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THE ROYAL AUSTRALIAN NAVY AND THEATRE BALLISTIC MISSILE DEFENCE

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About the Author

Commander Tom Mueller joined the RAN in August 1982 as a Supplementary List Seaman Officer. Following initial Seaman training he served aboard HMA Ships *Whyalla*, *Wollongong* and *Perth*, before leaving the Navy in 1985 for family reasons. Rejoining in 1986 he obtained his Bridge Watchkeeping Certificate aboard HMAS *Derwent* before commencing a succession of FFG postings aboard HMAS *Sydney* in 1988. Commander Mueller trained as an Air Intercept Controller in 1990 and was posted to HMAS *Darwin* in time for the first RAN Task Group deployment to the Gulf following the invasion of Kuwait. Following a posting to HMAS *Melbourne* he trained as a Principal Warfare Officer, qualifying as a Direction Officer in 1993. After a brief staff posting to the Directorate of Naval Warfare, he joined HMAS *Adelaide* as the PWO(D) in 1994. He subsequently took up the appointment as senior PWO, Gunnery Officer and Operations Officer of HMAS *Anzac* in 1998. During his tenure in this position *Anzac* won the OTRANTO Shield for Gunnery Proficiency. He was posted at short notice as the Executive Officer of HMAS *Westralia* in 1999, bringing the ship out of the long refit following the fire of 1998. Attendance at the inaugural Australian Command and Staff Course of 2001 preceded a posting to the Military Strategy Branch in 2002 and promotion to his current rank.

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Abstract

The issue of proliferation of *Weapons of Mass Destruction* (WMD) and ballistic missiles exercises Government decision makers the world over. The increasing range and accuracy of ballistic missiles now means that some nations can deliver their payload as far as the Australian mainland itself. This is, of course, in addition to the ability of many countries so armed to affect Australian interests within the region, and further abroad. The potential threat is thus clear. Further, emergent trends in Defence policy and strategy show that the Australian Government will need to deal with it. A greater willingness to commit to operations overseas will expose the *Australian Defence Force* (ADF) to the threat with increasing frequency.

The acquisition of a *National Missile Defence* (NMD) capability has proved a challenge for America. There, testing programs have been beset by technical problems, budget overruns and hostility from those reliant on ballistic missiles for strategic deterrence. NMD is out of reach of Australia's relatively small defence budget but a smaller version of it, *Theatre Ballistic Missile Defence* (TBMD), may not be. The Aegis class destroyers and cruisers of the *United States Navy* (USN) will host this capability, presenting the ADF with an opportunity.

The *Royal Australian Navy* (RAN) is acquiring a new class of warship for the air defence role—the air warfare destroyer. This acquisition will deliver capabilities similar to those of Aegis equipped USN ships. The value of an Aegis system to ADF acquisition of TBMD is great. It offers a relatively easy upgrade path to TBMD whereas an air or land based system would begin from a much lower starting position.

Any international resistance to America's NMD program will apply equally to an Australian TBMD acquisition. In the light of the potential for regional hostility on this issue, can Australia afford to follow America's lead? Given the threat and a changing Defence posture, can Australia afford not to?

INTRODUCTION

We are facing a potentially catastrophic disaster. Missiles are now in the hands of exactly all the countries we didn't want to have them.

Former US Ambassador, Robert Galluci, September 1998[1]

In the military world, as in the natural world, overspecialisation is an invitation to catastrophe ……. During the crucial early days of a regional contingency, the TBMD active defense capabilities most likely to be picked ……. will be naval.

Lieutenant Commander Charles C. Swicker, U.S. Navy, 1997[2]

On 14 June 2002 the *United States* (US) abrogated agreements made under the *Anti-Ballistic Missile* (ABM) Treaty. The US Navy promptly resumed missile defence testing in June on a new experimental missile (SM-3) with an exo-atmospheric kill capability against ballistic missiles.[3] Although this particular test was successful, not all has gone well with US Navy missile programs as the project team of the recently cancelled Standard SM-2 Block IVA program can attest.[4] The SM-2 Block IVA promised an endo-atmospheric *Theatre Ballistic Missile Defence* (TBMD) capability in the boost or terminal phases of flight. Teaming the SM-2 Block IVA with the SM-3 would have provided the US Navy with excellent defensive coverage of all phases of ballistic missile flight. Unfortunately, this goal now seems to be out of reach for the US Navy. However, the remaining naval missile development program, SM-3, could still be coupled with another child of the *Strategic Defence Initiative* (SDI)—sometimes referred to as 'Starwars'—that is, the Air Borne Laser.[5] This capability is a Boeing 747-based system that will commence flight trials in 2003. It promises much—presenting as something like Orson Wells' "Martian death ray" made real. Clearly, America is serious in its aims to field a capable defence against the ballistic missile threat.

International lobbying by the Bush Administration between 1999 and 2001 contained dire warnings on the growing ballistic missile threat, drawing heavy criticism from a number of quarters. China, heavily reliant on ballistic missiles for its particular brand of coercive diplomacy, was especially vocal on the issue. Amid serious sabre rattling over Taiwan, a significant increase in ballistic missile production was threatened by China.[6]

Many examples of ballistic missile deployment and employment exist. They range from Hitler's V2 program to the more recent tensions between India and Pakistan over Kashmir. Some of the latest systems under development could pose a significant threat to Australian regional interests and even the Australian mainland. Of even greater concern is that many of the systems currently fielded by non-Western aligned nations have sufficient range to be employed in Australia's *Area of Direct Military Interest* (ADMI) now.[7] They represent a cost effective deterrent and have been used repeatedly in coercive diplomacy.

The aim of this paper is to explore the level of threat ballistic missiles pose to Australia and its interests. It then seeks to determine what role the *Royal Australian Navy* (RAN) might play in defence against them, touching on alternative and complementary methods of TBMD in the process.

In considering a potential RAN contribution to TBMD it is necessary to differentiate the types of defence it is possible to mount. Broadly speaking, this is determined by the kind of ballistic missile to be defended against. In American parlance, three types of missile defence can be mounted: area, theatre and national. These definitions are predicated on the range of the weapon in question. Broadly speaking, area defence is measured in hundreds of miles whilst a theatre is a good deal larger and could cover say, South Korea. *National*

Missile Defence (NMD) refers specifically to the defence of the entire American homeland. Of these three, only the first two will be discussed in detail because NMD, by its nature, demands a system with exceptionally broad coverage, requiring an extensive array of installations. Only America could afford to develop such a system. NMD is, therefore, considered by the author to be well beyond Australia's means. Consequently, this paper will focus on area and theatre missile defences, both of which are addressed, henceforth, by the generic term "TBMD".

Any exploration of TBMD must begin with consideration of the current and future threat. Additionally, TBMD is not popular in certain quarters and any consideration of it must encompass both domestic and international political attitudes. This study will explore those issues. It will also be necessary to identify what kind of defences might be mounted against the postulated threat. Having canvassed the context for TBMD in Australia, specific options available to the RAN will be explored. Finally, international law, conventions and treaties affecting TBMD are examined to uncover any legal or political impediments to Australia fielding such a capability.

What is the Ballistic Missile threat to Australia?

The earliest recorded use of powered missiles in warfare was in 1232 at the military siege of Kaifeng, in which rockets were used to set fire to wickerwork fortifications. European technology developed these early rockets into heavier and longer-range weapons. In 1807, Copenhagen and the large French fleet in its harbour, were almost totally destroyed by a British naval attack using thousands of iron rockets.[8] However, the first true ballistic missile was the German V2,[9] developed towards the end of World War II, and the first missile defence program started not long after. So the threat of ballistic missiles has a long history.

The Cold War ushered in a period of enormous ballistic missile development and resulted in the birth of the modern weapons that have become part of military lore. These developments focussed heavily on the strategic delivery of nuclear-armed weapons between the continents of the superpowers. The weapons became known as *Inter Continental Ballistic Missiles* (ICBMs). Parallel developments that did not gain the same level of recognition as the ICBMs focussed on tactical level ballistic missile systems. These came to be seen more as delivery systems of a variety of different types of warhead from conventional through chemical and biological agents to nuclear tips. Collectively, these agents today bear the label—*Weapons of Mass Destruction* (WMD).

