DEFENCE SUBMISSION TO THE SENATE INQUIRY INTO NAVAL SHIPBUILDING

SECTION 1. OVERVIEW

1.1 Industrial capability has always been a critical partner for the Australian Navy, essential to the delivery and sustainment of warships throughout their life. Popular perceptions of warships[1] as autonomous agents of military capability often belies the essential industrial capability required to maintain the relevance of maritime combat power – industrial capability is often invisible to the public. Increasingly networked and interoperable at both joint and coalition levels, Australian Defence Force (ADF) maritime capability relies not only on a diverse range of Australian industrial capability but also on global industrial and military connections. In this context, the Australian shipbuilding industry is just one element of the broader national maritime industrial capability that is so vital to the defence of Australia.

1.2 This paper will focus on the Australian Maritime Industry because Defence believes that a ship building capability needs to be considered in the context of the broader national maritime industry essential to Defence.

Defence Strategic Aims

1.3 Defence strategic aims for the maritime industry underpin our approach to ship acquisition, upgrades and through-life support. These aims are as follows:

- The ongoing sustainment of a vibrant, competitive, cost effective Australian maritime industrial capacity able to conduct repair and maintenance, upgrade and systems integration of Navy's surface ships and submarine force.

- The cost effective delivery and sustainment of maritime capability identified in the Defence Capability Plan.

- An industry disposition that can efficiently support the Navy fleet basing strategy. The strategy will continue maintenance and home-porting of major surface ships on both the East Coast in Sydney at Fleet Base East (FBE) and on the West Coast near Perth at Fleet Base West (FBW). Industry disposition will also need to continue support to the submarine force home ported and maintained on the West Coast at FBW and minor war vessels in Darwin and Cairns. All submarine full cycle dockings are carried out in South Australia with the remainder of submarine maintenance activities carried out at FBW.

- Promotion of appropriate levels of competition within the maritime industry in order to promote innovation, efficiency and value for money.

1.4 Any discussion of the Australian maritime industry should consider the nature of modern warship construction and support, the imperatives for Australian skills and capacity and the supply and demand economics for Australian naval ships. Such considerations

[1] The term warship used through out this paper includes all maritime platforms such as submarines and patrol boats unless otherwise stated.

include recognition of the large number of small to medium size companies that provide specialist services and bring significant technology, innovation and skills to the maritime industry, particularly during upgrades and through-life support programs.

1.5 Defence recognises that it has a monopsony and must continue to foster and lead industry capability. Defence remains vitally interested in ensuring that competition within the industry promotes innovation, efficiency and value for money in shipbuilding that flows through to the lifecycle sustainment of maritime capability.

A vibrant, competitive, cost effective local industrial capacity

1.6 In its examination of Australia's maritime industry the Australian Strategic Policy Institute in 2002 stated that "There is in fact no strong strategic reason to build the Navy's warships here in Australia. It makes sense to do so if the premium is not too high, because there are economic benefits and some advantages in developing the skills for repair and maintenance. But the real strategic priority is to have the ability to repair and maintain our ships, including the ability to keep them in operation during a conflict.[2] The ASPI Report goes on to state "There is a high priority to be able to repair, maintain and upgrade vessels in-country because it would be simply impractical to do otherwise. The transit times to foreign maintenance locations would be prohibitive in peacetime and operationally compromising in wartime. It is desirable to have a repair facility close to each naval operating base for practical reasons, and to provide strategic redundancy."

1.7 Defence broadly agrees with ASPI's views in this regard. The ability to conduct repair and maintenance, upgrade and systems integration of Navy's major surface ships and the submarine force is Defence's primary strategic requirement of the maritime industry. Much of this type of work could not be conducted due to a range of technological, geo-political and economic grounds.

1.8 The capabilities that Defence requires of industry are summarized as follows:

- **Repair and maintain maritime platforms, their systems and the individual equipments that make up these systems**. It is important to recognise the complexity of the modern warship. Figure 1 is taken from an Australian Submarine Corporation (ASC) document and provides an industry view of this complexity. In addition to the involvement of major shipbuilding companies, the number of equipment assemblies involved in modern warships and the competitive forces applicable to the industry encourages the involvement of large numbers of smaller sized companies providing specialised and or critical support. The integration challenges of modern complex systems and the responsiveness of these specialised companies to meet operational availability requirements drive disposition decisions in favour of locating in Australia, including subsidiaries of defence multinationals.

[2] Australian Strategic Policy Institute paper titled Setting a Course for Australia's Naval Ship building and Repair Industry 2002.

Platform Complexity Metrics	Battle Tank	Boeing 777	Frigate	Collins Class Submarine
Weight (tonnes)	30	250	3,600	3,000
Length (meters)	7	60	118	78
Number of systems	25	40	60	108
Number of suppliers	600	550	600	1,600
Crew size	4	10	163	43
Patrol duration (hours)	24	8-14	340	1,700
Number of parts to assemble	14,000	100,000	170,000	500,000
Number for person hours to assemble	5,500	50,000	1,200,000	2,500,000
Construction time (months)	7	14	22	60
Price (AUD $M)	4	300	600	1,000

Source ASC Brochure - Hidden Assets - ASC Pty Ltd

FIGURE 1: RELATIVE COMPLEXITY OF SUBMARINES

- **Fabrication**. Section 2 explains that the actual manufacture of the ship hull only constitutes a small, relatively low skilled, part of the construction of a modern warship. The harsh conditions in which ships operate, the likelihood of damage sustained in operations or during conflict and the need to effect ongoing upgrades and modifications means that it is essential that there is a capability able to undertake fabrication tasks through out the life of a warship. To ensure that the ship's original capability is maintained it is necessary that this capability is able to maintain the standards inherent in the original design. These competencies are not dissimilar to the fabrication competencies of other Australian industry sectors. The strategic issue for Defence is maintaining the infrastructure, primarily a capability to dock warships in Australia.

- **The design and integration and the subsequent installation and commissioning of systems** for naval platforms present unique challenges. A capability to undertake these tasks is essential for the ongoing sustainment and modernisation of Navy platforms through life. Warships pose unique design and integration challenges such as shock hardening, high packing density and the harsh environmental conditions, including the electromagnetic environment, that requires industry to develop specific maritime skills.

1.9 Competencies developed during the build and acquisition phases of a warship are required to support the ship through life. There is a strong link between build and support regardless of where the ship is constructed. Access to the Intellectual Property, licences, infrastructure, tooling and support environments developed during the shipbuilding and equipment acquisition phase is essential for support. The levels of access to these elements can significantly influence the level of support that is feasible in Australia. Knowledge and skills can also be difficult to replicate, particularly at short notice, as much specialist knowledge and skill is tacit in nature.

Cost effectively delivering and sustaining the capability identified in the Government's Defence Capability Plan

1.10 Further detail is provided on the Government's capability development plans (the Defence Capability Plan (DCP)) and the implications for industry at Section 3. Government

forward projections on capability requirements must necessarily balance the need to address potential gaps in capability, the time required to address the shortfalls and the costs.

1.11 Defence will consider the cost of ownership of any capability and determine its sustainability over the length of operational service. Costs and acquisition time constrain defence capability. When defence commits to acquisition it is essential that it can guarantee that the capability is delivered on schedule within the projected costs and meet performance (including safety) requirements.

1.12 Defence performance against these criteria has not been adequate in the past. Shortfalls in the performance of the Australian maritime industry have contributed to the poor performance. Along with a range of other measures that are being taken to improve acquisition performance, before committing to an acquisition, Defence must independently assure that industry has the capacity to deliver on schedule and within budget the required capability. Accordingly, Defence will require objective evidence that supports industry claims that project outcomes can be achieved particularly in relation to schedule, cost and performance criteria.

A geographical disposition that can efficiently support Navy's fleet basing strategy

1.13 Navy requires that major support for its warships be provided in or near the ship's homeport. Important considerations in Navy's requirement include:

- The advantages and reduced impact on ship's company of conducting ship support and crew rest and recreation in parallel.

- Proximity to support infrastructure such as ammunitioning point, ranges and fleet assets, necessary to work up the crew and platform after maintenance.

1.14 Navy currently has major fleet bases located on the east and west coasts. Additionally, important infrastructure is located in the north (Darwin/Cairns) able to provide a level of support to the range of minor war vessels currently in service and planned for introduction in the future.

