

SUBMARINES FOR AUSTRALIA

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Senator the Hon Alex Gallacher
Chair
Senate Economic References Committee
Parliament House
Canberra ACT 2000

21 October 2020

Dear Senator Gallacher

Inquiry into Australia's Sovereign Naval Shipbuilding Industry

I am pleased to present a supplementary Submission from Submarines for Australia to your Committee's naval shipbuilding inquiry.

We made a Submission to the Committee in July, but since then I have commissioned further research by Insight Economics, supported as always by the distinguished Australians who comprise the Submarines for Australia expert reference group. This research contributed to a Submission to the Department of Defence Capability, Acquisitions and Sustainment Group (CASG) made by Submarines for Australia in September. This current Submission is a further development of that work.

The main feature of the current Submission is that it has an increased focus on the acquisitions processes undertaken by CASG, which have a significant impact on the performance of the naval shipbuilding industry. For example, if the government selects platform designs that are highly risky, as they have done in regards to both the SEA1000 and SEA5000 programs, it is unlikely that the industry will deliver them on budget or to the required schedule. We argue that the government should insist that CASG does what any private sector corporation would do, that is to analyse their proposed major investments in military capability, taking account of all the risks involved, so as to select the design most likely to deliver a positive risk-adjusted return on the investment.

The other issue for government to consider in its evaluation of acquisitions proposed by CASG is whether the acquisitions will be fit for purpose. It is almost comical to see how Defence has almost always sought to replace like with like for at least the last fifty years. For example, three 1950s Daring Class destroyers were replaced by three Perth class destroyers which begat three Hobart class destroyers. The only significant change to this approach came in 2009 when the Rudd government announced, not on the basis of advice from Defence, that the Submarine Force would be doubled in size to 12 boats.

This replacing like with like approach completely ignores changes in Australia's strategic circumstances. It reflects the fact that Defence never conducts serious force structure analyses. The ADF basic force structure still hangs off what the British bequeathed to us all those years ago. By contrast, the US Navy undertakes a serious force structure analysis about every five years and the effect on new acquisition strategy can be far reaching.

I am convinced that if the government had undertaken sufficient due diligence on the submarine (SEA1000) and frigate (SEA5000) projects, neither would have offered a positive risk-adjusted return in terms of delivering cost-effective capability. In the absence of any force structure analysis, Ministers should also have insisted on a detailed evaluation as to how both platforms would be fit for purpose in terms of the much more challenging strategic and operational circumstances in which these assets will be deployed in the 2030s and beyond.

In terms of SEA1000, additional information has come to light on the cost of the program since our last Submission was lodged in July. It seems that the budget was covertly increased

by up to 60 per cent in 2015 from \$50bn to \$80 billion in out-turned dollars (or \$50bn in constant prices), while the CEP was in progress but before the contenders had put in their rough order of magnitude (ROM) estimates of the project cost. TKMS put in a fixed price tender at \$20bn and we understand that neither of the ROM estimates for the other two designers exceeded \$25bn at constant prices. Yet in light of these estimates from the one source that should know – the submarine builders – it seems incredible that Ministers would simply accept Defence's advice that the program would cost twice as much as the highest shipbuilder's estimate. Did they even seek to determine whether the program would be cost-effective? What happened to the concept of deriving value for money in Defence acquisitions?

The schedule for delivering the submarines – over a period of 20 years from 2034 – bears absolutely no relationship to Australia's increasingly threatening strategic circumstances. If there were any further delay in the program (and we are hearing some disturbing stories to that effect) the situation becomes completely untenable and demands an interim solution so as to avoid a disastrous gap in submarine capability. This on its own provides grounds for a review of the program. Most importantly, such a review should also include an evaluation of whether Australia has a strategic and operational need for nuclear-powered submarines and, if so, how we might acquire them.

In some ways, the government's performance on SEA5000 is even worse. It is interesting that in approximately the same timeframe as the RAN, the US Navy was seeking to acquire a new ASW frigate, the FFG(X), with very similar specifications to ours. The Americans rejected the British Type 26 from their competitive process because it was an unproven design. We not only included it in the competition, but went on to select it, even though it did not embody American C3 systems and missiles that we needed to incorporate and there were already rumours about excessive weight issues in the less complex design being built for the Royal Navy. We rejected the Navantia F-100, even though it already embodied these American systems and we had already built three of them – the final ship quite successfully – as the Hobart class. We rejected the Fincantieri FREMM frigate despite the fact that the Italians offered a very satisfactory level of Australian industry content and, unlike the Type 26, had hangar space for two helicopters, which naval experts deem to be essential for anti-submarine warfare. As usual, Defence selected the riskiest option they could find.

Now the Hunter class needs a complete re-design because of its weight problems, leading to additional risks and a significant delay in the program. By comparison, the Americans have selected the Fincantieri FREMM design for their FFG(X) frigate. With a very similar specification to the Hunter class, that is, to be re-designed with US systems and missiles, the budget for the first nine American frigates is A\$1.4bn per ship compared with over A\$5bn per ship – all in inflated, out-turned dollars – for the nine vessels of the Hunter class. Even if you generously allocate \$5bn for infrastructure and other add-ons for SEA5000, our ships still will cost three times more than theirs.

Finally, our Submission includes a discussion of how to increase cost-effective Australian Industry Content in our shipbuilding programs. Without a higher level of AIC we are paying a lot of money to support a ship consolidation activity, not a shipbuilding industry at all. With a high reliance on overseas supply chains, it is also difficult to see how this represents a sovereign capability.

I wish your Committee every success. We would be very happy to present evidence at a public hearing should you invite us to do so.

Yours sincerely



Gary Johnston
Submarines for Australia

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Senate Economics References Committee

Inquiry into Australia's Sovereign Naval Shipbuilding Industry

Supplementary Submission by *Submarines for Australia*

October 2020

Submarines for Australia and its Reference Group

Submarines for Australia is an entity with a website owned and operated by Gary Johnston, founder and CEO of Jaycar Electronics Pty Ltd. Mr Johnston has no commercial interest in the SEA 1000 program or Defence projects more generally. Over the last three years, Mr Johnston has supported significant research by Insight Economics and others into Australia's future submarine project and more recently in naval acquisitions projects more generally. We are extremely grateful for Mr Johnston's sponsorship of this important public interest work.

Mr Johnston is also keen to acknowledge the contributions from the members of an expert reference group that has developed around this issue. These individuals include distinguished Australians with strong relevant experience who have contributed their time and expertise in the national interest.

Inter alia, this group includes:

- Dr Michael Keating AC, former Secretary of the Department of Prime Minister and Cabinet and Secretary of the Department of Finance
- Professor Hugh White AO, Emeritus Professor of Strategic Studies at the Australian National University and former Deputy Secretary of the Defence Department
- Rear Admiral RAN (Retired), Peter Briggs AO, former commanding officer of Oberon class submarines and CO of the Submarine Force, Director of Submarine Warfare and Head of the Submarine Capability Team
- Commodore RAN (Retired), Paul Greenfield AM, former Engineering Officer in the Submarine Force, and a principal of the Coles Review into Collins class sustainment
- Commodore RAN (Retired), Terence Roach AM, former commanding officer of two Oberon class submarines, former Director Submarine Policy and Warfare, Director General Naval Warfare and Director General Maritime Development
- Dr John White, former CEO of AMECON (builder of the Anzac frigates)
- Dr Hans J Ohff, Visiting Research Fellow at the University of Adelaide, former Managing Director and CEO of the Australian Submarine Corporation
- Mr Jon Stanford, Director, Insight Economics Pty Ltd.

The quality of this Submission has been greatly enhanced by the expert views of members of this reference group. Individual members of the group may not agree with every statement in the Submission, however, and responsibility for the material contained in this document lies with *Submarines for Australia*.

Executive summary

This submission focuses on Australia's Naval Shipbuilding Plan. It provides an analysis of the procurement process, namely the selection of the platform to be constructed. The choice of a high risk, unnecessarily complex, design affects the timely performance of industry. It is particularly relevant to Australian manufacturing and the establishment of a domestic supply chain.

A flawed acquisition process for naval platforms

Less than twenty years ago, Australia had a thriving, sovereign naval shipbuilding industry. It delivered complex platforms at global benchmarks with >70 per cent Australian industry content (AIC). Since the completion of the Collins submarine, ANZAC frigate and Huon mine hunter contracts in the early 2000s, the performance of the industry has deteriorated. Subsequent naval platforms have been delivered late, at a substantially higher cost than the global standards for comparable assets and with considerably lower local content in the supply chains.