Notwithstanding the end of the Cold War and its concomitant danger of global nuclear holocaust, the fear of a nuclear exchange remains. In recent times, a new fear of nuclear-armed ballistic missile exchange has arisen. One example is in the confrontations between India and Pakistan over Kashmir. This new period of tension on the subcontinent has its genesis in Pakistan's test of a GHAURI I/HATF V *Medium Range Ballistic Missile* (MRBM) in April 1998. Although no nuclear device was tested in this instance the GHAURI is reputed to be nuclear capable and has a range of 1,500km.[10] India replied to this event with an actual nuclear weapon test, followed by a Pakistani nuclear test, and so the posturing continued. Ultimately, Indian AGNI II and Pakistani GHAURI III weapons were added to the ballistic missile inventories on the sub continent. These weapons have ranges in excess of 3,000km,[11] enabling India at least, to exert influence over Australia's ADMI should it choose. It may be fortunate for Australia and ASEAN that India and Pakistan remain preoccupied over Kashmir, lest India feel free to turn her attentions to the east. Although things have quietened down for now, the potential threat that ballistic missiles pose on the modern battlefield is amply demonstrated by this brief case study.

At least 35 countries now field ballistic missiles of varying age, payload and range.[12] Of these, a number of countries possess missiles that can reach into Australia's ADMI and one regional nation is already known to field a ballistic missile capability. However, of all the above, the weapons already in the region, or those with the range to influence affairs here, are of most interest to this study.

At this early pass it is useful to briefly examine ballistic missiles already in the region. These are the SCUD B series weapons fielded by Vietnam. The SCUD Bs are relatively old and of dubious quality. Having no guidance system, they are truly ballistic once fired,[13] and at 300km are classified as *Short Range Ballistic Missiles* (SRBM). Due to their limited accuracy, with a typical circular error of probability of around 1,500 metres,[14] and relatively short range these weapons do not pose a major threat. The 1,000kg payload,[15] however, is not easily ignored due to the wide variety of munitions it could deliver. Although ballistic missiles are often only considered for their strategic application, Vietnam's SCUDs are tactical weapons for use against land targets such as airfields, ports and other points of entry. This is based on their relatively short range. Notwithstanding the low threat potential of conventionally armed SCUDs, Australian units operating in the region must consider their existence.

There are other ballistic missiles that must be considered by Australian defence planners. China, North Korea, Pakistan and India all field weapons of interest to this paper.[16] Pakistan and India have already been canvassed, however North Korea is another country that fields systems of considerable potential. The most significant North Korean weapon system is the TAEPODONG II. It is nuclear capable and may have a range of up to 6,000km. This range bracket suggests that the weapon will be able to reach the Australian mainland.[17] China's CSS-4 ballistic missiles could also reach the Australian mainland.[18] This alone may be sufficient argument in the popular press for Australia to acquire ballistic missile defences.

All countries listed also have systems with the reach to enable them to exert influence over the ADMI. The missile systems in these groups are diverse. They range from truly strategic weapons like the 13,000km CSS-4 (or DF-5 and 5A), a Chinese ICBM,[19] to tactical systems like the SCUDs previously described. The Chinese inventory also includes a range of sea and air launched weapon systems that could be deployed against Australia and its interests.

The range of weapons enumerated here is representative of those of interest to this paper. *Table 1* details the countries mentioned and some of their ballistic missiles. It is a large number and yet the list is incomplete—a further 27 countries and many more missiles would need to be included to complete it. They have been excluded as the weapons already canvassed sufficiently describe the threat.

It would not be practicable for a medium power such as Australia to devise counters to all of those systems listed at *Table 1*. It is necessary to examine what, if any, role the ADF might have in this area of warfare with a view to reducing the size of the task to more manageable proportions.

COUNTRY	SYSTEM NAME	RANGE (KM)	PAYLOAD (KG)	NOTES
China	CSS-8	230	?	2 stages. Road mobile.
	CSS-X-7	300	500	Solid fuelled. Road mobile.
	CSS-6	600	500	Solid fuelled. Road mobile.
	CSS-2/DF-3	2,800	Nuclear	Land based.
	CSS-3/DF	5,500	Nuclear	Land based.
	CSS-4/DF-5	13,000	Nuclear	Land based.
	CSS-5/DF-21	1,800	Nuclear	Land based.
	DF-31	8,000	Nuclear	Land based.
	Name TBA	12,000	Nuclear	Land based.
	CSS-N-3	1,700	Nuclear	Sea launched.
	CSS-N-4	8,000	Nuclear	Sea launched.
	B-6/H-6	3,100	Nuclear	Air launched.
	A-5/Q-5	400		Air launched.
India	Prithvi-150	150	1,000	From Russian SA-2. Fielded by Army.
	Prithvi-250	250	500	From Russian SA-2. Fielded by Air Force.
	Dhanush	250	500	From Prithvi.
	Bramhos	300?	225?	Launched from either ships or aircraft.
	Sagarika	350?	500?	From Prithvi.
	Prithvi-350	350	500	From Russian SA-2.
	Agni	1,500	1,000	From Scout.
	Agni-II	2,500	1,000	Tested January 2001.
	Agni-III	3,000	?	From Agni-II
	Surya	3250+?	?	
Iran	M-7 or	150	190	Modified SA-2
	CSS-8	300	1,000	Ex-North Korea
	Scud-B	500	600-700	Ex-North Korea
	Scud-C	1,300	1,000?	Ex-North Korea. From Nodong.
	Shahab-III	2,000	?	From Russian SS-4?
	Shahab-IV	5,000?	?	
	Shahab-V			

Iraq	Al Samoud Abadil-100 Al Hussein	150 150 650	200 200 500	Liquid fuelled. From Scud-B. Solid fuelled. From Scud-B. From Scud-B.
North Korea	Scud-B Scud-C Nodong Taepodong-I Taepodong-II	300 500 1,300 2,000? 5,500?	1,000 600-700 700-1,000 1,000 1,000	Single stage. Liquid fuelled. Combined Nodong and Scud.
Pakistan	Hatf-I Hatf-II Hatf-III/M-11 Shaheen-I Ghauri/Nodong Ghauri-II Ghaznavi Shaheen-II Ghauri-III	80 300 600 750 1,300 2,000? 2,000 2,500? 3,500?	500 500 500 500 750? 700 ? 1,000? ?	Ex-PRC Possibly an M-9 derivative. From Nodong. Possibly another name for the Shaheen-II. Two stage. Road mobile.
Vietnam	Scud-B	300	1,000	
Yemen	SS-21 Scud-B	100-120 300	480 1,000	Transferred from USSR in 1988 Transferred to South Yemen in 1979

Table 1: Ballistic Missile Table – Countries and Weapons of Interest[20]

Some ballistic missiles can be countered with conventional warfare tactics. This is particularly true of those delivered by submarine, ship or aircraft where the counter involves neutralisation of the weapon carrying platform prior to firing. Consequently they are of less interest to this paper. Other types of ballistic missiles would be dealt with by the United States—those armed with WMD will quickly attract their attention. Indeed, *Defence 2000 – Our Future Defence Force (Defence 2000)* makes explicit Australia's expectation that America will act in the case of nuclear weapons targeted at Australia under the doctrine of Extended Nuclear Deterrence.[21] This leaves defence against conventionally armed ballistic missiles, delivered by means out of the reach of conventional warfare tactics, as the main focus of this paper.

Of course, defining a need for an Australian TBMD capability is only a part of this paper's task. Of equal importance is to examine Australia's political will to acquire and use such systems. Parallel developments in Australian defence strategy also provide some useful guides to the potential for acquisition of an ADF TBMD capability.

Australian Defence Policy, Strategy and TBMD

No matter how important an ADF TBMD capability might be it will remain irrelevant to the ADF if there is no interest in Australia to support its acquisition. Even if there is a growing acceptance of the value of TBMD in the Australian community, this does not mean that it has a role in the ADF warfighting strategy. However, there is much evidence of change in Australia's defence policy and strategic outlook that lead to acceptance of the need for TBMD.

As recently as last year the Prime Minister, John Howard, offered the United States clear and unequivocal support for their intent to develop a NMD system.[22] It is also possible to identify changes in strategic Defence policy that imply Australian willingness to accept TBMD into the ADF. Among them is increasing rhetoric supporting expeditionary (or offshore) operations. If such operations were to be conducted against the interests of a country fielding ballistic missiles, it is certain that missile defences would need to be mounted. A number of references in *Defence 2000* demonstrate Australian willingness to deploy offshore.