1.15 Figure 2 shows the planned maintenance requirements for major surface ships in the East and West and for submarines in the South. During major ship acquisitions it is essential that industry retain a capacity to support existing major platforms concurrently on both coasts to provide sufficient flexibility to address emerging operational requirements.

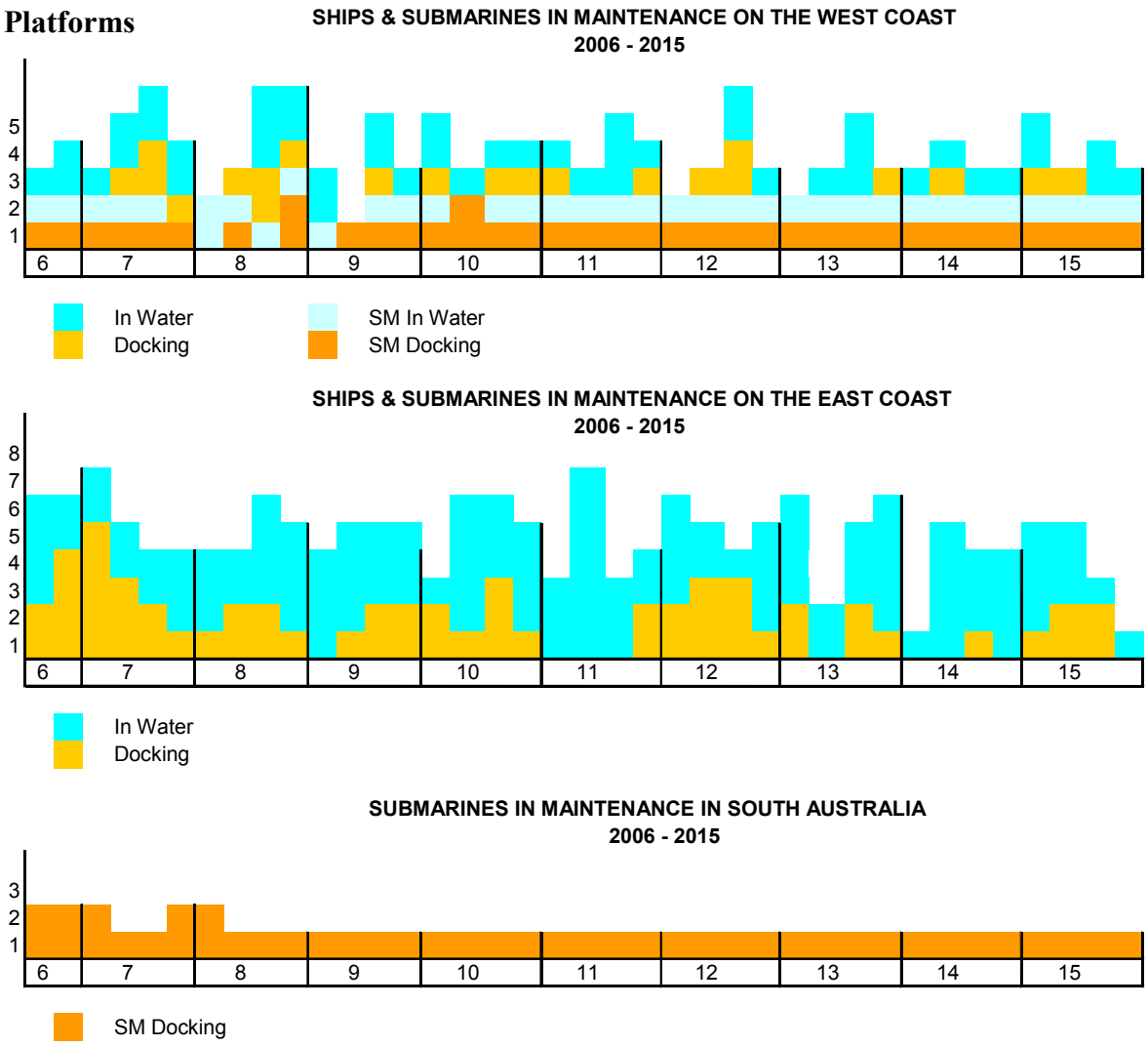

FIGURE 2: PLANNED MAINTENANCE REQUIREMENTS

A competitive Maritime industry

1.16 Defence continues to implement strategies aimed at assisting industry to develop a vibrant, competitive, cost effective local maritime industrial capacity. Defence now considers that maintaining an ongoing competitive environment is an essential ingredient in achieving this. An appropriate level of competition within the ship repair industry promotes innovation, efficiency and value for money to the Commonwealth and therefore the tax-payer.

1.17 Mistakes have been made in the past that has led to reduced competition and increased barriers to entry. Defence will look at its acquisition strategies to ensure that, where appropriate, contracts do not promote non-competitive behaviors. Strategies that Defence will consider include spreading work across Defence industry to prevent a single entity buying contracts to exclude future competition and looking for opportunities where barriers to entry such as the requirement for major infrastructure might be reduced. Defence will also examine open systems approaches in design and support. For example Defence supports the initiative of the Western Australia State government to develop a Common User Facility that will allow industry open access to docking and ship repair and construction infrastructure.

What is the Maritime Industry?

1.18 Reports and studies of Australia's Maritime Industry often focus solely on the companies that have previously managed warship construction. As explained in section 2 during any warship construction project a significant part of the work is undertaken by many second and third level suppliers and subcontractors. These companies are a very important component of the nation's maritime capability. They can represent 70% by value of a project. Many have internationally competitive maritime capabilities. They are a significant source of technology, innovation and skills particularly during upgrades and through-life support programs and they provide essential support to their products and much of the ability to upgrade ships through life stems from their capabilities. Such upgrades may be planned events to address obsolescence and known capability shortfalls but may also be in response to the need to rapidly address the needs of specific operations (such as coalition interoperability). The requirement for this type of flexibility is expected to increase in future warship procurement.

1.19 Based on the Collins experience the shipbuilding task can be relatively straightforward compared to the ship design task. Critical to the ability to provide maintenance, repair, refitting and capability upgrade services is a shipbuilder's access to deep design expertise and a sound understanding of the source and history behind the design. Hence, unless Defence is able to retain or obtain design services from the parent Navy ship designer (if there is one), we need to establish and grow that capability in Australia, preferably during the design phase or earlier. Without this design capability the ability to upgrade warships and provide effective through-life support is at risk.

1.20 The nature of the major ship construction companies also warrants comment. Much of their capacity is based on the availability of subcontracted work. The nation's capacity is finite and this work competes for other demands in construction, mining and infrastructure development. Defence is already experiencing flow on problems from the shortages of skilled labour in the workforce and the strength of the economy that are adversely impacting the ability of prime contractors to engage sub contractors. This issue is further discussed at Section 4.

Defence programs to assist the maritime industry

1.21 Defence has a range of programs and initiatives to assist the Maritime industry, two are mentioned here.

1.22 **Skilling Australia's Defence Industry.** In 2004 the Government announced the Skilling Australia's Defence Industry (SADI) program, a new policy initiative to address the significant shortfall in the quantity and quality of skills available in the defence industry. It recognises that industry alone is unlikely to make the total investment in training that will be required to overcome the shortfall. Therefore, up to 0.5% (around $200 million over ten years) of the money spent on major Defence capital equipment projects will be used in a program to generate additional skilled positions, up-skill existing employees and improve the quality and quantity of skills training in order to deliver the capability required by the Australian Defence Force.

1.23 **Major Ship Support.** The Defence Materiel Organisation is conscious that repair and refit arrangements for major ships have a short-term focus that is detrimental to developing and sustaining a viable industry support base and is inefficient in delivering effective support

outcomes. For example Defence's short-term focus has encouraged industry to focus on winning the next contract rather than delivering on outcomes.

1.24 New arrangements are being implemented for the support of major surface ships. Rather than contracting each ship repair activity separately a number of repair availabilities will be batched together. This will provide better continuity and skill development in industry, reduced logistics cost of ownership, improved system effectiveness, increased ship availability and reliability, improved industry relationships and ultimately, enhanced maritime capability.

SECTION 2. WARSHIP CONSTRUCTION

2.1 Reports and studies on warship construction often focus on the headline total project parameters. In considering the impact of a warship construction project on the shipbuilding industry and possible economic impact it is important to understand:

- The likely expenditure on different elements of a warship construction project,
- The implication of modern warship construction techniques,
- The makeup of the Australian shipbuilding industry, and
- The importance of second and third tier suppliers and subcontractors.