Late delivery and high cost are often the result of decisions made at the beginning of a Defence procurement process. It seems evident that there is a distinct lack of oversight and accountability in the governance of procurement process and decision-making:

- There is a lack of financial analysis of these very large investment projects to ensure they provide an acceptable pay-back, while the lack of transparency in the acquisition processes for defence assets results in the same mistakes being repeated
- Instead of the Government giving guidance on available funds to the Defence Department, the Minister is given a rough estimate on acquisition costs and delivery time by Defence
- Parliamentary scrutiny of defence projects is less intense than in most, if not all, Western countries and Japan
- The government routinely accepts high risk, high cost and late delivery acquisition proposals apparently without undertaking any level of due diligence
- Without vigorous scrutiny and interrogation Defence traditionally recommends the replacement of like with like – Ministers should challenge this process by insisting on regular force structure analysis (as the US Navy undertakes every five years or so)
- The government often fails to drive the timely replacement of obsolescent equipment, resulting in risky and costly life extensions to ageing platforms.

Within Defence (specifically the Capability, Acquisitions and Sustainability Group), we note:

- A disposition to select high risk *ab initio* designs – such as for the future submarine (SEA1000) – or the modification of existing platform designs that are so extensive that they effectively become *ab initio* designs – such as for the future frigate (SEA5000)

- instead of following overseas practice and where possible evolving existing platforms that Australian shipbuilders have experience in constructing at much lower risk
- An almost cavalier disregard for value for money and cost effectiveness, with the platforms selected for both SEA1000 and SEA5000 budgeted to cost around three times global benchmarks
 - with the budget for the future frigates being equivalent to over \$5bn per ship compared with the US navy's budget for its FFG(X) program, with a very similar capability requirement, being \$1.4bn per ship, and
 - the government's preparedness to spend \$89bn to deploy one conventional submarine permanently on station in its primary area of operations by the 2050s when the SEA 1000 program is scheduled to be completed.

Within the Australian shipbuilding industry we observe:

- A desire for the government to maximise construction activity in South Australia, which is inconsistent with the need to harness national resources in order to ensure the delivery of a challenging level of advanced industrial capability, when
 - while the industry can be centralised in South Australia, the State falls short of demonstrating the critical mass required to achieve this on its own
 - the current work scope for naval platforms may test the industrial capacities of Adelaide
 - relevant industrial capacities available in eastern States and in Western Australia should be exploited
- The selection of foreign companies as prime contractors that are unwilling or unable to deliver an appropriate level of AIC because they
 - understandably preference their well-established supply chains overseas
 - lack a deep understanding of both the strengths of Australian companies and how government could facilitate their further development
 - may be unwilling to develop a deep relationship with local companies and involve them in global supply chains because, on the basis of experience, they expect to be engaged for only one project
 - may have offset and other obligations derived from other countries in which they operate, to the detriment of AIC
 - fail to involve local companies during the design engineering stage, essential for their involvement in the supply chain
- A move away from the purchaser-provider model that has allowed CASG to intervene regularly in detail with the Prime contractor rather than specifying what is required from the Prime and then operating at arm's length, preferably with a fixed price contract

- this led to a dysfunctional relationship with the government-owned ASC on the SEA4000 Hobart class
- and has led to a similar dysfunctional relationship with Naval Group on the SEA1000 Attack class program, leading to the Naval Shipbuilding Advisory Board recommending that the government consider walking away from the contract.

A way forward

We propose that in the acquisition process, the Minister determines, in close consultation with her department:

- The capability that needs to be acquired on the basis of the most recent force structure analysis – with regular FSAs to occur in future – and in the context of the planned retirement of existing assets without
 - necessarily replacing like with like and taking full account of new technologies (such as un-crewed vehicles)
 - allowing crewing costs to determine the choice of platform
- The budget for acquiring the capability, on the basis that the new assets will be acquired in accordance with global procurement benchmarks.

The department oversees a competitive process to select the design, taking at least two proposals through to a Project Definition Study and preliminary design:

- The competing designs should be assessed in part on the basis of a detailed financial analysis of the risk-adjusted returns in terms of delivered capability within the required timeframe and maximising cost-effective AIC.

There is a strong case for privatising both arms of ASC – Submarines and Warships – as the prime contractors for delivering naval platforms. The Primes, which would have majority Australian ownership, would:

- Operate at arm's length from Defence under the purchased provider model on the basis of a fixed price contract
- Potentially work closely in the long-term with one well established overseas designer
- Work closely with Australian industry and develop an extensive local supply chain with a mandated and audited cost-effective level of AIC.

The most urgent necessity is for a review of both the SEA1000 and SEA5000 programs. This imperative was not included in the Minister's force structure review. The review is required to evaluate whether the new capability will be:

- Delivered on a schedule that is consistent with the implications of the elimination of warning time
- Cost-effective without putting excessive pressure on a constrained defence budget
- Fit for purpose in terms of delivering a sufficient capability so as to deter an attack on Australia or meet it with lethal force should it develop.

1. Identifying the problems

"It costs a lot to make bad products."

Norman Augustine, former Under Secretary of the US Army, Law XII

Less than twenty years ago, Australia had a thriving, sovereign naval shipbuilding industry. Following a successful completion of two FFG-7 frigates, two programs to build six highly complex submarines and 10 frigates (two for New Zealand) were being delivered at or near global cost benchmarks with over 70 per cent Australian industry content (AIC).

Currently naval shipbuilding in Australia is no longer a sovereign industry nor, in the true sense of the world, is it a *shipbuilding* industry. Rather, it is a ship *consolidation* industry that assembles components and integrates advanced military systems imported predominantly from the United States and Europe and fitted to an Australian-built hull. This is important because by merely undertaking an industrial process akin to the much more complex equivalent of assembling flat-packs, we do nothing to enhance the capability of the defence industry more generally so as to achieve the goal of increased industrial self-reliance.

In addition, in relation to sovereignty, rather than contracting the consolidation task to majority Australian-owned Prime contractors as has been the case since federation, the government has engaged foreign-owned Primes, one of which is majority French government owned, to deliver the future submarines (SEA1000) program, and another is British owned for the future frigates (SEA5000) program.

The commercial and political objectives of these foreign Primes may not always coincide with the Australian national interest. Quite understandably, they are likely, for example, to rely on their well-established supply chains overseas to the detriment of potentially competitive Australian companies. Having been engaged to deliver just one program, however lengthy that program may be, they will have little commercial interest in undertaking the major long-term task of developing an Australian supply chain that would benefit them in other projects. Importantly, if the Prime is majority owned by a foreign government, it would be entirely rational if it were more interested in creating jobs and wealth in its own country rather than in ours.

Despite having gravitated to what is essentially an assembly and outfit operation, with no control and little insight to the detailed design and production engineering data, the cost of locally built naval platforms has increased rapidly over the last fifteen years to levels that are extremely high when measured against global benchmarks:

- The recently completed Hobart class destroyers (SEA4000) cost between two and three times the global benchmark
 - with a very low level of genuine Australian industry content (AIC) in the supply chain
 - however, the percentage of the total acquisition cost that was expended in Australia was massively inflated beyond international benchmarks (including for Anzac Frigates), due to

this highly inefficient shipyard assembly/outfit activity,
artificially increasing the apparent overall program AIC

- The budgets for the SEA1000 future submarine program and the SEA5000 future frigates have blown out to well over double the global cost benchmark even before the designs have been completed
 - the Naval Group Attack class submarine is now budgeted to cost well over twice as much as the fixed price tender offered by TKMS for the German contender, with lower local content and a much later delivery date
 - the Hunter class acquisition budget is over three times that of the American FFG(X) frigate, a ship based on one of the contenders for SEA5000 and with a similar specification to Hunter
- The commencement of new acquisition programs is now generally so late that high-risk life extensions and upgrades to obsolescent vessels need to be undertaken, at very high cost, so as to ameliorate potential capability gaps.

In our view, there are two fundamental reasons for the industry's current problems:

First, many of the issues arise from deeply flawed processes early in the acquisition phase, before the naval shipbuilding industry itself becomes involved

- In defining the required capability and making a choice between competing designs, there seems to be little understanding of risk within the Defence department's investment appraisal processes, including how to evaluate and manage both technical and financial risk
 - and little obvious recognition of the imperative of obtaining value for money in these massive investments
- While the delivery schedule is governed more by seeking to optimise the capability solution with little obvious concern about the degree of risk
 - thereby making the perfect but very high risk capability outcome the enemy of a good outcome with substantially lower risk that might better satisfy the increasingly urgent strategic delivery imperative at an acceptable cost.

Secondly, in terms of the shipbuilding task itself, Defence appears to have abandoned the principles of the purchaser-provider model, whereby the supplier (the Prime) operates at strict arm's length from the customer (Defence) with

- An aversion to fixed price contracts, which would effectively prevent Defence from regularly intervening in the shipbuilding process and periodically seeking to change the design
- Little practical understanding of how to deliver the strategic objective of establishing greater industrial self-reliance by maximising efficient Australian industry content, especially in the supply chains - which will

increase the cost and endanger the reliability of through-life support if dependent on overseas supply.