In the *Defence 2000* chapter on Australia's Military Strategy, offshore operations are referred to in varying degrees. In the section "Proactive Operations",[23] Australia "would take a highly proactive approach" and "attack hostile forces as far from our shores as possible". In discussing "Contributing to the Security of our Immediate Neighbourhood"[24] and "Supporting Wider Interests"[25] less direct statements are made. It is clear, however, that Australia is positioning itself to be able to conduct expeditionary operations offshore, and that may well demand TBMD.

Australian Maritime Doctrine also implies a preparedness to consider expeditionary operations. It lists, as an "Enduring Strategic Interest", the "prevention of the positioning of extra-regional military forces in neighbouring countries which might be used contrary to Australia's strategic interests".[26] It goes on to argue that Australia's maritime interests extend further than the ADMI and have a global scope. It cites participation in the Gulf War as an example. The doctrine also describes the "Force Protection" role of warships for Australia's land forces, citing the role that the RAN played in East Timor as the ground forces went ashore.[27] If this had occurred against a belligerent nation armed with ballistic missiles, instead of a cooperative Indonesia, the "cover" mission would not have been possible without a TBMD capability. If not addressed, this would reduce significantly the available options exercised in future operations similar to that of East Timor.

Other defence doctrine deals specifically with WMD and ballistic missiles. The *Australian Approach to Warfare* (AAW) refers directly to WMD, noting that they are a more immediate concern to Australia than the prospect of invasion or military intimidation.[28] The doctrine goes on to argue that, in practice, the ADF's role goes far beyond the fundamental requirement to deter or defeat armed attack on Australia itself. This posture demands an ability to operate with the defence forces of other nations and away from Australia's shores. AAW reiterates a preference for attacking hostile forces as far away as possible, even in a Defence of Australia scenario.[29] The *Future Warfighting Concept* (FWC) also lists WMD and ballistic missiles as issues that the ADF will need to contend with.[30] FWC goes on to say that Australia's interests are now "truly global" and that events

far from our neighbourhood can have a direct impact on our citizens. Dealing with such issues will require the ADF to be able to "project power" within Australia and also within the region.[31]

The Defence Minister, Senator Robert Hill, has flagged the change in Australia's defence posture.[32] Without discounting the fundamental importance of the Defence of Australia, Hill is critical of the "defence of the moat" doctrine. He makes this point very strongly when he says that the Dibb view of layered concentric circles around Australia's north "never made sense". Further, Hill argues that this preoccupation with defence of the mainland has "distorted our capability". Although this statement is aimed at exposing the general run down of the Army over the last twenty years, it can be argued that ship-based anti-air warfare has also been discounted. The de-commissioning, without replacement, of the last *Guided Missile Destroyer* (DDG), HMAS *Brisbane*, is testament to this. *Brisbane* represents the last of the RAN's specialist anti-air warfare ships. As a consequence, the RAN now lacks an adequate area air defence capability.

Clear in Hill's rhetoric is a distinct shift in emphasis towards a broader contribution to global security issues. This is evidenced by the recent suggestions that an armoured brigade might be considered for overseas service. Such a deployment would require significant ADF force protection and support assets to be included, reflecting a more "expeditionary" outlook.

A summation of this discussion indicates a significant shift in Australian defence thinking, away from a primary focus on defence of Australia, towards the routine forward deployment of Australian forces. This is reminiscent of Australia's "Forward Defence" doctrine of the era of the Korean and Vietnam wars.[33] "Forward Defence" doctrine held that supporting global security interests contributes to Australia's national security. Hill is resurrecting this paradigm. So it can be concluded that Australian defence strategy is becoming more outward looking—but what is the link to TBMD?

In exploring what the RAN might contribute to TBMD it is appropriate to consider when, and how, the ADF might be exposed to such a threat. Merely asserting that Australia needs to field a naval TBMD capability to protect ADF forces operating abroad in support of UN or allied operations is insufficient. This is because, in such a situation, it might reasonably be argued that the ADF could operate under a US TBMD umbrella. A counterpoint to this argument might be that the ADF should come to a coalition operation as a self sufficient unit. However, that response may not carry sufficient weight to justify additional expenditure for an ADF TBMD capability. It is necessary to determine what situation(s) would mandate such an acquisition. Consequently, the discussion must be brought back to a scenario where Australia might actually be required to provide a TBMD umbrella. This could be for a unilateral action or, as is more likely to be the case, a regional coalition operation. A future regional conflict, in which ballistics missiles were involved, offers one context to support acquisition of a TBMD capability.

Consider the future possibility of a dispute in which a regional aggressor seeks control over a part of an Australian neighbour.[34] This hypothetical aggressor has recently acquired SCUD C missiles from a cash poor North Korea. The scenario is set in Australia's back yard and, as occurred with East Timor, with limited military support from America. Consequently, the problem falls into Australia's lap. Such a scenario is credible for a number of reasons. Firstly, the SCUD Cs are relatively cheap, compared to strike aircraft and aircrew, making them an attractive and simple acquisition. Also, Australia would be expected to assist and probably, lead a coalition that should be capable of dealing with any regional aggressor, barring China.[35]

In this scenario the landing force would almost certainly have to contend with the presence of SRBMs with the reach to cover many possible points of entry to the disputed territory. This would require a naval TBMD capability to cover the landing site even if a land based system were available because of the time it would take to set up the site. An airborne laser system is not included in this scenario because of the numbers of aircraft required to provide constant coverage and their anticipated cost.

A seaborne TBMD capability has a number of advantages over land or air based systems, in addition to those already canvassed. Sea-based TBMD has the advantage of mobility and self-reliance. For example, the landing force would need to be escorted to the landing site as well as being afforded air defence along the way. This demands a ship with systems specialised for missile detection and engagement, a need recognised by *Defence 2000*. This class of vessel would require a long-range surface-to-air missile system with sufficient range to engage aircraft firing anti-ship missiles prior to weapon release. Supporting such a weapon would demand a sensor suite and combat system of commensurate capability. This combination of capabilities, required by "normal" air defence, is also an excellent base on which to build a TBMD capability. Comparing this "ready to expand" solution with an Australian land or air based "greenfield" development beginning from a lower start point, results in a strong preference for a naval TBMD system. However, there are some disadvantages that must be considered in proposing a sea-based TBMD capability.

The ability of the sea-based system to detect and engage ballistic missiles over land will be limited by a number of factors. The most significant of these is the "reach" of the TBMD system. Such vessels may well find they are "tethered" to a station in close proximity to the landing force, reducing their availability for escort duties of the resupply and follow on forces.[36] For a large force like the US Navy this is not a significant issue, but for the RAN it requires consideration of some potential trade-offs. This question will be addressed in the discussion of the RAN contribution to TBMD below.

The "reach" question must also consider the delivery of weapons from far inland to a coastal landing site: Could the TBMD system destroy the ballistic missile before it gained its target? This question leads on to a broader discussion of the types of TBMD that might be mounted and the weapons required for those defences.

Naval TBMD Options

In discussion of area defence the example of the SRBM is useful. The SRBM threat has a lower apogee,[37] due to its shorter range and, therefore, conducts the major portion of its flight within the atmosphere (hence endo-atmospheric). Given the relatively modest (in theatre ballistic missile range terms) coverage required of an endo-atmospheric missile defence system, this is referred to as area defence. Current generation defensive weapons, designed to operate within the atmosphere, can fulfil this role. All current surface-to-air missile systems are endo-atmospheric. However, none have the capabilities of the cancelled SM-2 Block IVA, which was designed specifically for the TBMD role. This system also promised an improved general anti-air warfare capability.

A key determinant of SM-2 Block IVA design parameters is found in one of the characteristics of ballistic missile engagements. This demanded a more manoeuvrable weapon and a new fuse. These two are not the only modifications planned for SM-2 Block IV but they serve to demonstrate the key differences between it and the cancelled SM-2 Block IVA. These changes will now be discussed in more detail in order to explore some of the problems in defending against endo-atmospheric ballistic missiles.

The high closure speed between the two weapons in ballistic missiles engagements exceeds five kilometres per second.[38] This demands a weapon with more manoeuvrability in the end game of target interception.[39] Previously, a pair of annular fuses positioned around the guidance section in the SM family of anti-air weapons dealt with subsonic and supersonic targets.[40] Their fuses detected a passing target in sufficient time to detonate the fragmentation warhead to destroy it. If this type of fusing were to be used in a ballistic missile engagement the blast would only reach the target position after it had passed. In order to achieve a detonation at the closest point of approach to the target, a forward-looking infrared fuse was to be used. This fuse would track the ballistic missile from ahead of SM-2 Block IVA, detonating the warhead earlier. By the time the two missiles arrived at their closest points of approach, the fragmentation blast could intercept the target. Unfortunately, this very effective weapon design will not now reach production.