Warship Project Cost Breakdown

2.2 Table 1 provides a breakdown of the total project cost for elements of three typical ship projects. For combatant ship and weapon upgrade projects a high percentage of the costs are allocated to the combat system. As might be expected the hull, machinery and equipment costs dominate the costs in warships with less demanding combat roles. In either case the ship building activities that are normally included under "hull machinery and equipment costs" represent significantly less than half the total project cost.

Project Element	Combatant Ship Build	Support Ship Build	Weapons Upgrade
Platform Design	4%	7%	3%
Hull, Machinery and Equipment	28%	40%	10%
Logistics support including Training	17%	25%	25%
Combat Systems	42%	15%	50%
Project Management	9%	13%	12%
Total	100%	100%	100%

TABLE 1: PERCENTAGE OF TOTAL PROJECT COST

Ship Construction Techniques

2.3 It is often assumed that ships are fabricated and constructed in a single shipyard. Modern maritime industry techniques provide options for warship construction beyond traditional linear construction at a single primary location. Alternatives include construction of multiple modules simultaneously at geographically dispersed locations, including installation of systems and equipment followed by transport to a suitable facility for consolidation. Such approaches have potential to optimise the available industry capacity, to leverage specialist skills and to generate schedule, financial and performance benefits. It is therefore assumed that, as occurred during the construction of the Anzac class, at least 50% of

the fabrication of modules for future Australian warships will occur at sites other than the prime ship assembly yard.

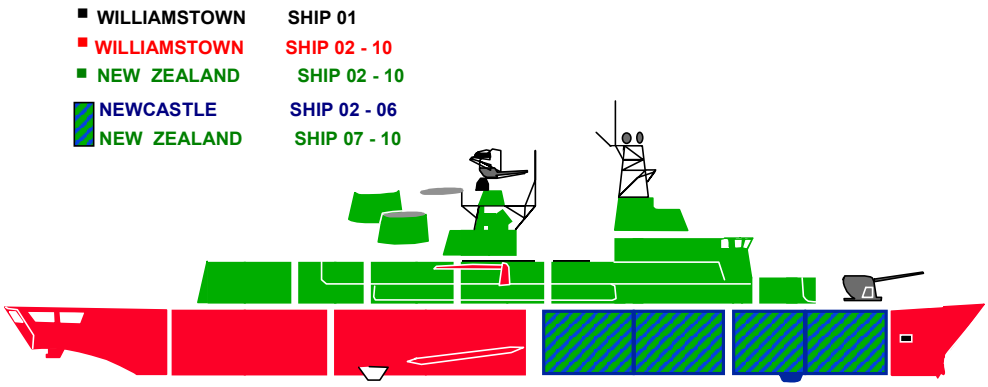

FIGURE 3: ANZAC SHIP MODULE CONSTRUCTION

2.4 A typical modular ship construction project would consist of the following activities:

- Initial module construction and equipment/system acquisition including:
  - Supply chain management for all systems and material
  - Cutting of metal accurately
  - Construction of internal systems to be fitted to the module
  - Construction of the individual modules
  - Fit-out of the module with major systems and equipment
  - Preparation for transportation to the ship consolidation yard
- Transportation of modules to the ship consolidation yard for consolidation and completion including:
  - Modules set-up for alignment and welding together. The complete ships hull will have about 60% of the major internal systems already fitted in the modules, with the rest of the fit-out work completed when the hull is intact.
  - Completion of fit out of systems including piping, cabling, below decks equipment and above deck equipment
  - Progressive set to work of internal and external systems
  - Checks of integrity of major systems prior to launch or lift to water
  - Complete paint and corrosion protection for hull
  - Move ship to water
  - Completion of systems set to work including all auxiliary systems
  - Trials alongside
- Sea trials
  - Commissioning and Naval acceptance processes
  - Post build defect rectification by contractor (Post Shakedown Availability)

2.5 The expenditure profile for a typical combatant ship build comprises:

- 5% metal preparation for hull

- 10% metal fabrication of modules
- 10% hull consolidation
- 50% overseas supply of major systems
- 10% initial fit out of systems
- 5% supply of Australian manufactured systems
- 5% final fit out of systems
- 5% set to work and trials

Makeup of ship build industry

2.6 Naval shipbuilding is significantly different to civil ship construction with unique requirements and skills impacting design, production and support. Australia's naval shipbuilding capacity is largely focussed on four main companies: ADI, ASC, Austal and Tenix. Of these, ADI is viable in the ship repair and upgrade activity but is having problems in meeting schedule and performance specifications. Austal is currently largely focused on the commercial export market combined with the replacement patrol boats for the RAN and the design and build of the first Littoral Combat Ships for the US Navy in the Austal USA yard. Austal has limited experience in the construction of steel vessels, the largest being 55m commercial super yachts. ASC is fully committed on the AWD program and support to submarines. TENIX will complete work on the Royal New Zealand Navy (RNZN) Protector program in around 2008 and is currently finalising work on the last Anzac ship.

2.7 In addition to these companies, United, in Western Australia is emerging as a capable ship repairer and is developing increased capacity. Forgacs also has facilities suitable for module and consolidation work, though its infrastructure (particularly in Brisbane) is old and does not currently meet the demands of modern major ship construction. Other smaller yards in Australia are generally less capable or lack capacity, are focused on their commercial activities and are less likely to play a major role in major projects such as Air Warfare Destroyer (AWD) or Amphibious Deployment and Sustainment (ADAS)[3]. Accordingly, the prime capacity available for Australian naval shipbuilding projects in the short term will be concentrated in ADI, ASC, Austal and Tenix. Secondary capacity will be available from Forgacs and could be supplemented by smaller yards. There may also be the option of utilising New Zealand shipbuilding capabilities and capacity based on the experience of the Anzac Frigate program.

Importance of Second and Third level Suppliers and Subcontractors

2.8 During any warship construction project many second and third level suppliers and subcontractors undertake a significant part of the work. These companies are a very important component of Australia's maritime capability. Many are internationally competitive and are a significant source of advanced technology, innovation and skills. The continued support of these specialist companies is particularly important during upgrades and sustainment (through-life support) programs.

2.9 The current small and medium enterprise (SME) base supporting the maritime industry is fairly evenly distributed across the eastern States – some of these have secondary facilities in Western Australia. A larger proportion of maritime SMEs are located in New

[3] The Amphibious Support and Sustainment (ADAS) project will deliver two Landing Helicopter Dock (LHD) ships, a number of landing craft for the LHDs and follow on sustainment capability that has yet to be defined.

South Wales and Victoria and high technology companies in the Australian Capital Territory and South Australia. SMEs tend to support new projects from their existing locations, with some setting up on a temporary basis in or near the consolidation facility until sustainment activities take over. Many SMEs are either subsidiaries or agents of overseas original equipment manufacturers (OEMs). Australian agents or subcontractors of overseas OEMs are an important element for through-life support, but experience indicates that they can have difficulty obtaining suitable licensing and intellectual property rights which in turn may have time and cost implications particularly in providing sustainment.

2.10 Importantly the Maritime industry also includes links to classification societies, survey authorities, design assurance authorities and both civil and military maritime safety regulators.

Summary

2.11 For a typical warship the traditional ship construction component of fabricating the hull, and purchasing and installing machinery represents significantly less than 50% of the total project costs. The actual work to construct a warship is likely to be conducted at a number of geographical locations and much of this work will be conducted by second and third level contractors and suppliers, many being SMEs.

SECTION 3. DEFENCE DEMAND FOR NAVAL SHIPBUILDING AND IN-SERVICE SUPPORT

3.1 Over the next 20 years Defence will be required to construct maintain and upgrade its Naval Fleet. With respect to construction, the Defence Capability Plan (DCP) includes provision for the construction of Air Warfare Destroyers (AWDs), Amphibious-Landing Helicopter Dock (LHD) ships, Afloat Support ships, Patrol Boats and Watercraft. Post DCP, it is anticipated that Defence will need industry to commence work on a replacement Frigate and Submarine program from about 2018 onwards.

3.2 With respect to maintenance (ie. in-service support) Defence will be required to maintain its current fleet of major surface combatants, submarines, amphibious and afloat support ships and minor war vessels until they are replaced or withdrawn from service. In-service support will also be required for the new AWD, LHD and Afloat Support ships from about 2017. With respect to upgrade work, Defence will, over the next 15 years, continue to upgrade its major surface combatants (FFG and ANZAC frigates), Minor War Vessels and Collins Class submarines to maintain capability and ensure that they remain operationally effective.