These two issues are addressed in Chapters 2 and 3 below. Some possible avenues for reform are explored in Chapter 4.

2. Strategic considerations: selecting the platform

"The last 10 per cent of performance generates one-third of the cost and two-thirds of the problems."

Norman Augustine, former Under Secretary of the US Army, Law I

2.1 Strategic issues underlying the capability requirement

The acquisition of new defence platforms clearly needs to be based on a capability requirement that derives from the nation's military strategy and its implications for the force structure. This strategy is likely to evolve over time and so should require a flexible response involving regular force structure reviews.

We may have cause to doubt whether this is the case in Australia, where the ADF has exhibited a longstanding policy of seeking to replace like with like.

The Australian Military Strategy and replacing like with like

Paul Dibb, in a letter to the Minister covering his 1986 Defence Capability Review, said that he could find nobody in the upper echelons of the Defence department who could explain to him why Australia needed in the future, as in the past, 12 destroyers, three fighter squadrons and six infantry battalions.¹ Over three decades later, these parameters have changed very little

- In the maritime domain, the RAN is in the process of replacing eleven destroyers and frigates with 12 warships in a situation where:
 - Australia's real GDP has approximately doubled and its population is 60 per cent greater than in 1986
 - Australia's strategic circumstances are now much more threatening – in 1986 Indonesia was regarded as the main potential adversary, whereas now it is a far more powerful China
 - because of advances in anti-ship missile technologies, the threat to warships is now more pervasive and challenging than in the last century.

The one recent exception to the 'like for like' rule was when in 2009 the Rudd government announced that the six Collins class submarines would be replaced by 12 new boats

- Significantly, this decision did not originate in Defence but was made by Ministers based on external advice
- Similar to the decision made by the Howard government to acquire F/A-18 Super Hornet aircraft when it became apparent that the F-111 bomber would be retired early and the F-35 Joint Strike Fighter would be delivered late

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<https://parlinfo.aph.gov.au/parlInfo/search/display/display.w3p;query=Id:%22publications/tabledpapers/HPP032016004265%22;src1=sm1>

- again, we understand this was an initiative of the Defence Minister, Brendan Nelson, acting proactively rather than on the advice of his department.

One possible reason for replacing like with like is that, particularly in a period where there was a minimal strategic threat to Australia, it avoided unnecessary tension between the services which would occur if one of them was seeking a larger share of the pie. Another possibility, as one of Australia's most eminent strategic experts has suggested to us, is that the like-for-like approach occurs because Australia doesn't have an effective military strategy. The Minister's recent Defence Strategic Update at least provides a new baseline on which to develop the future acquisition program. But it is unclear if the Strategic Update – which describes *where* the ADF will seek to confront an adversary in any emergency – has fed through to a review of the Australian Military Strategy (AMS), which should focus on *how* we will deter or engage the adversary. This then feeds through to the force structure.

Understandably, the AMS is a closely guarded secret. But in concert with Paul Dibb's observation from the 1980s, one former insider has suggested to us that revisions to the AMS, which occur rarely, appear to have an overriding objective of justifying the existing force structure.

If this is the case, we should not be surprised that, no doubt on advice, the Minister excluded current acquisitions, even those only in the design stage, from the force structure review that she commissioned from her department last year.

2.2 Naval acquisitions and the future force structure

The Defence Strategic Update has signalled a significant change in Australia's defence strategy. The two main implications of the Update are the elimination of the previous assumption of ten years 'warning time' and the shift of emphasis from coalition operations in far distant theatres such as the Middle East to forward defence operations in and beyond the air-sea gap to Australia's north and west. Inevitably, the RAN and the RAAF will be of primary importance in conducting such operations. This emphasis is in no way reflected in the current structure of the Australian Defence Force.

ADF force structure

Currently, just over half of the ADF's uniformed personnel serve in the Army. In the 2018-19 Department of Defence annual report, the breakdown of the ADF uniformed workforce headcount at 30 June 2019, not including reserves, was:

- Royal Australian Navy - 14,206 (24.5%)
- Australian Army - 29,511 (50.8%)
- Royal Australian Air Force - 14,341 (24.7%).²

² Department of Defence Annual Report, 2018-19, https://www.defence.gov.au/annualreports/18-19/DAR_2018-19_Complete.pdf, page 93.

The Prime Minister has compared the current period in Australia's history to the situation leading up to the Second World War. In 1938-39 the ratios were somewhat different:

- Royal Australian Navy - 5,051 (47.5%)
- Australian Army - 2,795 (26.3%)
- Royal Australian Air Force - 2,793 (26.2%).³

Although overall Australia was very ill-prepared for war in 1939 and the armed forces needed to have been much larger in aggregate, given that it takes a lot longer to build naval platforms than military aircraft or to recruit and train infantry, the ratio of personnel between the three services at that time may have been roughly appropriate. But is the current ratio appropriate in terms of the recent Defence Strategic Update?

As far as we know, the last significant force structure review occurred in the mid 1980s as a consequence of the Dibb Review of Defence Capability. Since June 1986, the RAN and RAAF workforces have declined by 12 per cent and 37 per cent respectively, while the Army has seen a 9 per cent reduction. In terms of developing the Update into a military strategy, it could reasonably be argued that the immediate emphasis should be on re-balancing the ADF away from the Army and in favour of building up the Navy and Air Force:

- The Army is likely to play a reduced role in implementing the new strategy because of the greatly reduced emphasis on major coalition deployments such as in Iraq and Afghanistan, although some ongoing role in peacekeeping missions may be expected
- In light of the time it takes to deliver the new platforms required to increase the capability of both the Navy and Air Force and to train the required number of skilled personnel, an increase in the number of both Navy and Air Force personnel may well need to begin now.

RAN force structure

Size of the RAN workforce

As regards the size of the Navy's workforce, there are two issues to be considered here. First of all, the Navy has been unable recently to provide a crew for a frigate that came out of a refit and upgrade and was available for deployment. This suggests there is a shortage of personnel that means we are not able to populate the Navy's platforms. Particularly as we enter a grey zone, which is the implication of the elimination of any warning time, this is clearly unsatisfactory.

Secondly, and more importantly from a longer term perspective, one factor underlying some recent critical acquisitions has been a concern to minimise the crew size:

³ Australian Defence Almanac, 2011-12, Australian Strategic Policy Institute, https://s3-ap-southeast-2.amazonaws.com/ad-aspi/import/12_53_35_PM_ASPI_defence_almanac_2011_12.pdf?vNzXEQtA5bqdxWO9r60xyDAD45g2_d1H, page 63. In 1939, the regular Army was also complemented by a much larger number of volunteers for the Militia, which played a major role in operations against Japan.

- The selection of the Spanish F-100 design for the Hobart class air warfare destroyers was influenced by the fact that it required a smaller complement than the larger and more capable DDG-51 Arleigh Burke class, which was the Navy's preference
- Despite the fact that the Navy is replacing the Anzac class frigates (regarded as Tier Two ships) with the Tier One Hunter class, which are also twice the size, there was a requirement under the Competitive Evaluation Process (CEP) for the crew to be of a similar size
 - while the desire to minimise crewing costs was presumably only one factor that led to the selection of the F-100, it was still the case that we paid far too much for that ship – over twice the sticker price for a more capable DDG-51 – a differential that would have been significantly greater over the life of the ship than the costs of a larger crew taking to sea a more capable ship.

The navy workforce needs to be reviewed as there would appear to be a strong case to increase its size.

Review of new acquisitions

There are major question marks as to how the Navy's current acquisition program will deliver the force necessary to prosecute the strategy contained in the Strategic Update in the much more urgent timeframe contained within it.

The doubling of the RAN Submarine Force from six to twelve boats in the 2009 Defence White Paper under SEA1000 demonstrated a welcome recognition of the importance of submarines to a middle power like Australia and its need to be able, if necessary, to wage asymmetric warfare against a major adversary. Without even alluding to the excessive cost of the program and its low level of Australian industry content, the selection of an *ab initio* design for the submarine implied both the acceptance of very high risks around the program and a very long delivery schedule.

Even if everything goes well, which it never has in recent history for an *ab initio* submarine design anywhere in the world, the first Attack class submarine will not be in service for another 15 years:

- It will take a generation before the RAN will be able to guarantee that at least one Attack class submarine will be available on station 'up threat' for half the time
 - and not until the 2050s will the RAN be able to guarantee that at least one submarine will be available on station all the time.