A possible European alternative to SM-2 Block IVA is the ASTER 30. It has TBMD potential and is currently under redevelopment for that role, with an in service date of 2005.[41] The ASTER 30 would be less attractive to the RAN due to its incompatibility with US systems as this would impact on RAN/USN interoperability in allied/coalition operations. Other alternatives include the PATRIOT ground based missile system used in the Gulf War, but as this has no naval application it will not be discussed in any detail. Consequently, there are currently no endo-atmospheric naval TBMD options.

Other threats include MRBM and *Intermediate Range Ballistic Missiles* (IRBM) with ranges of 1,000-3,000km and 3,000-5,500km, respectively. Requiring a much higher apogee to achieve longer ranges, weapons in these categories spend significantly more of their time-of-flight outside the atmosphere (hence exo-atmospheric). Systems designed to defend against them will need to be capable of exo-atmospheric operation, which will require aerodynamic control surfaces for operation within the atmosphere and rocket controls above it. The demarcation altitude from endo to exo atmospheric operation is 70,000 metres.[42] The recently tested SM-3, featuring an exo-atmospheric kill vehicle, will be an appropriate defensive system in this latter category. Requiring a good deal more boost to lift the kill vehicle above the atmosphere enables these systems to derive a much longer range. Consequently, they can cover an entire theatre of war (hence theatre defence). Before proceeding further, it is appropriate to consider in more detail the planned operation of the SM-3 missile, to provide a deeper level of understanding of the additional challenges posed by exo-atmospheric intercepts of ballistic missiles.

The heart of the SM-3 exo-atmospheric intercept capability is the kinetic warhead kill vehicle referred to earlier: a rocket propelled vehicle that destroys the ballistic missile by impact and kinetic energy. There is no blast warhead. The kinetic warhead is steered to the target by thruster jets positioned around the body and is guided by an optical target tracking system in the nose of the vehicle.[43]

This package is carried to within end-game guidance range by a multi stage rocket based on the SM-2 Block IV missile. The weapon uses normal aerodynamic control surfaces within the atmosphere. There is a booster behind the missile and a third stage rocket motor in front of it. Once the missile leaves the atmosphere this third stage separates and carries the kinetic warhead to within attack range of the target. It has no control surfaces, as there is no atmosphere for them to act on, and is steered by thrust vectoring from the rocket motor.[44] This section will accelerate the kinetic warhead to hypersonic speeds, thereby providing it with the kinetic energy required to achieve a mission kill on the ballistic missile target.

The US Navy systems discussed here were expected to provide two layers of defence for American expeditionary warfare operations. Unfortunately, since the cancellation of the SM-2 Block IVA program there remains only one US system likely to be fielded in the near to medium term: the SM-3 theatre defence system. However, a less pessimistic view is now being touted by The US Missile Defense Agency, which is responsible for the SM-3 test program. They argue that SM-3 will provide a limited capability against medium and short range (endo-atmospheric) ballistic missiles.[45] Notwithstanding this less pessimistic view, a "limited" capability will not answer America's needs in the longer term.

A second layer of defence might be offered by the *United States Air Force* (USAF) airborne laser project, which aims to field a particle beam weapon system in the form of an exceptionally powerful laser fitted to a Boeing 747 platform. Long airborne times are available from this airframe, so by rotating a number of aircraft into an area of operations a constant presence could be maintained. It is postulated that this would have the effect of providing a layered defence, incorporating exo and endo atmospheric kill capability, for a US expeditionary operation. The broader utility of the airborne "death ray" is still to be explored, but may yet offer much.

Ballistic Missile Tactics and Counters

The preceding discussion has focused on US attempts to field a TBMD capability and serve to illustrate some of the technical issues to be overcome. It is, therefore, necessary to explore what aspects of ballistic missile employment demand naval TBMD. This leads to a broader discussion of the utility of ballistic missiles and an exploration of how such weapons might be used. A recent example is instructive here.

In the months leading up to the Taiwanese election campaign in March 1996, considerable tension erupted between the Chinese and Taiwanese governments. The crux of the tension was over the pro-independence movement in Taiwan, which the prospective president, Lee Teng-Hui, leaned strongly towards.[46] The subject of Taiwanese independence has been a particularly sensitive issue to Chinese governments since Chiang Kai Shek eluded mainland Communist forces in 1949. Chinese sabre rattling included a demonstration of strategic military reach by "test" firing a series of ballistic missiles to positions north and south of Taiwan. Target sites were chosen to show missile accuracy, range and reach, thereby exerting considerable diplomatic pressure on voters in Taiwan.[47] The entire series of tests were tracked and recorded by USS BUNKER HILL, a Ticonderoga class Aegis cruiser, which has similar capabilities to those mooted for the RAN's air warfare destroyer, flagged in *Defence 2000*.[48]

The Chinese "test program" was an object lesson in coercive diplomacy. The implied threat was clear: China could, if it chose or was sufficiently angered, attack Taiwan from across the straits with missiles that could be nuclear armed. As a result, Taiwanese voters were forced to consider the implications giving their new government a mandate for independence when casting their vote. This discussion represents the strategic application of ballistic missiles. However, the question arises: what is the basis for choice of this particular type of weapon when other, more conventional means of military force exist?

The answer can be found in Western warfare tactics. Vietnam, the Gulf War and Kosovo all demonstrated the reliance of the West on establishing air superiority prior to commencing ground operations. This approach allows the Western commander unfettered control of the air to systematically destroy the adversary's infrastructure targets prior to commencement of a ground war.[49] The easiest targets, and the most difficult to hide, are the component parts of air defence networks, from air bases to radar installations.

Consequently, a Western commander's adversary would soon be without defensive air power, as Saddam Hussein discovered during the Gulf War. However, among the hardest targets are mobile ballistic missile launchers. The so-called 'SCUD hunt' of the Gulf War is testament to this. During that conflict, Iraq's SCUD missiles were used to considerable politico-strategic effect and may well have dragged Israel into the war.[50] Such an outcome would have been politically disastrous for the West.

A powerful political weapon, the SCUD attacks were relatively few in number and the high explosive warheads used did little real damage. They were contained by a very focussed campaign to hunt out and destroy them. However, the delivery of any of a variety of other, more dangerous, types of warhead was a distinct possibility, hence the powerful psychological effect of the attacks.[51] Although the SCUD attacks were largely contained, it was still very difficult to defend against the few ballistic missiles that could be launched. The poor PATRIOT results in the Gulf War demonstrates this assertion.[52] It has been assessed that only one PATRIOT missile, out of over thirty that were fired, actually found its target. Notwithstanding their limited availability in the Gulf War, the utility of ballistic missiles was showcased in this conflict because of the disproportionate effort required to contain them.

An important advantage of the ballistic missile is the payload flexibility alluded to previously. With the ability to carry a broad array of warheads on the same basic delivery system, it can be configured for many missions. These range from nuclear, biological and chemical or WMD warheads, through sub-munitions,[53] to conventional explosive rounds. This allows the owner of such a system to field a single weapon system with considerable ambiguity as to their intent.

America, through the US Navy, has always been able to wield the implied threat of nuclear weapons whether they were actually onboard a ship or not. It is now possible for much less powerful nations to "neither confirm nor deny" the availability of such weapons, although the capability to deliver them is clear. Thus, they wield the nuclear "stick" without actually having to procure many weapons.

These factors, combined with the relative cost effectiveness of low technology and mobile launchers, make the ballistic missile a highly desirable weapon. This is particularly so for countries lacking the infrastructure, technology and educational base to maintain and operate large numbers of conventional strike/multi-role aircraft or other potential power projection assets. This applies to the tactical application of SRBMs and the strategic employment of MRBMs and IRBMS.

So, the uses of ballistic missiles can be summarised in strategic and tactical terms. At the strategic level ballistic missiles are more useful for their implied threat. That is to say, merely possessing the capability inherent in a ballistic missile allows a government considerable political leverage. This is because of the ambiguity with respect to the kind of threat posed to a potential adversary. This offers a nation with ballistic missiles greater bargaining flexibility to resolve complex geopolitical issues without committing it to acquiring specific capabilities. At the tactical level, when the weapons are actually used, countering them will absorb a disproportionate amount of an adversary's military effort.[54] This delivers the benefit of relieving pressure on the remainder of a defending country's forces and infrastructure and facilitating a stronger response to the adversary on the ground. It is the intention of this paper to focus on the latter, tactical aspects, as the area in which the RAN is most likely to be employed.