3.3 Defence demand can be expressed in two ways, namely by expenditure or by workforce requirements. Each of these aspects of Defence demand is examined below.

Defence Expenditure

3.4 Based on current planned projects and likely future unplanned projects, Defence expenditure on ship programs over the next two decades is estimated at approximately $27 billion. This can be broken down into approximately $9.5 billion of approved and DCP nominated construction and upgrade projects (ie. AWD, LHD, Afloat Support, Anzac and FFG Upgrade), approximately $12.5 billion for in-service-support of the current naval fleet, and approximately $5 billion for anticipated post DCP projects for the replacement frigate and submarine. This demand is represented in Figure 4 and is based on estimates that assume earliest possible AWD and LHD delivery first ships in the 2010-2012 timeframe.

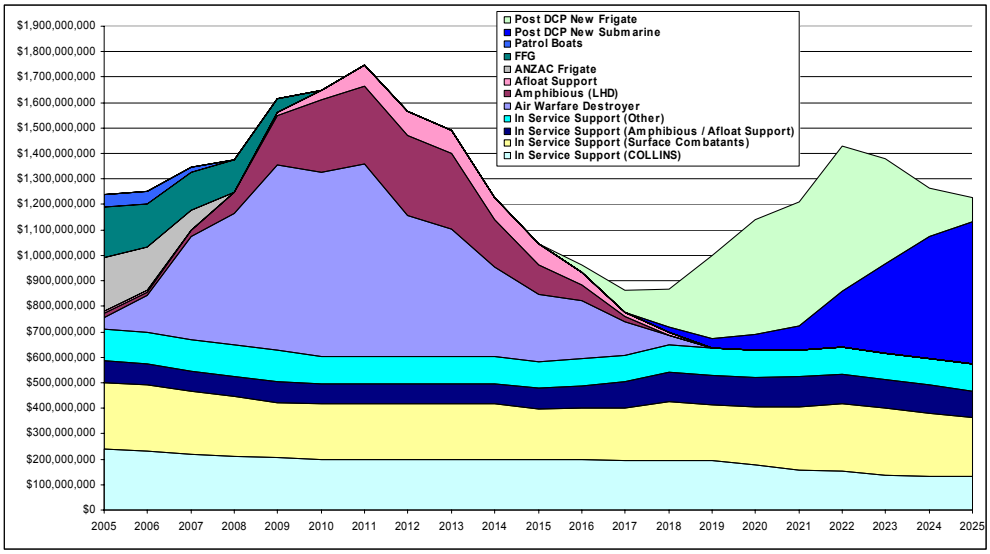

FIGURE 4: ESTIMATED DEFENCE EXPENDITURE BY PROJECT (2005 – 2025)

3.5 If all of this work was to be managed in country, it is estimated that approximately 60%, or $16 billion, would be spent locally. The proportion of local expenditure differs on a project by project basis. Major combat and weapon systems are typically acquired from overseas suppliers and, as such, these projects have a lower proportion of local expenditure. In-service support activities typically involve the highest level of local expenditure. The anticipated level of local expenditure by project / activity is represented in Figure 5. The difference between total and local expenditure is represented in Figure 6.

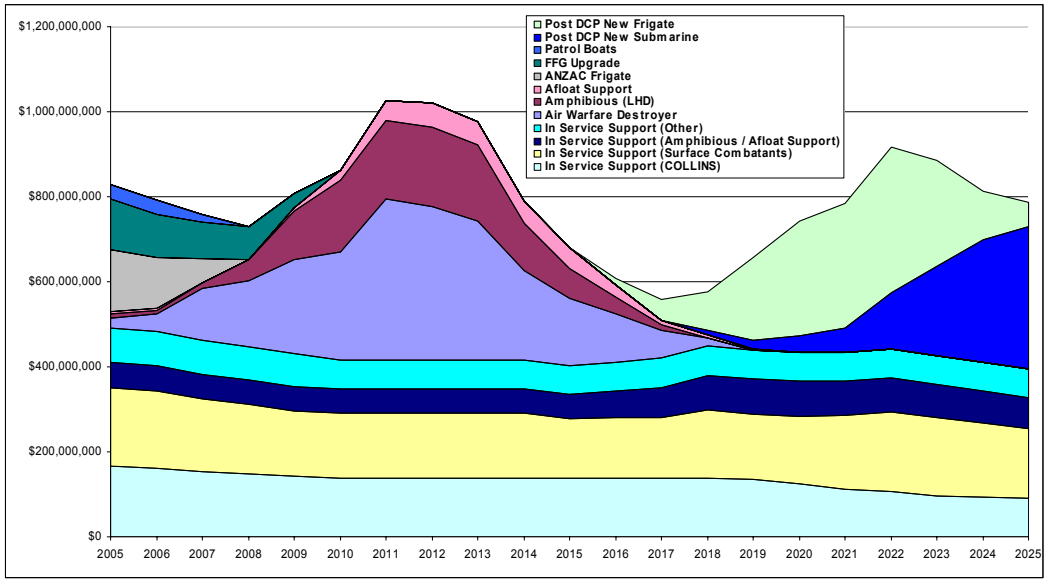

FIGURE 5: ANTICIPATED LOCAL DEFENCE EXPENDITURE BY PROJECT (2005 – 2025)

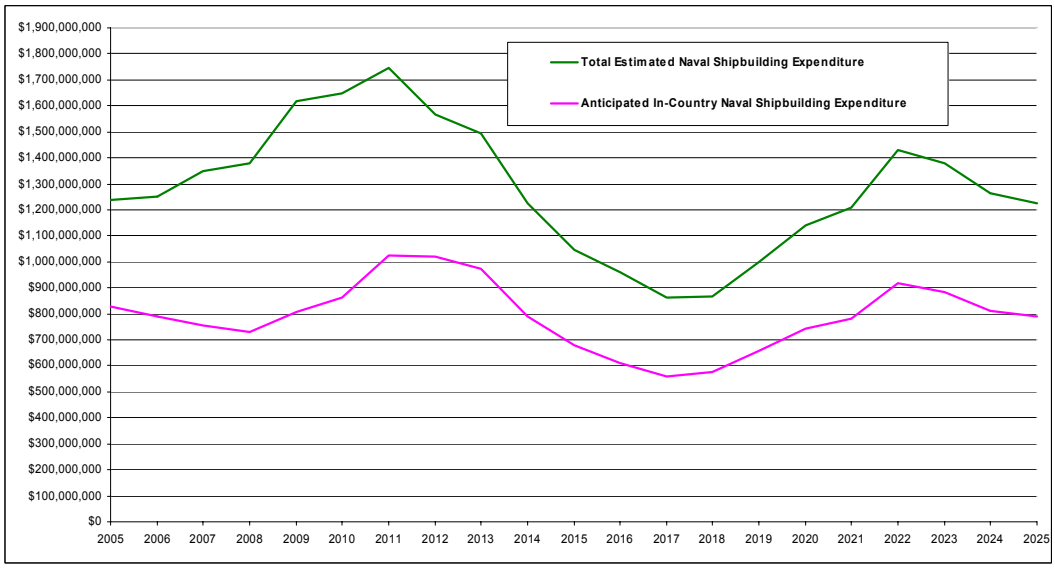

FIGURE 6: TOTAL AND ANTICIPATED LOCAL EXPENDITURE (2005 – 2025)

Total Workforce Requirements

3.6 Defence demand can also be expressed in terms of workforce requirements. This provides a more detailed indication of what skill sets are needed over what timeframes to construct upgrade and support the Naval Fleet to the required capability levels. For the purpose of this analysis, the naval shipbuilding and repair skill sets have been classified into seven broad categories, namely:

- Systems Engineering,
- Platform Engineering,
- Design,
- Integrated Logistic Support,
- Project Management and Planning,
- Hull and Mechanical Construction, and
- Subcontracted Module Fabrication.

3.7 The Workforce requirement figures were obtained from estimates provided by the relevant Defence project and in-service support areas, work undertaken on the 2003 Naval Shipbuilding and Repair Sector Plan, and from workforce numbers provided by the major Australian naval shipbuilders. The workforce requirements for naval construction and upgrade work by skill sets and by projects are provided at Figures 7 and 8 respectively.