This schedule is totally at odds with the urgency implied both by the much more dangerous strategic situation implied in the Update and the elimination of warning time. To relate the situation back to 1939, as the Prime Minister sometimes does, it is equivalent to then Prime Minister Menzies telling the people at a time of peril that they should take heart because the government was designing a powerful new Australian class of submarine, with the first one to be in service, if all went well, in 1953. There is a clear case for a review to examine possible avenues to bring forward the delivery of an advanced

submarine capability in an acceptable timeframe at an acceptable cost, with a higher level of AIC:

- But government also needs to consider other options, such as the acquisition of nuclear-powered submarines and Underwater Un-crewed Vehicles (UUVs), in the longer term as an important means of deterring an attack by a major adversary

Under SEA5000, the Navy is still seeking to acquire large, powerful warships at a time when, with the development of hypersonic and targeted ballistic missiles, combined with much more effective and pervasive space-based surveillance systems, the threat to surface ships is dramatically increased. This is not to argue that a frigate or even a corvette is any less vulnerable than a bigger destroyer, but they are smaller and cheaper and we should be able to afford more of them, and build and/repair them faster in Australia, so as to be better able to deal with the implications of attrition. The Royal Navy, for example, has reduced its requirement for the large Type 26 platform that Australia has selected in favour of acquiring more smaller, less expensive warships.

The American approach to this issue is also interesting. The US Navy did not replace the 1970s-80s FFG-7 frigates when they retired, except with the less capable Littoral Combat Ships that were designed, in part, to confront non-State actors. With the rise of China, this philosophy has changed, but not necessarily to the extent of building more large, expensive warships. It is worth quoting from a report from the Congressional Research Service as lately as July 2020:

The Navy's 355-ship force-level goal is the result of a Force Structure Analysis (FSA) that the Navy conducted in 2016. The Navy conducts a new or updated FSA every few years, and it is currently conducting a new FSA that is scheduled to be released sometime during 2020. Navy officials have stated that this new FSA will likely not reduce the required number of small surface combatants, and might increase it. Navy officials have also suggested that the Navy in coming years may shift to a new surface force architecture that will include, among other things, a larger proportion of small surface combatants.⁴

In addition to this, it is clear from the same report that the US Navy will focus more of its procurement budget on Un-crewed Vehicles in the future.

This report is also interesting in that it shows how frequently the American armed forces review their force structure and make changes where necessary. This idea appears to be quite foreign to the approach of the ADF. Although the Minister instructed the Department to undertake a force structure review last year, any asset of any importance was excluded from it.

From the perspective of the force structure, a review of SEA5000 is warranted because:

⁴ Congressional Research Service (2020), *Navy Frigate (FFG(X) Program: Background and Issues for Congress*, Washington DC, July, page 3.

- It appears that BAE Systems cannot meet the Navy's specification for the Hunter class in terms of the size of the platform, and based on the resulting schedule implications BAE Systems has gained agreement from Defence that its overseas supply chains will be relied on for the re-design of the Hunter class
- There is a need to review the capability required of the warships in light of the Strategic Update to examine, for example, whether a mix of large warships, with their important anti-ballistic missile capability, and a greater number of Corvette-sized vessels might be better suited to Australia's evolving strategic circumstances.

2.3 Naval acquisitions and the capability requirement

Excessive ambition

In one sense at least, Australia is fortunate in not being reliant on a national champion in developing high-risk, indigenous defence technologies:

- In general the ADF is able to choose from the best of western defence technologies and acquire them at a fair (and competitive) price
- One of the main benefits of the ANZUS alliance is the ability to acquire advanced technologies from the United States that may not be available to other countries.

But, as Norman Augustine has pointed out (above), over-ambition in the capability requirement can have major downsides.

First, it is highly risky to specify a requirement for a capability that pushes out the contemporary technology frontier into unknown territory. For example, in the case of SEA1000, there is a widespread recognition, including by two former Prime Ministers, that primarily because of the very long transits to and from the area of operations, there is an operational need for a nuclear-powered submarine (SSN). Yet the decision by successive governments not to attempt to acquire SSNs while maintaining an operational requirement almost tailor-made for them has led to the selection of an *ab initio* design for a very large diesel-electric submarine with an endurance much greater than that of other SSKs around the world.

The preliminary design still has not been completed in the fifth year after the decision was made and the program is acknowledged to be of high risk and it also exhibits a high and increasing cost and extended delivery. Apart from being delivered far too late in the context of Australia's evolving strategic circumstances, as discussed above, the Attack class is also likely to be

- Well short of being cost-effective in terms of the deployment of a sufficient force on station at any time because of the very long transits to the area of operations (AO) made at less than half the average speed of advance (SOA) of which a SSN is capable
- Because of its lack of speed and limited dived endurance, not necessarily fit for purpose in terms of both effectiveness and survivability in the tactical environment of the 2030s and beyond

- With the price and delivery risks increased substantially by Defence eliminating all further competition and deciding to down select to one contender on the basis only of a concept design for an *ab initio* platform.

Secondly, the ability to go shopping in the world's military high technology markets can provide a temptation to "mix and match" the world's best sensor and weapons systems with the best platforms:

- Integrating systems with each other and with platforms not designed for them can be highly fraught and lead to major delays, cost overruns and possibly sub-optimal performance over the life of the asset.

For example, in the case of the SEA5000 acquisition, the government selected the UK Type 26 platform:

- A ship that was eliminated from consideration by the US Navy for its FFG(X) program because it was not in service and therefore not a proven design
- Having fundamentally transformed the capability requirement from an ASW frigate to a general purpose destroyer incorporating the American Aegis combat system and SM and ESSM air and missile defence weapons systems
 - thereby increasing the full load displacement by up to 20 per cent, necessitating what is in reality an *ab initio* re-design of the platform
 - with a high degree of risk around cost and delivery
 - without adding to the short list of contenders other platforms that already met much of the revised capability requirement
 - against the backdrop of a deteriorating strategic situation, and
 - a politically-driven need to avoid a 'valley of death' in the ASC Osborne shipyard following completion of the Hobart Class.
- There are at least three less risky options available to satisfy the capability requirement for SEA5000:
 - the Navantia F-100 platform, already on the short list, that incorporates almost all of the systems specified by Defence (including ASW capability) and of which ASC had already built three copies, the last of which apparently met the global benchmark cost for Aegis ships
 - the DDG-51 Arleigh Burke class destroyer, that more than meets all the revised capability requirements under SEA5000 and that the RAN had wanted to acquire for the SEA4000 acquisition
 - but that is a much bigger ship than the Navy was seeking under SEA5000, with a significantly larger complement and higher operating cost than other contenders
 - the Fincantieri FREMM frigate, included in the SEA5000 assessment, that has subsequently been selected by the US Navy for its FFG(X) acquisition and will incorporate Aegis, SM

missiles and ESSM at reportedly around half the cost of a DDG-51 destroyer.

Ab initio designs are very high risk and should only be considered if a satisfactory capability cannot be derived from an existing military off-the-shelf (MOTS) design or the evolution of an existing RAN platform. In general, the latter is a much lower risk option that was available for both SEA1000 (with 'Son of Collins' or Collins 2.0) and SEA5000 (with the Hobart class). In fact, when Defence was first considering options for SEA1000, the US Navy suggested that an evolved Collins would be a relatively low risk option. For Dr Marcus Hellyer of ASPI, the exclusion of Collins 2.0 from consideration for SEA1000 was "one of Defence's most bizarre capability decisions".

Succession of design partners

In its last six acquisitions of major naval platforms, Australian has worked with six different foreign shipbuilders with responsibility for the designs:

- Adelaide class frigates – Todd Pacific Shipyards (USA), well proven design, including in service in Australia
- Anzac frigates – Blohm+Voss (Germany), well proven
- Collins class submarines – Kockums (Sweden), novel and developmental design
- Hobart class destroyers – Navantia (Spain), generally proven
- Attack class submarines – Naval Group (France), novel and developmental design
- Hunter class frigates – BAE Systems (UK), developmental design.

Unlike most other advanced countries with a significant naval shipbuilding capability, in acquiring six complex platforms Defence has worked with different designers, only two of which are domiciled in Five Eyes countries and have English as a first language. Some of these companies operate differently to Australian industry in terms of their processes, industrial practices and cultures.

The main difficulty with this policy is a lack of continuity that can have a disruptive effect on the long-term experience curve, as local Primes and their suppliers seek to develop their expertise over time in the interests of continuous improvement:

- Where an Australian-owned Prime is engaged to deliver a new platform, they will need to come to grips with a different approach by a new designer
 - this may manifest itself, for example, in a different engineering philosophy, a strong preference to use the designer's existing overseas supply chain, a different platform for digitalising the shipyard and a difference in organisational and workplace culture – the difficulties with the Hobart Class provide an example of this
- Similar difficulties will be encountered by companies operating in the shipbuilding supply chain

- with no continuity in terms of the nature and specifications (including language and embedded/implied know why & how) of the components required by platform designers from different countries.

Although there are many other reasons for the decline in efficiency and Australian industry content in the transition from building the Anzac frigates (designed by the German company Blohm+Voss) to the Hobart class (designed by the Spanish company Navantia), these issues will have also played a part.