Capabilities Supporting TBMD

Thus far this paper has only discussed the actual weapons that might be used against ballistic missiles. However, before TBMD can be employed a ballistic missile target will first need to be detected and once fired, intercepting missiles will still require guidance. In short, there needs to be a platform capable of fielding the TBMD system. As already described, such a platform would require an air target detection system significantly more capable than any fielded in the ADF today or in the near future. The radar suite and combat system fitted in the Aegis ships of the US Navy represents the capability the RAN would require for the TBMD role. However, not even the prodigious capability inherent in the Aegis combat system will provide the early warning required for interception of exo-atmospheric ballistic missiles. So the question remains: How could TBMD be integrated into maritime air warfare operations?

Offboard cueing is the key to early ballistic missile detection. By 2005, early cueing for the Aegis system will be primarily a function of the US *Space Command* (SPACECOM).[55] A satellite based detection capability that will contribute much to the offboard cueing problem is known as *Space Based Infra Red System* (SBIRS). This system combines American national and Department of Defense infrared detection systems into a single architecture, for missile warning and defence.[56] This capability will help theatre commanders by providing attack assessment information during combat operations. SBIRS is an integrated "system of systems" that includes multiple space-based assets and an evolving ground element. The architecture includes satellites in geosynchronous low earth orbit and ground data processing and control assets. The "system of systems" approach integrated previously independent infrared sensor programs resident in the Air Force and SPACECOM communities. SBIRS incorporates infrared technologies to detect and report ballistic missile launches for national and theatre missile defence. A variety of other systems can feed into SBIRS.

A significant limitation of many overhead sensors is their inability to gather data on ballistic missiles after their boost phase: that is, when the hot plume of the rocket motor no longer exists. Without post-boost information, other sensors will still be able to search for the target but may not meet criteria for a fire control solution. The importance of other sensors to facilitate fire control system cueing has been shown by studies advocating infrared search and track equipment for the US Navy's E-2C Hawkeye AWACS aircraft. Airborne infrared systems can continue to track a ballistic missile after its motor burns out by sensing heating of the missile body from the friction of its passage through the atmosphere. However, this E-2C capability, known as GATEKEEPER, is not currently funded for the US Navy.[57] Instead, the USAF has taken the lead in post-boost tracking systems with its E-3 Sentry AWACS-based extended airborne global launch evaluator. This sensor consists of a passive infrared surveillance sensor and a laser range finder.[58] The system has sufficient accuracy to pass fire control quality target data to Aegis ships. This highlights a very important point—detection and cueing data must still be passed around a force to enable engagement of ballistic missiles. The United States presently uses Link 16 for this task but better capabilities will be available in the near future. One of these is known as the *Co-operative Engagement Concept* (CEC).[59]

CEC began as an extension of the Aegis anti-air warfare system. The associated SPY-1 radar was found to be so effective that one ship could use its radar to guide missiles fired by another. A logical next step was to set up a link that could transmit, not merely processed fire control quality data, but the individual detections made by all radars in a task group. This completely changes the paradigm in which current air warfare doctrine

operates. One consequence is that ships grouped around islands would be able to engage incoming missiles even if the target were terrain masked. Further, approaching stealth aircraft and missiles will become visible to the network of radars, since their radar cross sections cannot be reduced in all directions. A group of ships using a CEC link will be able to engage any target held within the network based on a composite track. This would be generated from a series of fleeting detections reported electronically by a variety of radars seeing the target from many directions. It is theoretically possible to apply an extension of this capability to TBMD, since it allows any one ship to make direct use of remote sensor data for the purposes of missile guidance of its own or another platform's weapons.[60]

This section of the paper has discussed issues surrounding the detection, targeting and engagement of ballistic missiles. It has done so through an examination of existing and planned, mostly American, systems. Not all of these will be appropriate for use in the ADF and some are unlikely to be affordable. The next section will explore what might be possible in the ADF.

TBMD the RAN and the AWD

Although briefly discussed earlier it is useful to reiterate the value of naval TBMD when compared with land-based systems. An example from the Gulf War is useful here, contrasting the time taken to establish PATRIOT missile batteries with the deployment of Aegis cruisers. Once the SCUD threat was recognised, it took 34 days to establish the first PATRIOT battalion in Saudi Arabia.[61] Even if there had been no Aegis ships in the Gulf at the time, the nearest would have been 14 days steam away in Yokosuka, Japan. A comparison of lift is also useful. The first two PATRIOT batteries that deployed took 50 C5 Galaxy aircraft to move them. By comparison, a full load of weapons for a TICONDEROGA class cruiser would use four of the same aircraft.[62] This comparison appears to weight the discussion heavily in favour of the ship. However, it should be remembered that reloading the ship's vertical launch system could only take place alongside in a friendly port. Nonetheless the comparison is considered ample demonstration of the advantage in initial deployment time and resources to be gained from naval TBMD systems. In the ADF this would translate to a very significant saving in capability "start-up" costs, given that the air warfare destroyer is already in the Defence Capability Plan.[63]

The mobility aspect of sea-based ballistic missile defence should also be examined a little more detail. The mobility and persistence of warships comes to the fore in this discussion. A TBMD capable air warfare destroyer would be able to position itself, often in international waters, to best effect to intercept ballistic missiles in any of the phases of their flight. It would also be able to remain there for long periods of time. Positioning forward to engage in the boost phase would have the additional advantage of destroying the target over the launching State and returning the debris to the enemy. Forward deployment also allows more time to evaluate trajectories and check for decoy weapons. It would also foster a "shoot-look-shoot" policy to allow more engagement opportunities.

The advantages to be gained from a sea-based TBMD capability are significant, and synergistically accrue to and are supported by, the vessel's broader air defence role. However, acquisition of the capability must consider pathways to foster introduction of TBMD. At this point it is appropriate to examine what the air warfare destroyer might be expected to deliver and then address additions and changes to accommodate TBMD.

Procurement of the air warfare destroyer with long range air warfare capabilities is a high priority in *Defence 2000*.[64] The revision of the sensor suite and combat system to include

growth potential for CEC and TBMD would be a vital addition to this basic requirement. The new class should be an existing, proven design to avoid the systems integration pitfalls of so many recent acquisitions. It must also be remembered that the class will remain in service until about 2050, based on a life span of 30–40 years. Because it will be in service for so long, and to hedge against obsolescence, there needs to be substantial margin for growth—6,000 tonnes has been assessed as the minimum displacement for the air warfare destroyer.[65] This is larger than any class of surface combatant the RAN has fielded for half a century. The figure of 6,000 tonnes is based partly on experience with the ANZAC Warfighting Improvement Program. In this program, expanding the class by lengthening the hull to fit more power generating capacity was explored. The extra generation capacity was needed to power additional systems required for the increased air warfare capability mooted for an upgraded ANZAC. However, it was discovered that even a ship of between 4,000–5,000 tonnes would have been too small to provide the room required for this growth.[66] Consequently, it is now accepted that the specific requirements of the air warfare destroyer really mandate a larger vessel. The additional size will be of little concern to the "bean counters" as the hull and propulsion machinery are relatively cheap, it is the combat systems fitted that govern the cost.

A large hull also offers space for growth into other warfighting arenas in the longer term. The Vertical Launch System with which the air warfare destroyer will be fitted permits the launch of other missiles, which includes CEC, TBMD or even land attack. There are other drivers for a ship of this size too. One is the issue of survivability should the air warfare destroyer sustain combat damage. The larger the ship the less overall impact on warfighting capability a hit on the ship will have. However, the core capability of the air warfare destroyer, and the main driver for ship size will be the air defence systems. For interoperability, within the RAN and with likely allies and coalition partners, such as the United States, this must be based around the vertically launched Standard family of missiles. This would also provide an easy growth path to introduction of SM-3 for an exo-atmospheric TBMD capability when that system becomes available and necessary.

The new ships will provide the air defence umbrella that would allow task groups to project power wherever it might be required, independently of RAAF aircraft if necessary. In the ideal situation, where ground based aircraft were available the ship's SM-2 missiles would still be important contributors to the battle for local air superiority. Powerful surveillance radars and long range missiles would also be force multipliers that would increase the effectiveness of the ADF joint air warfare effort. Additionally, *Airborne Early Warning and Control* (AEW&C) aircraft could rely upon the continuous protection of these ships while synergistically feeding back the excellent long range radar picture that their height advantage allows. This could even relieve the pressure on scarce fighters, which may well be more heavily committed elsewhere.