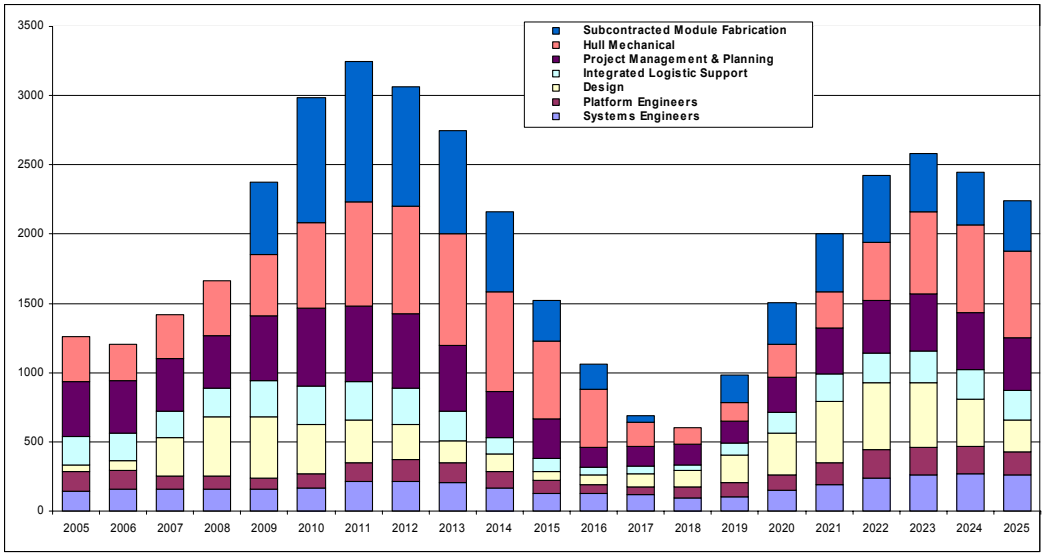

FIGURE 7: WORKFORCE REQUIREMENTS (SKILL SETS) – CONSTRUCTION AND UPGRADE WORK (2005 – 2025)

3.8 Figure 7 clearly shows a major peak in Defence demand that translates to a doubling in construction and upgrade workforce requirements over a six-year period from 2009 to 2014. Specifically, workforce requirements will rise dramatically in 2009 with the commencement of construction work on the AWD, LHD and Afloat Support ships. These workforce numbers will peak at approximately 3250 in 2011 and then drop sharply from 2014 as the new construction work winds down. The majority of the workforce increase is in the Hull and Mechanical Construction and Module Fabrication skill sets.

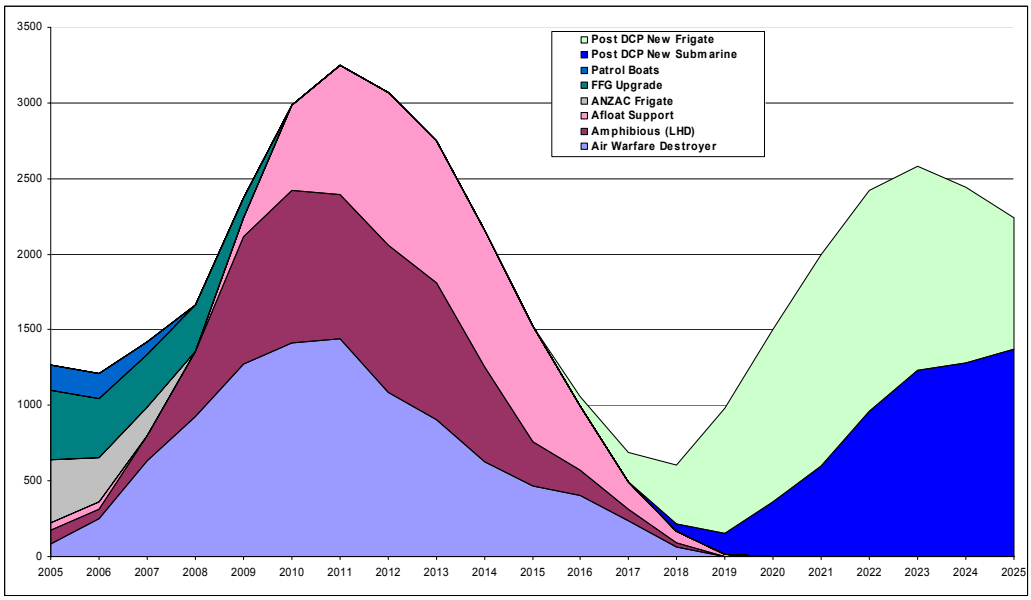

FIGURE 8 WORKFORCE REQUIREMENTS (PROJECT) – CONSTRUCTION AND UPGRADE WORK (2005 – 2025)

3.9 Figure 8 indicates that the AWD project will require almost half (ie. 44% or 1440) of the construction and upgrade workforce during the peak construction period (2009 to 2012), with LHDs and Afloat Support ships requiring the remaining workforce. Over the period 2013 to 2015 the workforce requirements are spread evenly over the AWD, LHD and Afloat Support ship projects. The figure shows the significant 'trough' in workforce requirements (2016-2019) during the transition period between major projects.

3.10 The workforce requirements for naval in-service support by skill sets and by projects are provided at Figures 9 and 10 respectively.

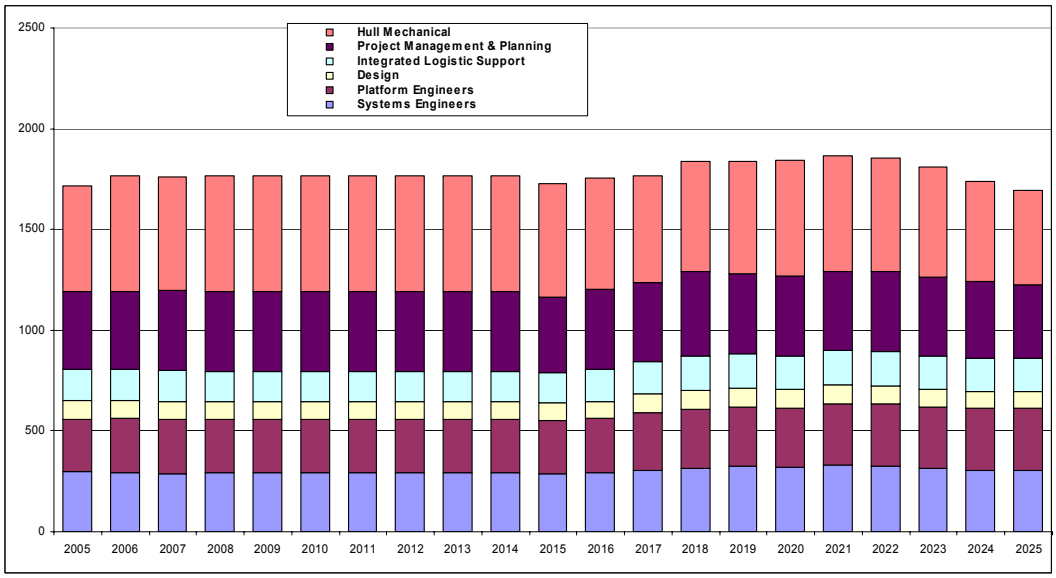

FIGURE 9: WORKFORCE REQUIREMENTS (SKILL SETS) IN-SERVICE SUPPORT (2005 – 2025)

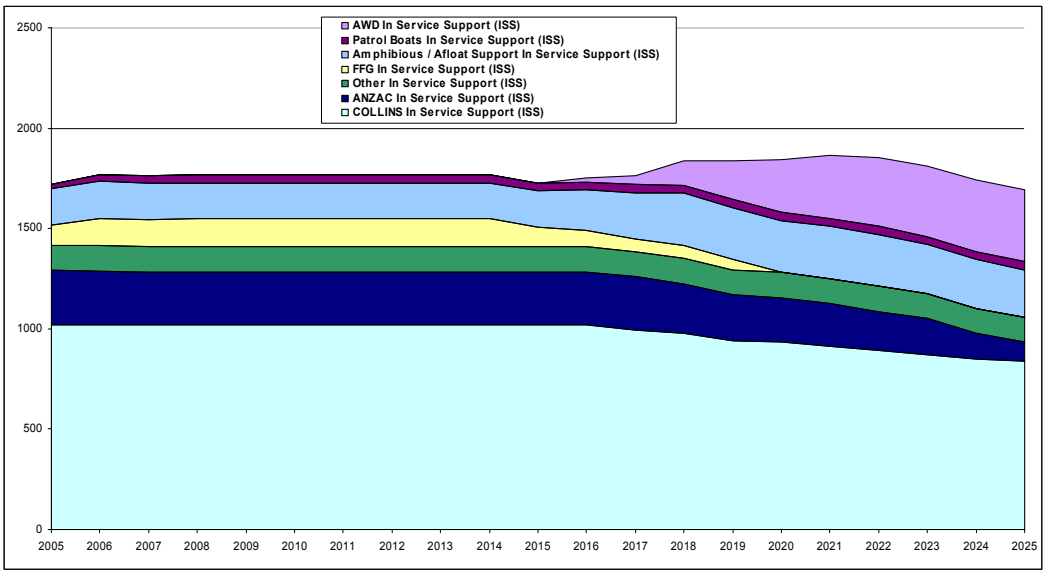

FIGURE 10: WORKFORCE REQUIREMENTS (PROJECT) – IN-SERVICE SUPPORT (2005 – 2025)

3.11 Figures 9 and 10 indicate that in-service support workforce requirements are relatively constant over the next two decades. A slight increase in 2018 reflects the introduction of the AWDs into service. Submarine in-service support accounts for almost two thirds of the workforce requirements.