2.4 Reducing cost and risk

Evaluating risk

One reason why budgets for military equipment often blow out is because of the risks involved in overly ambitious capability requirements (see Augustine's first 'law' at the beginning of this chapter). This can mean that a lesser capability may be delivered than originally required or that the capability costs more than it should or is delivered later than required. It is therefore essential that Ministers, who should ultimately be responsible for acquisitions, understand the risks involved in any acquisition and, if they are excessive, examine ways of reducing them either by modifying the requirement at the outset or establishing a risk management process during the procurement process combined with cost reviews and controls.

For example, the risks around the SEA1000 project were set out succinctly in a Parliamentary submission by two senior analysts from the Australian Strategic Policy Institute (ASPI) in March 2020 (Exhibit 1):

EXHIBIT 1: DOES THE GOVERNMENT UNDERSTAND THE RISKS AROUND SEA 1000?

Currently, while there is extensive public commentary in the media and strategic policy community, there is no agency or entity which has a mandate to provide independent advice to the government on the broader risks associated with the undersea warfare capability transition based on all available information.

These risks include:

Operational risk. For example, will the program deliver enough boats to sustain adequate presence in the areas we need to operate? Will this level of presence actually make a strategic difference? Just as importantly, can conventional submarines do what Defence expects of them? Put another way, are the requirements for the future submarine program reasonable in the first place? Or are they driving the development of the largest, most expensive submarine in the world that will fall short of meeting those requirements anyway?

Force structure risk. Does the massive investment in submarines distort the ADF force structure? Is it forcing Defence to delay or reduce investment in other key capabilities? We know already that Defence has delayed expenditure on many other projects in order to fund SEA 1000. We also know that Defence is fundamentally underinvesting in key emerging technologies such as autonomous systems. It is dangerous to regard submarines as a silver bullet that justifies any cost, no matter how high.

Technological risk. Will new technologies render the investment in submarines nugatory? While there may not be inventions in the short to medium term that will make the seas transparent, it is highly likely that with the proliferation of cheap, small drones carrying sensors (and potentially weapons) that can aggregate their signal data, even the undersea domain will become extremely dangerous for manned submarines.

Source: Marcus Hellyer and Michael Shoebridge, Submission to the JCPAA, March 2020.

The most important risks in these technologically advanced and highly complex programs are likely to be technical. These need to be thoroughly evaluated by engineering and shipbuilding experts, who can also point out how

the risks could be reduced, perhaps by not insisting on, say, the final 5 per cent of capability and to avoid making a difficult to achieve 'perfect' solution the enemy of a more easily achievable 'good' one. Then their risk assessment of various options could be used as an input to the financial modelling of the investment, as discussed below.

Since the abolition of the Naval Technical Services group around two decades ago, it is unclear whether Defence currently has the capacity to undertake high quality, technical risk assessment in a complex shipbuilding project. Such an assessment is vital in informing risks around capability, costs and schedule. This should occur ideally within the Capability, Acquisitions and Sustainment Group (CASG) inside Defence. However, one former senior Defence insider, told us that:

The power lies with the lawyers in CASG and it has gone unchallenged for so long that it is now unassailable. The lawyers decide on matters of engineering without any input from engineers. The operators rarely bother talking to the engineers and are dominated by the lawyers. And none of them talks to industry - by which I mean has a genuine dialogue with the people who will actually do the work. The rest of the organisation isn't even aware of having been neutered by the lawyers. They are not called lawyers, they're called "commercial" people, which could not be further from the reality.

Of course, lawyers are vital when it comes to drawing up contracts and safeguarding the interests of the Commonwealth. But expertise in corporate finance, naval tactics, engineering and technology, and Australian industrial capability/culture would seem to be of much greater importance when making decisions around the trade-offs between capability on the one hand and cost and risk on the other.

Value for money

The way that Defence estimates the cost of new acquisitions is unnecessarily opaque. The recent practice appears to be to set an extravagant budget at the outset and then increase it.

We now know that the original budget for SEA1000 increased from \$50bn in out-turned dollars to \$50bn in constant price terms in 2015, during the Competitive Evaluation Process (CEP), an increase of nearly 50 per cent. To increase what was already widely regarded as an extravagant budget by this amount in secret and without waiting to see what rough order of magnitude (ROM) cost estimates the three contenders for the program would provide is an extraordinary approach:

- As it turned out, TKMS offered a fixed price tender of less than \$20bn to design and build the 12 submarines in a time frame that potentially could mean that not all of the existing Collins class would require a potentially very costly life extension
 - and we understand that the other two contenders came in with ROM estimates of \$25bn or less
- Nevertheless, the budget has remained since the CEP and in terms of out-turned dollars at least has increased by a further \$10bn

- it is not at all clear how Defence justified the very substantial cost increase or the extent to which it was interrogated by other departments and by Ministers on the National Security Committee of Cabinet
- in any significant private sector investment where the estimated cost had increased by 50 per cent, Directors would scrutinise the proposal in great detail in terms of its cost-effectiveness and opportunity cost and if it could not offer a positive, cost-adjusted rate of return, the investment would not go ahead.

Turning to SEA5000, the budget has increased from \$35bn to \$45.6bn out-turned, at a time when the ship is being extensively re-designed

- and again when the value of the AUD has been relatively stable and future inflation is projected to be low
- and the overseas supply chain has been adopted for the re-design at the expense of AIC.

While the Attack class submarine is a unique design whose cost is difficult to compare with overseas benchmarks, the same is not true of the Hunter class. The Fincantieri FREMM frigate was one of the contenders for SEA5000, and has been subsequently selected by the US Navy for the FFG(X) program – an ASW frigate that will incorporate Aegis and the American missile systems that the RAN requires. The estimated cost of the first nine American frigates is approximately US\$1 billion per ship in “then year dollars”, equivalent at an exchange rate of 70 cents to around A\$1.4 billion per ship. This compares with a budget of \$45.6 billion in “out-turned dollars” also for nine ships under SEA5000, or \$5.1 billion per ship, over three and a half times as much as the American frigate:⁵

- While we do not know exactly what is included in the budgets for the ships in America relative to Australia – weapons? helicopters? – this difference is too extreme for such considerations to make very much difference
- Noting also that the American shipbuilding industry does not set the global benchmark in terms of costs
 - with Aegis ships constructed in Japan and Korea, for example, being delivered at a significantly lower cost per tonne.

In addition to this, we should note that Fincantieri made a very attractive proposal to Australia in the CEP for SEA5000, including 70 per cent AIC and even building modules for the company's new cruise ships (not so relevant post-COVID-19). The FREMM ship also has at least one significant advantage over the Hunter class in that it has hangar space for two helicopters, regarded as essential by Navy professionals for detecting and tracking submarines where a ‘tag team’ can be required. Importantly, unlike in Australia, these frigates will

⁵ Congressional Research Service (2020), *op. cit*, Summary page.

be built by an American owned shipyard in liaison with the Italian designer. They will, no doubt, have a very high level of American industry content.

The budgets for these platforms, therefore, appear to be far higher than the publicly available cost estimates of acquiring similar assets overseas. It is not clear how much scrutiny is applied to these budgets, either by the Ministers in the Defence portfolio or at Cabinet level. A former Secretary of the Department of Finance has advised that Finance did not apply the same level of scrutiny to Defence programs, even those with very high budgets, as to programs in other departments. This is because Defence has a single line budget, which means that no savings are available if cuts were applied to one of the underlying programs – the funds would simply be transferred elsewhere in the Defence portfolio.

Australian governments seem less committed than others around the world to deriving value for money for defence acquisitions. In the US, for example, Congress maintains an assiduous scrutiny of the cost of individual military programs. When considering a new acquisition, the DoD is quite clear how much it is prepared to pay for it and advises contenders accordingly. Recently, for example, the US Navy decided it needed to reduce its focus on non-State actors and terminate the Littoral Combat Ship program in favour of acquiring the FFX(G) frigates. But the Navy told the industry exactly how much it would be prepared to pay for the new capability – around half the cost of an Arleigh Burke destroyer– and invited bids from contractors offering only proven in-service platforms enhanced by incorporating Aegis and SM and ESSM missiles.

Defence in Australia has not always been so prodigal with acquisition budgets. Establishing tight budgets for new capability was the approach adopted by the Hawke government, for example, with Kim Beazley telling Defence that the new submarine program would only go ahead if the cost “didn’t have a four in front of it”. The budget was then fixed at \$3.9 billion (although this was exceeded in the course of the project, partly due to overseas design & technology failures and inflation).

