYER

The Hobart Class Air Warfare Destroyers will be state of the art but conventional ships capable of operating across a broad spectrum of diplomatic, constabulary and warfighting roles. They will be fitted with the Aegis combat system and Standard Missile to provide a significant increase in the Australian Navy's air warfare capability with the growth potential to contribute to ballistic missile defences. The ships will carry a helicopter for surveillance and response in a variety of warfighting roles, while for surface warfare they will employ long range anti-ship missiles and an advanced naval gun system, and for undersea warfare will be fitted with advanced sonar, decoys and torpedoes.



About the Kokoda Foundation

Purpose

The Kokoda Foundation has been established as an independent, not-for-profit think tank to research, and foster innovative thinking on, Australia's future security challenges. The foundation's priorities are:

- To conduct quality research on security issues commissioned by public and private sector organisations.
- To foster innovative thinking on Australia's future security challenges.
- To publish quality papers (*The Kokoda Papers*) on issues relevant to Australia's security challenges.
- To develop Security Challenges as the leading refereed journal in the field.
- To encourage and, where appropriate, mentor a new generation of advanced strategic thinkers.
- Encourage research contributions by current and retired senior officials, business people and others with relevant expertise.

Membership

The Kokoda Foundation offers corporate, full and student memberships to those with an interest in Australia's future security challenges. Membership provides first-release access to the *Kokoda Papers* and the refereed journal, *Security Challenges*, and invitations to Foundation events. Membership applications can be obtained by calling +61 2 6204 1822, and downloaded from:

<http://www.kokodafoundation.org/Joinindividual.html>