3.12 The total workforce requirements (ie. construction, upgrade and in-service support) by skill sets and by projects are provided at Figures 11 and 12 respectively.

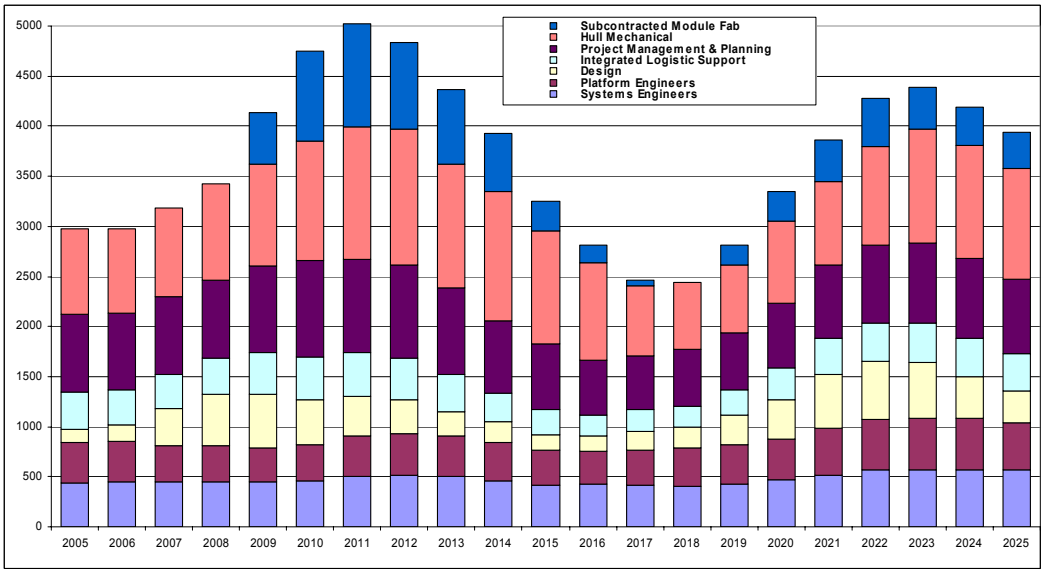

FIGURE 11: TOTAL WORKFORCE REQUIREMENTS BY SKILL SETS (2005 – 2025)

Figures 11 and 12 represent approximately 77,000 naval shipbuilding and repair-person years. The figures again highlight a sharp rise in workforce requirements from 2009 to 2014 where demand increases by approximately 42 percent (ie. from an average workforce of 3100 to 4400). The peak workforce requirement of 5018 occurs in 2011 at the height of the AWD, LHD and Afloat support ship construction. Again, the majority of the workforce increase is in the Hull and Mechanical Construction and Module Fabrication skill sets. Both Figures again highlight the 'trough' in Defence demand from 2016 to 2019 as the AWD, LHD and Afloat Support ship projects are completed and there is a gap until the next proposed major build programs (ie. new frigates and submarines/undersea vessels).

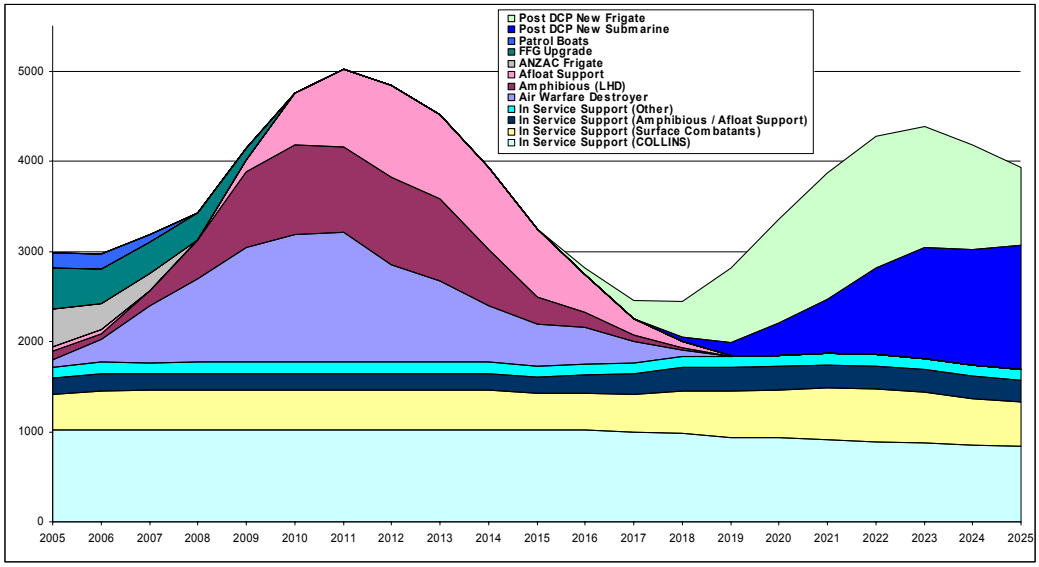

FIGURE 12: TOTAL WORKFORCE REQUIREMENTS BY PROJECT (2005 – 2025)

Sustainment Requirements

3.13 The above workforce figures provide an indication of the total workforce numbers required to construct, upgrade and support Australia's Naval Fleet to the required operational capability levels. However, from a Defence capability perspective, the primary reason for in-country construction is to provide for sufficient skills development, technology transfer and attrition management, to allow for an effective indigenous in-service support capability. A secondary reason is to provide for a core of capability, which can be built upon, should further in-country construction be deemed necessary. Accordingly, once a ship is constructed only a proportion of the associated skills are required for in-service support or future capability needs.

3.14 To this end, Defence has estimated (using input from industry) the skills needed to meet the Navy's operational requirements. These estimates, defined as 'sustainment requirements', reflect the industry skills required by Defence to be able to maintain, upgrade and modify the Naval Fleet to the required operational capability levels. In essence, the 'sustainment requirement' includes all of the in-service support workforce plus a proportion of the construction workforce that will need to be retained and used to support the new ships once they enter service and to address attrition within the in-service support workforce. With respect to the required industry skills, the higher the skill levels the higher the estimated sustainment level (ie. Defence would seek to retain a higher proportion of System Engineering skills than Hull and Mechanical Construction skills). The 'sustainment requirement' estimates, which comprise 100% of the required in-service-support workforce plus a proportion of the construction workforce are detailed in Figures 13 to 19.