In our view, the current approach needs to change. It’s all very well increasing the Defence budget to two per cent of GDP, but any benefit from this in terms of acquiring a greater level of military capability will vanish if Australia continues to pay twice as much (and more) for naval platforms as we should. Governments should insist on a much greater focus on demonstrable value for money in its investment program measured against global cost benchmarks. The Minister for Defence should be accountable for driving individual programs to both meet required delivery schedules and either keep within their annual budget allocation under the Integrated Investment Program or direct the Department to make savings elsewhere. In addition, as discussed in Section 4 below, the government should apply commercial disciplines of rigorous investment appraisal of proposed projects, along with competitive tendering to achieve fixed prices (including contractual obligations to a percentage of cost-effective AIC, and provisions for escalation based on inflation and currency exchange rates).

3. Building the platform

"The best way to make a silk purse out of a sow's ear is to begin with a silk sow."

Norman Augustine, former Under Secretary of the US Army, Law XV

3.1 Selecting the Prime contractor

Up until the 1980s, warships were built in Australia largely in government-owned shipyards. In the period following World War II, the industry exhibited very low productivity in building platforms such as Daring class destroyers, River class frigates and the replenishment oiler HMAS *Success*. For a time, governments took to acquiring major combatants on a MOTS basis from the United States. The three Perth class DDGs were imported from the US under the Foreign Military Sales program as were the first four of the Adelaide class FFG-7s, with the remaining two ships to be built in Australia. This approach served the Navy well and facilitated an increased level of interoperability with our major ally, but it contributed nothing to developing a national naval shipbuilding capability.

Hawke government's naval shipbuilding privatisation

The naval shipbuilding industry was transformed in the 1980s under the leadership of Kim Beazley, Defence Minister in the Hawke government. Two majority Australian-owned Primes, AMECON (later Transfield Defence Systems and then Tenix) and the Australian Submarine Corporation (ASC) competed for contracts to deliver the remaining two FFG-7s, ten Anzac frigates (two for New Zealand) and six Collins class submarines.

Although the Collins class project suffered many problems early in its life, few of these were the result of the shipbuilding operation *per se*, and both Tenix and ASC were considered to have performed very well in these acquisition processes. Although there was some slippage on Collins' schedule, not unexpected for a totally new design with an unfamiliar partner in a nation that had never built a submarine before, both programs had tight budgets that were largely met. Both Australian Primes were highly successful in developing local supply chains, delivering a level of Australian industry content of over 70 per cent.

The general characteristics of these two programs were:

- They were built to fixed price contracts following a competitive process
- Australian industry content percentages were specified in the contracts (as achieved by the competitive tendering process), along with continuous reporting & independent auditing, and penalty obligations, so that the Primes had the responsibility to ensure that the overseas designers cooperated in the engineering and the procurement of Australian suppliers into the design of the First-of-Class vessels, ie, from the outset of the programs with provision of appropriate technology transfer
- A modular approach to construction was adopted and the workload was distributed across the nation

- modules for the frigates were built in three Australian States and in New Zealand
- Changes to the design after the contracts were signed were very limited
 - the only significant change to the Anzac specification was the substitution of a 127mm gun for the original 76mm
- While the Navy maintained a site office at the shipyards, the Primes operated at arm's length from the customer with good cooperation (especially from Naval Technical Services Division) but minimum intervention.

Howard government's naval shipbuilding nationalisation

The privately-owned Tenix's success in delivering the Anzac frigate project close to schedule and on-budget and with over 70 per cent AIC might have been expected to put the company in the box seat to win the competition to build what became the Hobart class air warfare destroyer under SEA4000. But this was a vain hope, with the project being awarded to the government-owned ASC in Adelaide. This decision was reported to have been influenced by the labour rates tendered and possibly too by the government's desire to privatise ASC. There was no genuine price competition or evaluation of the relative risks, with ASC (and South Australia more generally) never having built a warship nor, indeed, any surface ship. One caustic but quite understandable observation from a senior private-industry source at the time was that performing well in delivering a Defence acquisition guaranteed the company would never get another one.

Some reasons for the selection of ASC were:

- The Howard government was unimpressed with the performance of both the Collins submarines and the Anzac frigates even though in the latter case this was because of the original specification of ship capability and had nothing to do with its builder
 - for a long period of time the Collins class submarines were on the projects of concern list and were depth limited
 - the Minister for Defence Industry, Bronwyn Bishop, referred to the Anzac frigates in Parliament as "floating targets"
 - Defence was dissatisfied with the nature of the Anzac contracts, which required formal contract variations for them to intervene in order to, for example, upgrade the weapons fit for the later ships during the build process, even though the vessels had many 'fitted-for but not-with' features
- For reasons not altogether clear, the government had decided to make South Australia the centre of gravity of Australia's major naval shipbuilding industry
 - despite legitimate doubts as to whether the State could muster the critical mass of essential skills required to undertake this role

- ASC was now government-owned, which meant that although the Department of Finance was formally the shareholder, in operational terms Defence could exercise control over the main shipbuilding provider, ASC.

In an era where the Defence Matériel Organisation (DMO) was immersed in the new pessimistic ideas around the capability of traditional cost and schedule control systems for purchaser and provider (prime contractor) management and delivery of complex projects, the governance of SEA4000 was based on an Alliance between Defence, ASC and the American company Raytheon. The first inexplicable decision was not to require the inclusion in the Alliance of the designer of the platform, Navantia, while including the systems integrator, Raytheon.

According to ASC, the principal benefits of the AWD Alliance were:

- “All members work on a shared outcome basis, avoiding the adversarial relationship often set up in fixed-price contracting models
- Risks and responsibilities are shared and managed collectively, rather than allocated to individual participants, which reduces confrontation between parties
- Industry participants can only improve profitability by improving project performance—there is no extra profit for extra work
- Profits (gain) and losses (pain) are shared equally between government and industry
- The alignment of business outcomes causes ‘best for project’ thinking in management decision making
- Government has retained key controls including the power to ‘step in’ and complete the project if required
- The removal of the scope boundaries between the major project participants eliminates the time-consuming and costly disputes that typically occur as work passes across these boundaries and helps ensure that industry participants are focused on delivering a whole-of-capability solution.”⁶

This was an extraordinarily interventionist policy for a conservative government to adopt. The arrangement was facilitated by the fact that Defence had concluded a purchaser-provider agreement with the DMO in 2005. (This was an idiosyncratic view of the purchaser-provider model, where the provider should have been the Prime.) With Defence occupying the two most important chairs in the Alliance – purchaser and provider – and with Raytheon more in the position of an observer, there was never anybody to blame or sue when things went wrong. Effectively, all the project risk was borne by the Commonwealth.

And things did go very wrong indeed:

- Because Defence had contracted with Navantia for the design drawings rather than the production drawings (fit-for-building in Australia),

⁶ <https://www.asc.com.au/shipbuilding/awd-alliance/>

substantial and avoidable errors and language/industrial-culture driven difficulties were embedded in the design data leading to thousands of construction defects and resulting rework, including the construction of a major module with incorrect dimensions

- as a result of this failure and subsequent delays, some of the modules had to be built in Spain
- The design data integrated the overseas supply chain
 - leading to practically no Australian industry content in the Hobart class supply chain
 - which will cause higher costs and endangered reliability of through-life support of the Hobart class
- The ships were delivered very late
 - with the third ship commissioned four years later than originally scheduled which was also 19 years after the decommissioning of the final ship of the Perth class DDGs it replaced
 - necessitating the highly risky, expensive and only partially successful FFG Upgrade program
- At the time, the three Hobart class ships were the most expensive warships of their size ever built
 - only to be surpassed, according to their current budget, by the nine Hunter class ships
- Australian industry content on the Hobart class was very low, perhaps half the level on the Anzac frigates
 - mainly taken up by the high costs of (inefficiently) building modules and consolidating the platforms, due to the overseas sourced design data errors and deficiencies
 - and providing virtually no capacity building in the supply chain
- In cultural terms, far from promoting a close relationship between Defence and ASC, the Alliance led to a dysfunctional relationship between the two
 - no-one was properly in charge and ASC was unable to take responsibility and act because it was hamstrung by the Alliance processes
 - giving rise to a situation where Defence clearly doesn't now regard ASC as a credible Prime in any new acquisition
 - ASC's role is now to deliver sustainment, upgrades and LOTEs.

During the process, concerns about progress with the project prompted Defence to commission a report, by RADM (USN retired) Don Winter and Dr John White (foundation CEO of AMECON), on what needed to be done to get the project back on track. The Winter-White report has never been published but it appears to have contributed to a significant improvement in performance on SEA4000:

- ASC completed the third and final AWD more efficiently and claimed that its construction cost was comparable to the benchmark for Aegis platforms around the world.

At least after this late success, ASC, as the incumbent shipbuilder in South Australia, could surely look forward to being the Prime contractor for the next class of major warships, the British designed Hunter class, even if Government's ultimate objective is to privatise the company, as it arguably should. Also, with its good record, albeit dated, in building Collins, surely ASC could also look forward to being the Prime for building the French-designed Attack class? But it was not to be. Instead the Turnbull government turned to inviting foreign Primes to establish operations in Australia.