The air warfare destroyer will be limited in numbers and so a full class may not always be available due to maintenance and refit requirements. Clearly, there is a need to balance a core force of high capability ships with adequate numbers of less capable ships that are able to defend themselves and still contribute to task group operations. Such ships are more affordable and will be the numerical majority of the Fleet, allowing lower tempo operations to be conducted in widely dispersed areas while the air warfare destroyers form the core of task groups undertaking high tempo, high risk operations. Currently, the Guided Missile Frigates and ANZACs have this role but a future platform may well be replaced by a smaller version of the air warfare destroyer. Further, the broader introduction of a smaller ship class with good air defence capabilities would relieve the pressure on the air warfare destroyer for escort duties, allowing it to focus on the TBMD role.

Senior members of the RAN have publicly articulated what SEA 4000 should embody. Rear Admiral Robertson is one who has enunciated what is expected from the air warfare destroyer.[67] A summary of current defence thinking on what is required results in a list of very significant new capabilities.

As a fundamental requirement, the ship should be capable of operating effectively in all weather conditions from the tropics to the sub-Antarctic with a range of 6,000 nautical miles or more. Good sea keeping is essential as RAN operations are spreading beyond the immediate confines of the "inner arc" to the Southern Ocean, the Middle East and beyond. The vessel should have a maximum speed of 30 knots or better in order to conduct the defensive manoeuvring required in the fast paced era of modern warfare.

A robust design to ensure a reasonable chance of survival in the event of receiving action damage and to reduce the chance of damage to vital areas, equipment and personnel is also a must. Minimum manning will also need to be achieved through higher levels of automation. This is due to the changing social demography[68] of Australia that will enforce a continued minimum manning policy in RAN ships.[69] Generally, the air warfare destroyer is expected to have manning levels significantly lower than that of the current frigates—which is about 190 persons without the helicopter detachment. One source of automation is unmanned aerial vehicles. However, it has been suggested that these could bring with them a significant personnel burden so achieving the personnel reduction could be problematic.[70] Incidentally, a capability to carry two helicopters is also sought to improve the ship's surface surveillance range and reduce reliance on shore-based assets.

The air warfare destroyer will need long-range and layered anti air defensive systems demanding phased array radar capabilities. An air defence capable, large calibre gun will constitute one of the ship's defensive layers and could offer an additional capability—the ability to apply long range precision fires to land targets. Consequently the class should come with a 127mm extended range gun as a minimum, with an upgrade path to the new naval 155mm gun. Due to the expectation that it will fulfil a significant command and control function, extensive command, control and communications facilities will also be required for the ship.

Contributing significantly to the air warfare destroyer's survivability will be low ship signature against all detection systems above and below water. The inclusion of self-defence capabilities against torpedo and mine attack would further this contribution.

The hull size and design should allow for major equipment additions and alterations during the lifetime of the vessel, including at least one major modernisation. This consideration should include a growth path to TBMD capabilities and standoff weapons such as the tactical TOMAHAWK land attack missile.

At least three fully fitted ships are expected to be built in Australia. With parts, training and missiles included for three years the estimated cost is between $3.5 and $4.5 billion.[71] Currently, the year of decision for SEA 4000 is planned for 2005-6 with acquisition and building due to commence soon after. The first ship is to be in commission by 2013.

A variety of possible contenders arise: The F-124 (Germany), the LCF (Netherlands), the Type 45 Daring class destroyer (United Kingdom), the F-100 (Spain & US) are the main ones to date. A much less publicised design to be offered to the RAN is the Gibbs & Cox International Frigate.[72] Whatever the choice the RAN makes, interoperability with major allies and potential coalition partners will rank high on the list of requirements.[73] Where TBMD is concerned, this limits the choices to those that offer US weapon systems, specifically, the Standard family of missiles and their supporting combat systems and

network links. This paper has demonstrated the need for an integrated approach to TBMD involving inputs from offboard sensors and systems. An Australian TBMD capability must consider these requirements.

If interoperability with allied and potential coalition partners' forces is important then interoperability within the ADF is critical. This would demand commonality of network systems within the ADF as well as to the US Navy. The inclusion of Link 16 with an upgrade path for CEC would contribute much to interoperability with RAAF assets as well as the US Navy.

A key capability that CEC offers TBMD is the faster and more accurate TBMD engagements. It also offers the ability to see stealthy aircraft or small anti-ship missiles through the use of a fully integrated anti air warfare tactical picture. For this information to be passed around a task force a new data link will be required, as the ADF's current generation system, Link 11, cannot deliver the data quality. Such equipment would be sourced through Australia/US defence cooperation through America's Foreign Military Sales program to which ANZUS gives us easier access. The growth path to CEC will enable over the horizon and other non line-of-sight air as well as third party engagements. This capability would be further enhanced by the inclusion of an illuminator on the RAAF AEW&C aircraft and US development of an autonomous surface-to-air missile.[74] The operational flexibility that such a "system of systems" offers is immense.

Achieving the offboard cueing for TBMD engagements is another part of the "system of systems" that needs to be considered. This would entail combining satellite surveillance feeds from overseas (ie. SBIRS) with that available from Australian assets. These would include the JINDALEE Over The Horizon Radar Network; GLOBAL HAWK unmanned aerial vehicle surveillance; and AEW&C aircraft. Such collaboration will be necessary because satellite surveillance alone will not necessarily provide complete coverage. A consequence of this for an ADF TBMD planner will be the need to achieve constant coordination of allied and national sensors with those of ships. Critical to this requirement will be the capability that resides in Australia's Pine Gap facility.

Although Pine Gap's major role remains the collection and processing of satellite communications intercepts over Asia, missile defence puts an entirely new slant on the facility. In 1999, when Nurrungar was shut down, Pine Gap absorbed its role of monitoring America's *Defence Support Program* (DSP) satellites that detected ballistic missile launches. DSP is about to be replaced by SBIRS, which will also use Pine Gap.[75] However the facility is little more than a relay station that is known by the Americans as a "bent pipe". This means that the data comes in from a satellite and is relayed automatically to the United States. No processing of missile launch data is done at Pine Gap. Moreover, the satellite feed goes to other ground stations, and also hops from satellite to satellite back to the United States. This level of redundancy means that Washington could close the SBIRS missile detection system at Pine Gap with no detriment to its NMD program.[76]

Rumours have also circulated that the ADF has gained agreement to "tap" into the "pipe" at Pine Gap to download and process data from the satellites. It has further been suggested that construction of satellite terminals to relay important signals intelligence has begun.[77] If true, this would offer a direct link into an ADF TBMD system as proposed elsewhere in this paper.

It seems then, that many of the basic building blocks required for an ADF TBMD system are being put in place. The air warfare destroyer, as the delivery platform for ballistic missile defences, is in the Defence Capability Plan. Appropriate weapon systems are under development in the United States, with good prospects for success. The ADF is developing

a networked force.[78] The communications hardware that this would demand should easily accommodate dissemination of the data required for a TBMD capability. The kind of networked force proposed would facilitate the incorporation of JINDALEE and AEW&C into a coherent, focussed air warfare and TBMD package. Finally, the satellite information feed that could become available through Pine Gap would provide the ADF, with a useable, deployable TBMD capability. Given that so many of the basic building blocks are being put in place it would be remiss of ADF planners not to ensure a growth path to such a valuable capability—but what would the neighbours say?

International Relations

In the foment of post Cold War geopolitics, responsibility for managing regional disputes is being firmly devolved. In recent years Australia, along with other US aligned Asia-Pacific nations, has been under pressure from America to take more responsibility for regional defence.[79] The Prime Minister, John Howard reiterated this in his now famous gaffe about Australia's "deputy" status to America in South East Asia.[80] Notwithstanding the political incorrectness of that remark there is a role for Australia to play in the region. The frequently expressed desire for greater engagement with the region, which began with the Hawke and Keating governments, has evolved under Howard. This evolution has led to a push for greater influence in the region.[81] A traditional vehicle for Government foreign policy, the RAN has always been an important conduit for delivery of this influence. The Navy, as one of Australia's key representatives in South East Asia, must therefore be able to operate in the region with military credibility. A TBMD capability, and the broader air warfare capability that it implies, would contribute significantly to RAN credibility in the ADMI and the broader region.