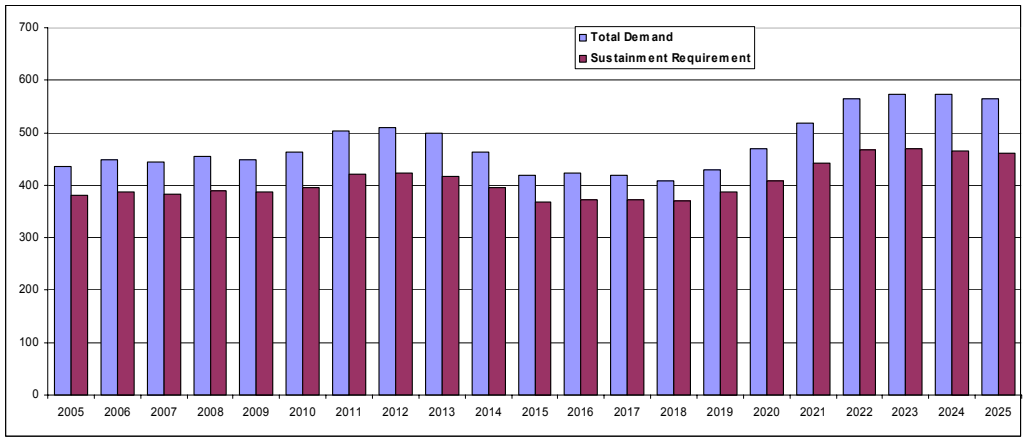

FIGURE 13: SYSTEM ENGINEERING – SUSTAINMENT REQUIREMENTS (2005 – 2025)

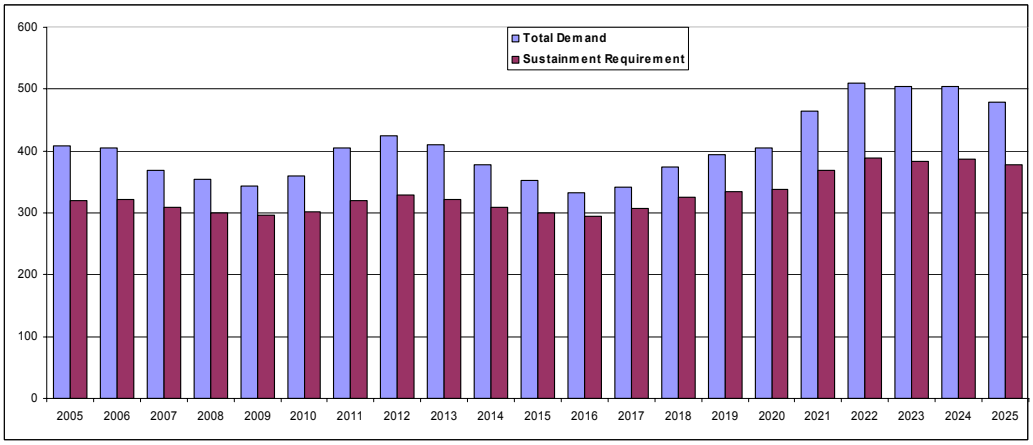

FIGURE 14: PLATFORM ENGINEERING–SUSTAINMENT REQUIREMENTS (2005 – 2025)

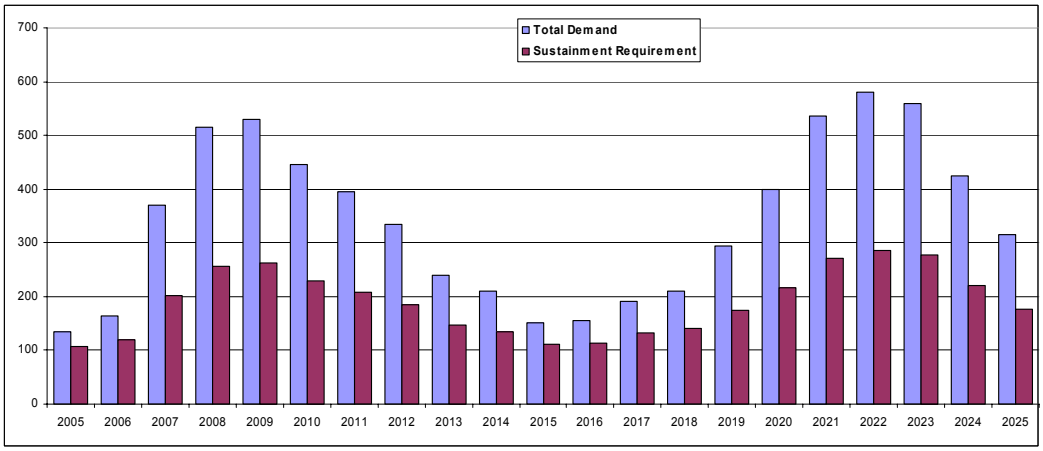

FIGURE 15: DESIGN – SUSTAINMENT REQUIREMENTS (2005 – 2025)

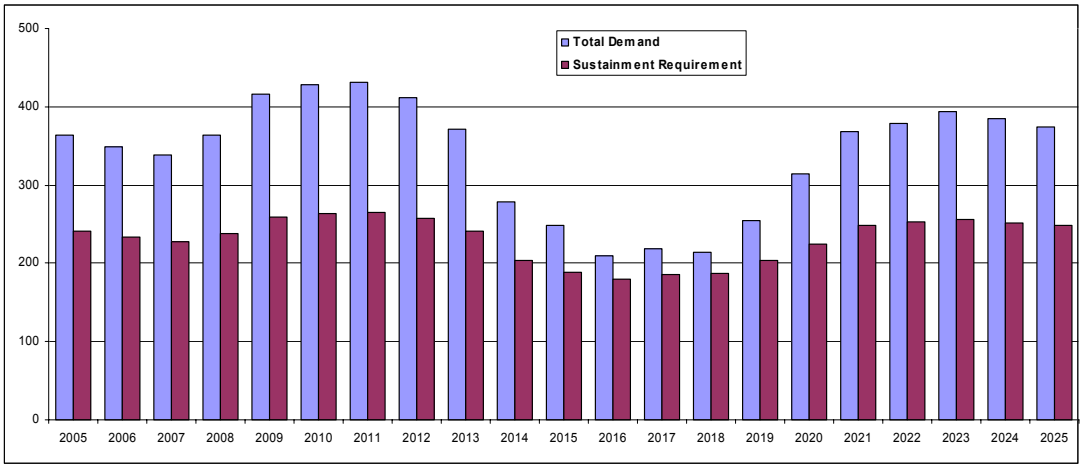

FIGURE 16: INTEGRATED LOGISTIC SUPPORT – SUSTAINMENT REQUIREMENTS (2005 – 2025)

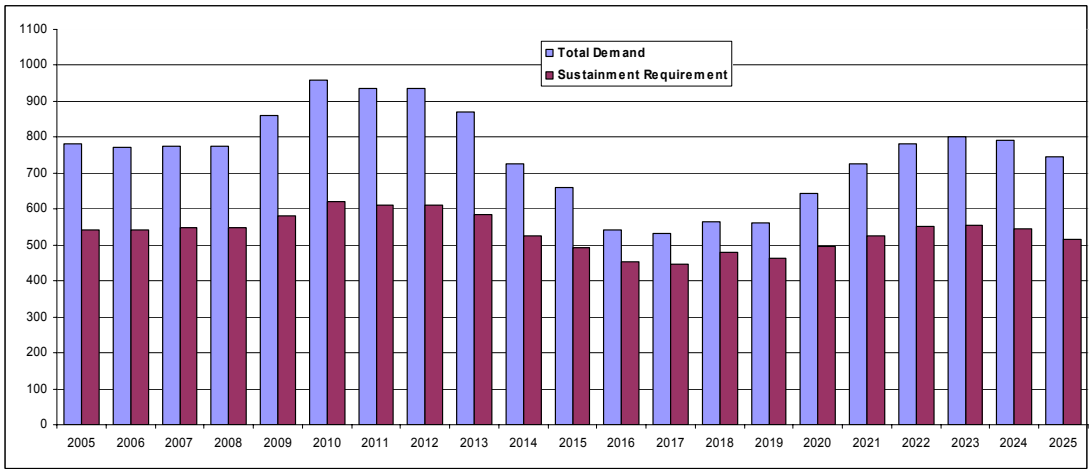

FIGURE 17: PROJECT MANAGEMENT & PLANNING – SUSTAINMENT REQUIREMENTS (2005 – 2025)

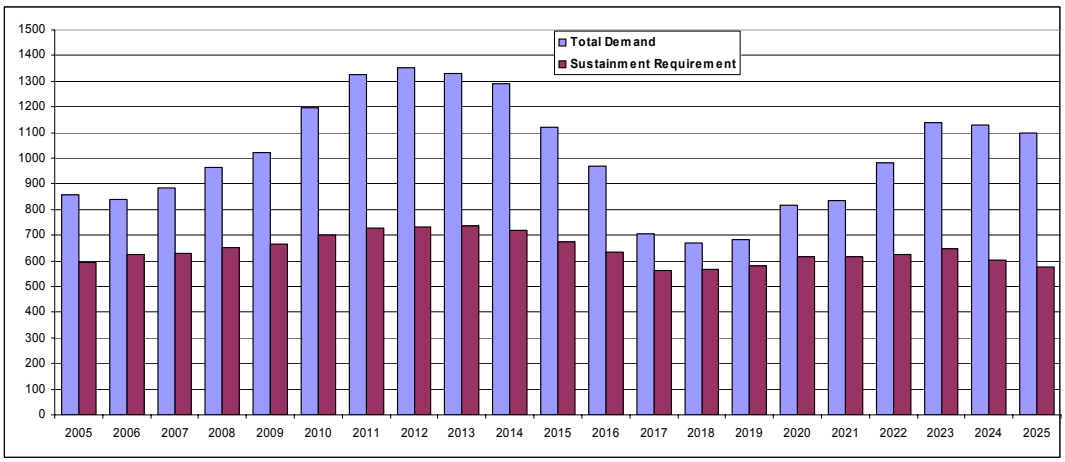

FIGURE 18: HULL AND MECHANICAL CONSTRUCTION – SUSTAINMENT REQUIREMENTS (2005 – 2025)