Turnbull government' switch to foreign Primes

Australia has moved from building ships in government-owned shipyards (very inefficiently) to building them at arm's length in yards by wholly Australian owned private companies (highly successfully) to building them in a government-owned shipyard again (inefficiently).

The current approach on both SEA1000 and SEA5000 is to bring in the overseas designer as the Prime with no competition for the detailed design or construction contract. It is not at all clear what the relationship with the overseas Prime will be. Will it reflect a traditional, arm's length purchaser-provider model with the purchaser specifying its capability requirement and the shipbuilder delivering it under a fixed price contract? Or will Defence be unwilling to relinquish control over the designer and shipbuilder even though they may not be able to mobilise many naval shipbuilding experts themselves? And we should not be influenced by these Primes setting up Australian subsidiaries, wholly owned by their overseas parent company, to create the illusion of Australian sovereignty, nor of them having the necessary commitment to establish Australian-owned industry supply chains.

In principle, there are several problems with this model:

- The level of commitment by a foreign-owned Prime to Australia's objective of creating a sovereign naval shipbuilding industry may be underdone, indeed conflicted
 - in the case of SEA5000, BAE Systems has already stated that the delays in the design because of concerns around excessive weight requires them to utilise their own overseas supply chains in order to keep the program to a tight schedule
 - in terms of SEA1000, with Naval Group, for example, being majority owned by the French government, as the Prime will it not be motivated more towards supporting the interests of French over Australian industry and creating jobs in France?
 - with the other major shareholder being Thales, will Naval Group commission Thales to provide systems (and associated supplies) for the future submarine to the exclusion of, perhaps, other systems the RAN may prefer?

- if the new Primes have offset or similar obligations in other countries where they undertake major projects, would they not have an incentive to provide work to sub-contractors in those countries in preference to Australian firms?
- to what extent will these foreign-owned Primes allow their traditional overseas suppliers to establish Australian subsidiaries (with ABNs) to rebrand overseas supplies as Australian content)?
- Knowing that Australia has not engaged a foreign naval platform designer for more than one project in the last fifty years, the foreign Prime may make hay while the going is good by means of:
 - with no competition, maximising the revenue from the Australian operation by exploiting a monopoly position first in the design stage and then in the shipbuilding operation
 - with no contractual obligation to meet a pre-determined AIC requirement, the temptation is to maximise the workload for the foreign Prime's overseas supply chain.

Continuous build

Provided it is cost-effective, the continuous build approach is an appropriate way of developing and retaining a high level of capability in the naval shipbuilding industry. It may also have the effect in ensuring that new capability is commissioned when required without giving rise to a capability gap.

One problem with continuous build is that a reduced drumbeat may be required to ensure the integrity of the policy. This may well conflict with the Navy's requirement for delivery of new capability due to the onset of block obsolescence of existing classes of ships built under the earlier model. Under SEA1000, for example, the final platform will be delivered in about 35 years' time.

These issues require evaluation and modelling. For example, it may be appropriate to retire Australian naval platforms earlier than most navies would contemplate – perhaps after 20 or so years in service – but with the proviso that they would not undergo costly (and risky) mid-life upgrades or LOTEs. Potentially, if designed carefully, this could provide net benefits in terms of the ongoing availability of cost-effective capability.

3.2 AIC and capacity building in the supply chain

Australia imports almost all of its major air and most land defence platforms, which have minimal local content (land equipment seeing a recent change from that practice). We import virtually all of our sensors, missiles, torpedoes and complex ordnance that provide the ADF with its lethal capability. The argument for procuring our naval platforms in Australia is based on the requirement for self-reliance in sustaining the platforms locally and efficiently repairing battle damage so as to get the vessels back on station as quickly as possible but, even more importantly, constraining the total cost of ownership

by ensuring sustainment and upgrades can be done here, without critical reliance on overseas supply chains.

If AIC in the supply chain for these platforms is low, there is little point in procuring these assets in Australia. At around 15,000, the number of jobs in naval shipbuilding is relatively small – far lower than in the motor vehicle industry now gone. If it wasn't worth protecting those jobs, what is the rationale for protecting a naval shipbuilding industry that merely fabricates the hulls and installs mainly imported components to consolidate a naval ship late and at very great cost and one that we may have the engineering capability to sustain anyway, like the F-35, even if it is imported?

This raises the very important point that AIC must be genuine, that is, the platforms must incorporate a large range of equipment made in Australia by local industry. There are a number of ways in which the level of apparent local content in naval platforms can be inflated, such as:

- Mixing local content (AIC) from excessive shipyard hours with materials produced by the supply chain – thus artificially inflating the dollars spent in Australia in the shipyard versus overseas supply chain purchases
 - so that the higher the cost of the ship in Australia, the higher the local content because of inefficiencies in the consolidation process
- Buying overseas components through foreign owned subsidiaries registered in Australia with ABNs and declaring this as AIC
- Including as AIC expenditure on service industries – such as accountants, lawyers, lobbyists, executive retreats in the Barossa valley – that make no contribution to developing the local manufacturing supply chain in naval shipbuilding
- Spreading the calculation of AIC over the acquisition and through-life support/sustainment (TLS) phases of the programs so that the inevitably higher level of expenditure in Australia for TLS averages up a low level of AIC during acquisition (design, supply chain procurement and construction) phase due to the use of overseas supply chains
 - if TLS were included in the acquisition of a fully imported aircraft like the F-35, for example, the program may well present with a respectable level of AIC.

Ultimately there is little rationale for a naval shipbuilding industry with very low genuine local content in the supply chains. As for RAAF assets, with no local industry, efficient foreign companies could come in and establish sustainment operations for RAN platforms, although this particularly challenges one of the lessons from COVID-19, namely the greater need for self-reliance in supply chains. In an industry policy context, Australian industry content below 60 per cent in naval shipbuilding arguably doesn't cut it.

Nevertheless, Australia got rid of industry protection a generation ago and should not return to it. If local companies are going to succeed in the naval shipbuilding industry, they must participate on the basis of being able to

provide equipment at or very near global benchmark costs. This is effectively what the local industry is asking for – to be able to bid for work on an equal basis with foreign players. The caveat here is that if local industry is to become more efficient and cost competitive, it is likely that government will need to assist in capacity building in the supply chain as all governments do around the world. The latest package of measures announced by the Morrison government to build capability in selected innovative manufacturing sectors, including Defence industry, is welcome in that regard. In addition, the potential for Australian supply must be factored in at the design engineering stage of the first-of-class platforms with appropriate licensing and technology transfer arrangements. If this does not occur, the foreign Prime will merely establish a home run for overseas suppliers.

A contestable pathway for Australian companies will not be established unless, within Defence, CASG:

- Develops a deep understanding of Australian industry capabilities and establishes close relationships with relevant companies, including a wide range of SMEs and current/potential Australian-owned Primes
- Establishes contractually enforceable minimum levels of cost-effective Australian-owned industry content in the supply chains of the military platforms, to be facilitated by technology transfer programs and engineered into the detailed designs of the first-of-class platforms by the (foreign-owned) Prime contractors
- Engages with the Prime in great depth during the design engineering stage of acquisitions so as to involve competitive Australian companies.

While some of the capacity building initiatives in the Naval Shipbuilding Plan are very welcome, Defence does not appear to have a strategy to develop and then maintain a high level of local content in the supply chain for the shipbuilding operation. In a commercial environment, exhortation and moral suasion rarely work.

The foreign Primes now tell us that Australia does not have the engineering and manufacturing capability to support a level of local content in naval shipbuilding of 70 per cent. Well, they would say that wouldn't they, and indeed recently in SEA5000 that is exactly what has been argued by BAE Systems, but:

- TKMS undertook a major study of Australian industry capacity in submitting a fixed price bid for SEA1000, with the submarines to be built in Adelaide at the same cost as in Germany with minimum 70 per cent AIC
 - TKMS did not do this lightly – their bid might have had existential repercussions for the company if they got it wrong and the analysis was extensively checked by the accountants and engineers in Kiel
- Arguably, Australia's resources industry is the world's most efficient – in a relatively high wage country – and this relies on an extremely efficient mining services industry

- with a range of local companies with excellent engineering skills and competencies that are readily transferable to naval shipbuilding.

The key factor is that if we are going to include competitive Australian companies in the defence supply chain for naval platforms we need to engage them at an early stage, that is, at the design engineering stage.

4. Way forward

"A billion saved is a billion earned."

Norman Augustine, former Under Secretary of the US Army, Law XLVI

In our view, it makes little sense to examine Australia's naval shipbuilding industry in isolation from the acquisition process for naval platforms more generally. Decisions about the capability requirement, including important issues around risk and cost, can have an important bearing on the performance of the industry in delivering the required naval capability.