The argument for military credibility must of course be tempered with the sensitivity of regional States, which could bear heavily on any Government deliberations to acquire a TBMD capability. Regional attitudes vary considerably. They range from almost hysterical outbursts from the Chinese, through the more considered attitudes of ASEAN to wholehearted acceptance from Taiwan.

Generally, regional attitudes reflect the military positions of the particular country in question. In the case of China, opposition to TBMD reflects the fear that the United States' first strike capacity combined with NMD would render China's nuclear retaliatory capability impotent. This could make the United States less cautious during any crisis involving China.[82] Development of an ADF TBMD capability might therefore be expected to draw a similar response from China. Key to understanding China's position on NMD is the doctrinal basis of the ABM Treaty. It controlled the development of US and USSR missile capabilities on which the doctrine of Mutually Assured Destruction was founded during the Cold War.[83] This held that a reduced ability to defend against ballistic missiles, and the assurance that both parties would be mortally wounded in a nuclear exchange, militated against WMD proliferation.[84] With the demise of the old USSR and the recommencement of America's missile test program, the ABM Treaty is now defunct.

The ABM Treaty should be irrelevant to the Sino-US relationship too, as there is no nuclear parity between them. Nonetheless it is the basis of China's opposition to NMD. The People's Liberation Army argues that some nuclear capabilities would be missed granting them a retaliatory capability.[85] This, they argue, is what contains a casualty averse America. This issue became more sensitive during the 1990s with the re-ignition of Sino-US tensions over Taiwan.[86]

Not surprisingly Taiwan, threatened by Chinese ballistic missiles from the mainland, is more sanguine about such developments. As a major beneficiary of an American NMD program Taiwan has little to lose by its construction. Consequently, Taiwan has been relatively quiet on the issue so as not to further beard the Chinese lion. It is this Taiwanese aspect of China's opposition to NMD, and by implication any ADF TBMD acquisition, that should give Australia some pause for thought.

Given Chinese sensitivity to missile defence, particularly in relation to the issue of Taiwanese independence, can Australia afford to anger one of the major players in its ADMI? Would the ANZUS Treaty draw Australia into a conflict across the Taiwan Strait? Would a TBMD capability merely guarantee an ADF contribution to such a conflict? The answer to all these questions is—possibly—but should Chinese sensitivity be a determinant on whether or not to acquire a TBMD capability?

Lying even closer to home there may yet be other sensitivities—in ASEAN. At a press conference given after the 33rd ASEAN Ministerial Meeting the Vietnamese Minister for Foreign Affairs spoke quite plainly.[87] When questioned he opined that ASEAN responded negatively to America's NMD proposals. In this example it must be remembered that Vietnam is currently the only country in ASEAN to possess ballistic missiles. This lends support to the comment that State attitudes are a reflection of their military position. However, the Vietnamese statement is not a true reflection of ASEAN attitudes. An official communiqué on the 34th ASEAN Ministerial Meeting, the following year, is very muted on the subject, merely encouraging further dialogue.[88] This even-handed position reflects an ASEAN that is not united on the matter of NMD (or TBMD).[89]

A final aspect of regional sensitivity to TBMD capability can be explored through an examination of associated international law issues. This relates to territorial sovereignty, which extends to the airspace above a country and its territorial sea.[90] Consider the possibility of a regional conflict where ballistic missiles and TBMD capabilities are deployed. In South East Asia many countries are physically small. It is not difficult to posit an engagement of a ballistic missile, fired from a belligerent country, against an Australian led coalition's landing site, over a neutral country. If this weapon were then intercepted and the debris landed in the sovereign territory of that neutral third state the, politico-strategic ramifications could be significant. Hence the concern felt by Japan in August 1998 when North Korea tested its TAEPO DONG I missile system.[91] The flight path followed by that weapon passed exo-atmospherically over Japanese territory.

In considering the above scenario in the light of the Outer Space Treaty some further minor points can be made. The treaty is silent on defensive weapon systems in outer space. However, offensive systems, specifically WMD, do rate a mention and are prohibited.[92] A general reference to State liability for any damage occasioned by objects launched into space is also made.[93] In summation, no specific prohibitions are made on defensive conventional weapon systems being used exo-atmospherically.

It seems then that, in considering international relations, the main impediment to Australia acquiring a TBMD capability would be China. This is the major power in the region and so not easily ignored. ASEAN as a block is undecided, although some within it clearly oppose NMD/TBMD. Australia would need to balance the encouragement of the US and the pull of the ANZUS alliance with the sensitivities of a major regional power with no clear leads from our near neighbours. With the current Government bias clearly towards America the climate may be right for such an acquisition—but an election could change all that.

CONCLUSION

The fundamental question this paper asks is—Does Australia need to be able to defend against ballistic missiles? The question raises issues beyond the mere existence of ballistic missile weapon systems capable of affecting Australia. It also goes to issues of Defence policy and strategy.

In examining these questions this paper has reviewed ballistic missile systems with clear capability to influence Australian interests in the region and even the mainland itself. Nations fielding these systems will, of course, deny they pose any threat to Australia or any other country. They might even argue that ballistic missiles are defensive systems—but these systems cannot be used defensively. They are, by their nature, offensive weapons. Indeed it is TBMD that is the defensive system in this kind of argument. In any case current national intents are barely relevant to this discussion because regimes change, and so does the geopolitical landscape. What matter is that these systems have the potential to threaten Australia and its interests. Therefore the ADF requires the capability to counter them.

Domestic attitudes to TBMD reveal a clear shift in rhetoric away from the "Fortress Australia" paradigm towards something closer to the "Forward Defence" of the sixties and seventies. This is not a backward step. The author argues that a good way to defend Australia is by "Supporting Wider Interests" and "Contributing to the Security of the Immediate Neighbourhood". This consideration underlies much of the revisionism of Australian Defence policy and emerging strategy, driven to a large extent by Minister Hill. This shift in emphasis towards "force projection" brings with it new requirements for "force protection". Any Australian contingent deploying against a ballistic missile armed adversary had better be able to deal with that threat. It is the proliferation of ballistic missiles and their payloads, coupled with a new expeditionary outlook, which drives the ADF to acquire such a capability.

Establishing the requirement for a ballistic missile defence capability spawns other questions. What is the right kind of defence? What is the best way to acquire it? How can the ADF tie in existing (or legacy) systems? What issues must be considered in new acquisitions to ensure the ADF can accommodate the introduction of ballistic missile defences?

The ADF has always been, and will always be, resource constrained. America's dream of a ballistic missile defence system with national coverage is well beyond what Australia could generate. However, this does not prevent Australia from leveraging off American developments to build a versatile mobile capability of its own. Indeed, it would be remiss of the ADF not to do so. The air warfare destroyer is already in the Defence Capability Plan, as are a number of other critical components of an Australian ballistic missile defence system. Whilst this will not provide an Australian version of NMD, it could offer theatre wide coverage—certainly enough for ADF "force projection" needs into the foreseeable future. Even if the ballistic missile defence weapons were not actually acquired for the RAN's air warfare destroyer, the ADF must include an upgrade path to TBMD when acquiring it and supporting RAAF capabilities. Unfortunately, the acquisition of land or air based ballistic missile defences is probably a "bridge too far" for the Government purse.

An issue that would be certain to exercise Government decision makers is the impact ballistic missile defences would have on regional political relationships. What about our major alliance? Does international law encourage or decry such acquisitions?

With the demise of the ABM Treaty there are few arguments that can be made against TBMD on the basis of international law or agreements. In any case the ABM Treaty only ever applied to the old USSR and America. The *Law of the Sea* and *Outer Space Treaty* both offer little resistance to such acquisitions. So the Government is left to contemplate international opinion—and this is the fulcrum upon which the real decision will turn. On the one hand lies a clear threat that must be countered and the pull of our major strategic alliance, while on the other the ire of a potential superpower and the mixed bag of opinion that is ASEAN.

So finally one is driven to pose an earlier question a second time: Should regional sensitivity be a determinant on whether or not to acquire a TBMD capability? In balancing this consideration against the potential threat to other ADF areas of operation the author suggests that, it is not. The Government would be abrogating its responsibility to ADF soldiers, sailors and airmen if it espoused a new strategic role for them without providing the tools to carry it out.

Notes

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[6] Nemets, Dr Alexander, (2002). Situation Over Taiwan Very Tense – Again. *NewsMax.com – America's News Page*, 21 August 2002, http://www.newsmax.com/archives/articles/2002/8/20/173108.shtml.