4.1 Acquisition process – selecting the platform

We believe the government should implement some fundamental principles in the preliminary stages of the acquisition process:

- Investing in new or replacement capability should be directed towards building the force structure required to enforce the government's defence strategy going forward
 - thereby moving away from the policy of 'like for like' replacement that has endured for at least the last four decades
- Ensuring the timely replacement of obsolescent capability so as to avoid both a capability gap and the need to undertake expensive and risky upgrades
- Deriving value for money in naval acquisitions by ensuring new platforms are delivered at a cost that reflects global benchmarks
 - and not sacrificing capability, often at a cost, by an unwarranted focus on specifying a relatively small crew size
- As proposed in many previous reviews, reducing risks in the acquisition process by
 - wherever possible, avoiding *ab initio* design projects in favour of evolving an existing platform or selecting a proven, in-service MOTS design
 - and avoiding, unless absolutely necessary, excessive ambition in new capability, including the temptation to mix new systems with other systems and platforms not designed for them.

Implementing these principles would require a process somewhat different to the present approach:

- The first step in the acquisition process would involve determining what new or replacement capability is required, based on the force structure necessary to enforce the government's defence strategy
 - this analysis would need to occur long before current assets become obsolete and then be regularly reviewed
- Secondly, the Minister would place a value on acquiring that capability, that is deciding how much the government is prepared to pay for the capability in the overall context of the Defence capital budget
 - this would reinforce the principle, not always observed in the current approach, that within a pre-determined Defence budget

- envelope there should be contestability between a range of capability options going forward
- with trade-offs based on the estimate of the relative value of the various options in contributing to the defence of Australia
- Thirdly, determining how the capability can be delivered most efficiently and effectively
 - rather than focussing on acquiring ASW frigates, for example, an ASW capability designed for Australia might best be delivered by a mixture of naval, air force and space-based assets as well as the deployment of seabed sensors in areas of particular sensitivity
- Fourthly, advising the market how much the government is prepared to pay for the new assets:
 - at a stroke this could reduce the cost of new capability for the RAN, with the industry realising that the era of easy money is over and that efficiency is here to stay.

The next step would be to undertake a substantial investment appraisal process for the proposed new acquisition. The magnitude of the proposed investments in SEA1000 and SEA5000 suggest that these are some of the largest capital projects ever recorded in an economy characterised by massive investments in the resources and infrastructure sectors. Yet none of those commercial investments would be approved without having exhaustively modelled the various development options and selecting the proposal that offered the greatest payback in terms of the projected risk-adjusted rate of return.

The government should adopt a similar approach for major investments in the Defence domain. Clearly, an investment in a warship produces a return not in monetary terms but in defence capability. Using a shadow-price methodology, this can be replicated in commercial investment appraisal models.

A comprehensive evaluation of risk is essential if a meaningful result is to be obtained – before committing to its then \$50bn Gorgon LNG project, for example, and essentially ‘betting the company’, Chevron needed to assess the risk of the high CO₂ content in the gas and the risks of its proposed carbon capture and storage solution to sequester it underground. Technical uncertainties and through-life sustainment would likely be the main source of risk in major projects like SEA1000 and SEA5000 and these would need to be assessed by experts in the fields of naval engineering, naval architecture, systems integration, supply chain procurement, shipbuilding and through-life logistics support.

We propose that the Department of Finance should establish an arm's length financial modelling service to evaluate major Defence acquisition proposals. They could draw on expertise from investment banks that undertake advanced work in assessing major commercial investment projects. The technical risk assessment, presumably contributed by Defence, would provide a vital input to this process. The outcome should show the particular project configuration that delivered the best risk-adjusted return in terms of military capability.

4.2 Naval Shipbuilding Plan – building the platform

Australia's naval shipbuilding industry has only provided superior outcomes during the Anzac, Collins and Huon class acquisition programs. The outcomes from these projects reflected costs and schedules that approximately met global benchmarks, as well as a very high level of competitively priced Australian industry content in the supply chains.

The key features of these projects were that:

- The Prime contractors were privately-owned companies with majority Australian ownership
- Under the purchaser-provider model, these Prime contractors operated at arm's length from Defence
 - but with flexible mechanisms to ensure essential modifications could be made to the design during the shipbuilding process
- The Primes were engaged on the basis of fixed price contracts (with escalation provisions for inflation and currency exchange rates)
- They worked closely with the designers (as subcontractors) but were not subordinate to them
- They commissioned work from all over Australia (and some from New Zealand)
- They developed very extensive supply chains in Australia.

An optimal governance arrangement for naval shipbuilding would see a return to this model. One approach would be to:

- Privatised ASC into two specialist companies – one for submarine building and sustainment and the other for warships – with a requirement for majority private Australian ownership
- Evaluate the costs and benefits of developing a long-term engagement with one preferred overseas design partner for warships and another for submarines, to work closely with the two Australian-owned Primes
 - noting that the development of deep Australian supply chains for the first-of-class (or batch) would be a condition of the engagement.
- Develop the continuous build approach so as to sustain local industry without 'valleys of death'
 - but examine ways of increasing the drumbeat so as to deliver essential capability to the Navy when it is required
 - perhaps by reducing the service lives of Australian naval platforms and eliminating costly (and risky) mid-life upgrades
 - and in general pursue a policy of evolving new platforms from existing ones where ever this makes sense
- Get serious about AIC, by mandating a minimum level of local content in the design and construction phase to be regularly audited
 - the definition of AIC should not include unproductive expenditure in the consolidation phase, the importation of

equipment by subsidiaries of foreign companies or expenditure in Australia during the through-life support phase of the programs.

4.3 Review the SEA1000 and SEA5000 programs

In developing their Defence Strategic Update, the government excluded both SEA1000 and SEA5000 from the associated force structure review. This seems very difficult to justify.

The workload for Australia's naval shipbuilding industry will be dominated for at least two decades by these two major naval acquisition programs. Yet even if all the reforms to the acquisition process and the Naval Shipbuilding Plan proposed above were to be implemented immediately, it would be too late for them to have any significant impact on these two major programs (nor the smaller Offshore Patrol Vessels – SEA1180). Although both major programs are still in the design stage, most of the critical decisions have already been made:

- The platforms have been selected
 - on the basis of what are both effectively *ab initio* designs
 - and so with a very high degree of risk
- The budgets have been established
 - \$89.9bn for SEA1000 and \$45.6bn for SEA5000 (out-turned dollars)
 - which relative to global cost benchmarks appear inexplicably excessive and in no way provide value for money
 - and when drawn down may well put excessive demands on the annual Defence capital budget and pressure on the Integrated Investment Program
- Particularly for SEA1000, the delivery schedules have been agreed
 - that, while extremely long, would be difficult to accelerate
 - reflecting the reality of the length of time required to deliver bespoke designs of military platforms exhibiting ever-increasing complexity
- The shipbuilders have also been selected
 - with two foreign-owned companies in the role of Prime contractors
 - whose commitment to developing Australian supply chains must be in serious doubt
- Although both projects are in a relatively early stage of their life, it may soon be too late in the design process to increase Australian industry content
 - which needs to be engineered into the design process at an early stage if it is to be incorporated into the first-of-class

- otherwise, experience tells us that it will be practically impossible to increase AIC in the supply chains for subsequent vessels.

These decisions are seriously at odds with the principles we have proposed to guide future acquisitions. Indeed, even irrespective of the more far-reaching issues we raise below, these problems with both the SEA1000 and SEA5000 acquisitions suggest that the government could have a case for not proceeding to construct either the Attack class submarines or the Hunter class frigates:

- In the case of SEA1000, Australia has contracted to date only for a design partner
 - and if the design will not provide the Navy with what it needs when it needs it, and at an acceptable cost, there is at least a case for a review of the program
- For SEA5000, Defence contracted to acquire a frigate of around 8,000 tonnes while the Prime is now designing a destroyer of around 10,000 tonnes
 - that requires a substantial and risky re-design, which also argues for the need for a program review.

But the case for a review of both programs is also substantially reinforced by the Strategic Update. The elimination of warning time and a major shift in emphasis away from far flung coalition operations towards an A2/AD strategy in the waters to our north and west place the capability we are seeking to acquire under SEA1000 and SEA5000 into stark relief. A review is required to evaluate whether the new capability will be:

- Delivered on a schedule that is consistent with the implications of the elimination of warning time
- Cost-effective without putting excessive pressure on a constrained defence budget
- Fit for purpose in terms of delivering a sufficient capability so as to deter an attack on Australia or meet it with lethal force should it develop.

We have also explored these issues in an earlier Submarines for Australia Submission to the Senate Economic References Committee inquiry on Australia's Sovereign Naval Shipbuilding Industry. This has been accepted by the Committee as Submission 34 and is available on the Senate website at:

https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Navalshipbuilding/Submissions