[7] Commonwealth of Australia, *The Defence of Australia 1987*, Australian Government Printing Service, Canberra, 1987, Article 1.10, p. 2.

[8] Cirincione, Joseph, (2001). *A Brief History of Ballistic Missile Defense*, Carnegie Endowment for International Peace, 2001, http://www.ceip.org/files/Publications/BriefHistoryofBMD.asp.

[9] Narvias, Dr Martin, (2000). The German Missile Campaign and the Strategy of Terror, *Jane's Special Report – BALLISTIC MISSILE PROLIFERATION*, Jane's Information Services, 1 March 2000, Article 13.1.

[10] Sheppard, Ben, (2000). India and Pakistan – a Tale of two Processes, *Jane's Special Report – BALLISTIC MISSILE PROLIFERATION*, Jane's Information Services, 01 March 2000, Article 11.3.2.

[11] Schweikert, Mark, (2000). BMD and the RAN. *The Navy – Official Journal of the Navy League of Australia*, Vol. 62 No. 3, Sydney, NSW, Jul–Sep 2000, p. 7.

[12] Sechser, Todd, (2000). *World Missile Chart*, Carnegie Endowment for International Peace, 2000, in toto, http://www.ceip.org/files/projects/npp/resources/ballisticmissilechart.htm.

[13] A true ballistic missile is one that has a brief period of rocket-powered flight, continues on an unpowered (or ballistic) trajectory, then curves back to an impact point on earth.

[14] Siegel, Adam B., (2002). Scuds against Al Jubayl? US Naval Institute - *Proceedings,* Annapolis, December 2002, p. 35.

[15] Sechser, op cit, p. 7.

[16] Note that not all non-Western aligned countries fielding ballistic missiles have been included. The reasons for this are twofold: firstly, non-Western aligned countries are more likely to threaten Australia's interests and secondly, those chosen serve to focus the scope of this paper to an indicative discussion of ballistic missiles that could generate military effects in our region.

[17] Lunn, Stephen, (2002). North Korean missiles could hit Australia, *The Australian*, 2 December 2002.

[18] See Table 1.

[19] *Proliferation News and Resources – China Nuclear Forces*. Carnegie Endowment for International Peace, 2001, http://www.ceip.org/files/nonprolif/numbers/china.asp.

[20] Sechser, op cit, p. 7. (extract)

[21] Commonwealth of Australia, *Defence 2000 – Our Future Defence Force*. Defence Publishing Service, Canberra, 2000, Section 5.15, p. 36.

[22] Prime Minister John Howard, *Joint Statement between the United States of America and Australia*, 10 September 2001, http://www.pm.gov.au/news/media_releases/2001/media_release1233.htm.

[23] Commonwealth of Australia, *Defence 2000*, Sections 6.8 and 6.9, pp. 47, 48.

[24] Ibid, Section 6.12, p. 48.

[25] Ibid, Section 6.20, p. 51.

[26] Department of Defence, *Australian Maritime Doctrine – RAN Doctrine 1*. Defence Publishing Service, Canberra, 2000, p. 31.

[27] Ibid, pp. 57–58.

[28] Department of Defence, *The Australian Approach to Warfare*, National Capital Printing, Canberra 2002, p. 12.

[29] Ibid., p. 20.

[30] Department of Defence, *Future Warfighting Concept*, National Capital Printing, Canberra 2003, p. 9.

[31] Ibid, p. 16.

[32] Office of the Minister for Defence, "Senator Hill on Lateline" (TV program transcript), June 2002, http://www.minister.defence.gov.au/2002/110702.doc

[33] Dean, Gary, (1999). *Security and Australia's Involvement in the World*. May 1999, http://www.okusi.net/garydean/works/ozsecurity.html

[34] Such scenarios are already being explored in Defence experimental activities. The author recently participated in Joint Experiment 02, which postulated a "Kamarian" takeover of northern Papua New Guinea. In this scenario the aggressor was equipped with SRBMs fitted with cluster munitions to be used as runway denial systems, against which the ADF had no counter.

[35] Powell, Colin L., (2001). *Statement of the Secretary of State-Designate*, Confirmation Hearings of the US Senate Committee on Foreign Relations, 17 January 2001, http://usembassy.state.gov/posts/jal/wwwhc272.html. If China was the aggressor, or WMD were likely to be used, the US would become involved and take the lead.

[36] Swicker, op.cit.

[37] SRBMs have ranges of less than 1000km.

[38] Hammerer, John, (2002). Missile Defense … From the Sea. *Sea Power*, Vol. 45, No. 9, September 2002, p. 46.

[39] Schweikert, op. cit, p. 9.

[40] United States Navy, *Navy TBMD*, Navy Area menu, Slide 4.

[41] Surface to Air Missiles, International, *Jane's Naval Weapon Systems 34*, 2001, http://defweb.cbr.defence.gov.au/disgjanes/jnws36/jnws0482.htm.

[42] Swicker, op cit.

[43] United States Navy, *Navy TBMD*, Navy Theatre Wide menu, Slide 9.

[44] Ibid, Kinetic Warhead Overview, Slide 2.

[45] Sirak, Michael, (2002). Sea-Based Ballistic Missile Defense. *Jane's Defence Weekly*, Volume 38, Issue No. 18, Jane's Information Services, 30 October 2002, p. 21.

[46] Yang, Andrew N.D., (2000). Coercion and Crisis Management during the 1995-96 Taiwan Strait Missile Exercises. *Jane's Special Report – BALLISTIC MISSILE PROLIFERATION*, Jane's Information Services, 1 March 2000, Article 15.2.

[47] Schnurrpusch, Captain Gary W., USN (Rtd), (1999). Asian Crisis Stirs Navy TBMD. US Naval Institute, *Proceedings*, September 1999, pp. 46–49.

[48] Commonwealth of Australia, *Defence 2000*, Article 8.60, p. 90.

[49] Schweikert, op cit, p. 8.

[50] Erikson, Mark, (2002). Israel Ready for War with Iraq. *Asia Times*, Hong Kong, 28 August 2002, http://www.atimes.com/atimes/Middle_East/DH28Ak01.html.

[51] MacKenzie, Stuart and Stephens, Alan, (1994). *Bolt from the Blue: the Ballistic and Cruise Missile Problem*. Air Power Studies Centre, Paper No. 20, RAAF, February 1994, p. 5.

[52] Cirincione, Joseph, (1998). Our Anti-missile Defenses are Overrated. US Naval Institute, *Proceedings*, Annapolis, April 1998.

[53] These are variations on the scatter bomblets used in conjunction with some aircraft delivered runway denial systems and rocket/artillery delivered area denial systems.

[54] MacKenzie and Stephens, op cit, p. 7.

[55] Friedman, Dr Norman, (2001). Future C4I for Smaller Navies. In David Wilson, ed., *Maritime War in the 21st Century*, RAN Sea Power Centre, Defence Publishing Service, 2001, p. 161.

[56] United States Air Force, *Air Force Issues Book – 1997*, Appendix B – Air Force Background Papers, SBIRS, 31 January 1997. http://www.af.mil/lib/afissues/1997/index.html

[57] Swicker, op cit.

[58] Ibid.

[59] Willfong, Captain Dallas, USN, (2002). *Cooperative Engagement Capability*. Briefing delivered to RAN representatives, Russell Offices, 12 December 2002.

[60] Friedman, "Future C4I for Smaller Navies", op cit, p. 161.

[61] Schweikert, op cit, p. 10.

[62] Ibid, p. 10.

[63] Defence Materiel Organisation, *Defence Capability Plan 2001–2010 (Public Version)*. Defence Publishing Service, Canberra, 2001, p. 264.

[64] Commonwealth of Australia, *Defence 2000*, Section 8.57, p. 89.

[65] There is general consensus in the material reviewed by the author on this figure.

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[67] Robertson, Rear Admiral Andrew, RAN (Rtd), (2002). The RAN and Air Warfare Destroyers. *The Navy – Official Journal of the Navy League of Australia*, Vol. 64 No. 2, Sydney, NSW, April–June 2002, p. 3.

[68] Department of Defence, *Future Warfighting Concept*, p. 10.

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[92] Office of Outer Space Matters, *Outer Space Treaty*, United Nations, New York, 1994, Article IV.

[93] Ibid, Article VII. [93] United States Navy, *Navy TBMD*, Presentation CD, 2001, Introduction, Slide 1.