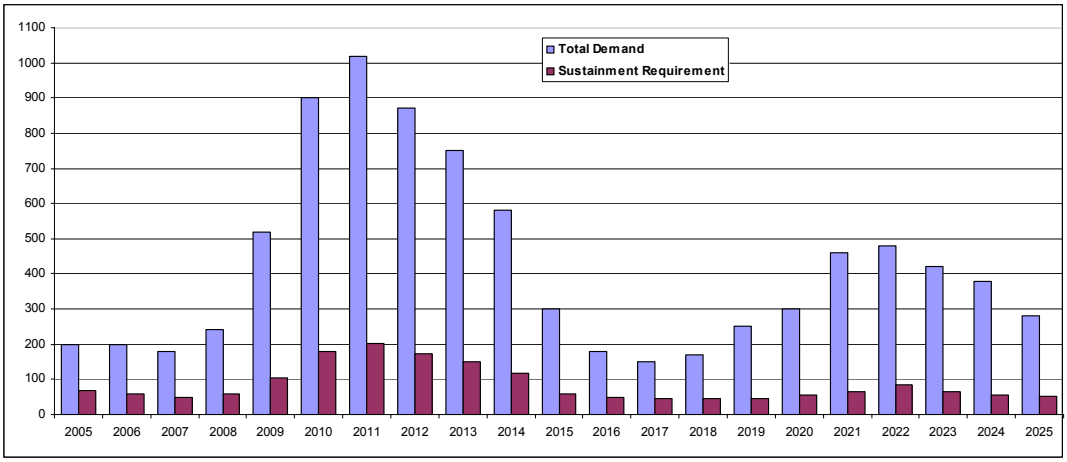

FIGURE 19: SUBCONTRACTED MODULE FABRICATION – SUSTAINMENT REQUIREMENTS (2005 – 2025)

3.15 Figures 13 to 19 indicate that only a proportion of the naval construction workforce needs to transition into the in-service support workforce to meet operational requirements. The proportion of skills to be transitioned depends on the nature of the skills. System Engineering (Figure 13) and Platform Engineering (Figure 14) represent specialist, high-end skill categories that are fundamental to retaining the operational capability of the naval fleet. As such, Defence would seek to retain a higher proportion of these skills. Design (Figure 15), Integrated Logistic Support (Figure 16) and Project Management / Planning (Figure 17), whilst important skills, are not required for sustainment purposes at the same proportions as the high-end specialist skills. Hull and Mechanical Construction (Figure 18) and Subcontracted Module Fabrication Skills, whilst critical for construction, are not required at high-levels for in-service support and capability sustainment.

3.16 The sustainment requirement form naval construction and upgrade work, by skill sets and projects, (ie. the workforce numbers that will need to transition into in-service support activities), are provided in Figure 20 and Figure 21 respectively.

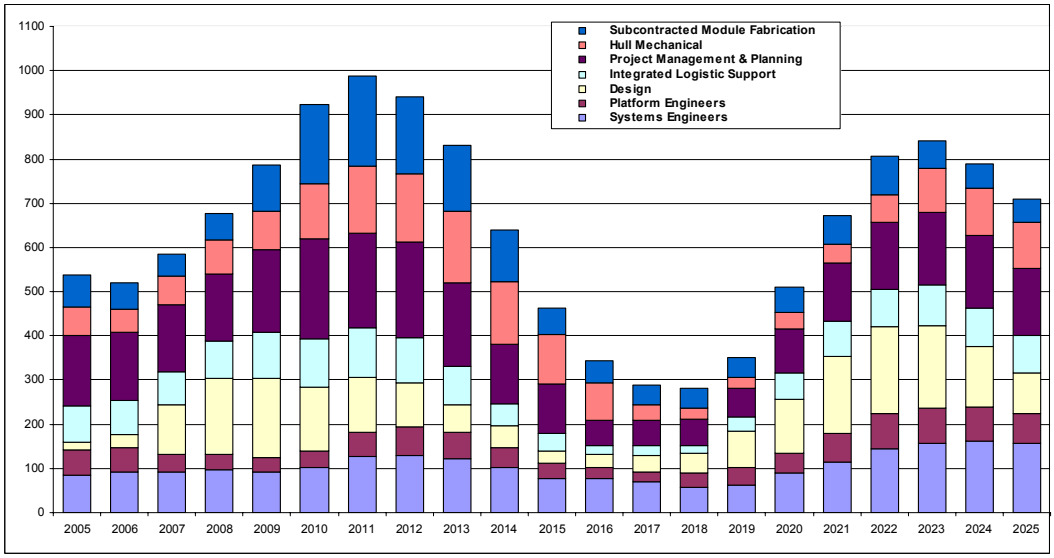

FIGURE 20: SUSTAINMENT REQUIREMENTS (SKILL SETS) – CONSTRUCTION AND UPGRADE WORK (2005 – 2025)

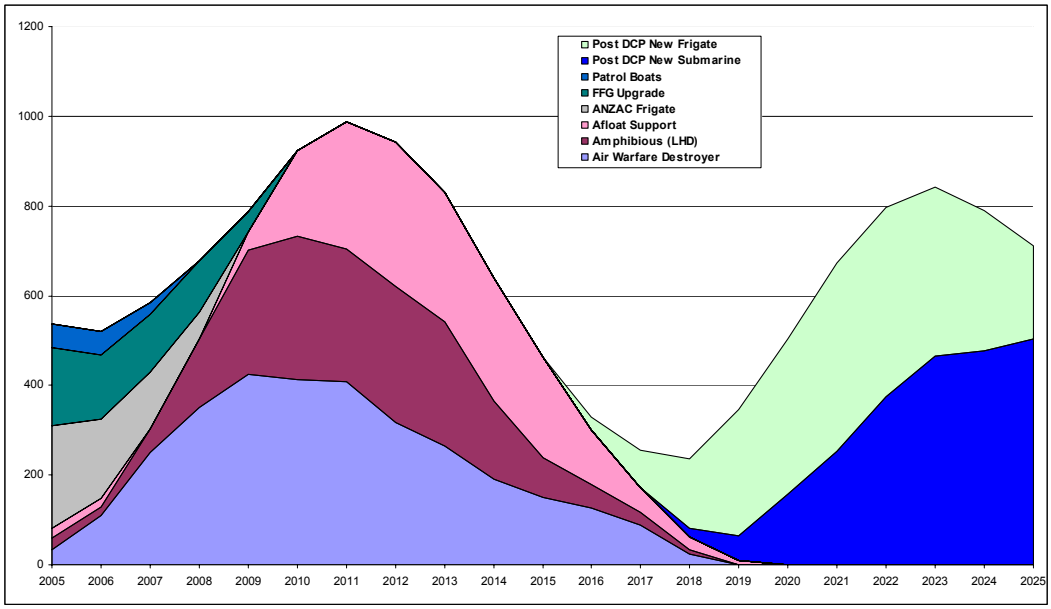

FIGURE 21: SUSTAINMENT REQUIREMENTS (PROJECT) – CONSTRUCTION AND UPGRADE WORK (2005 – 2025)

3.17 In comparison with Figures 7 and 8 (indicating the total workforce requirement for naval construction and upgrade work), Figures 20 and 21 represent a 72% reduction in workforce numbers. Specifically, Figures 20 and 21 indicate that Defence only needs to retain about one quarter of its total construction and upgrade workforce to meet its operational sustainment requirements (ie. in-service support, attrition and future capability needs).

3.18 The total sustainment requirement (ie. construction, upgrade and in-service support), by skill sets and projects, are provided in Figure 22 and Figure 23 respectively.

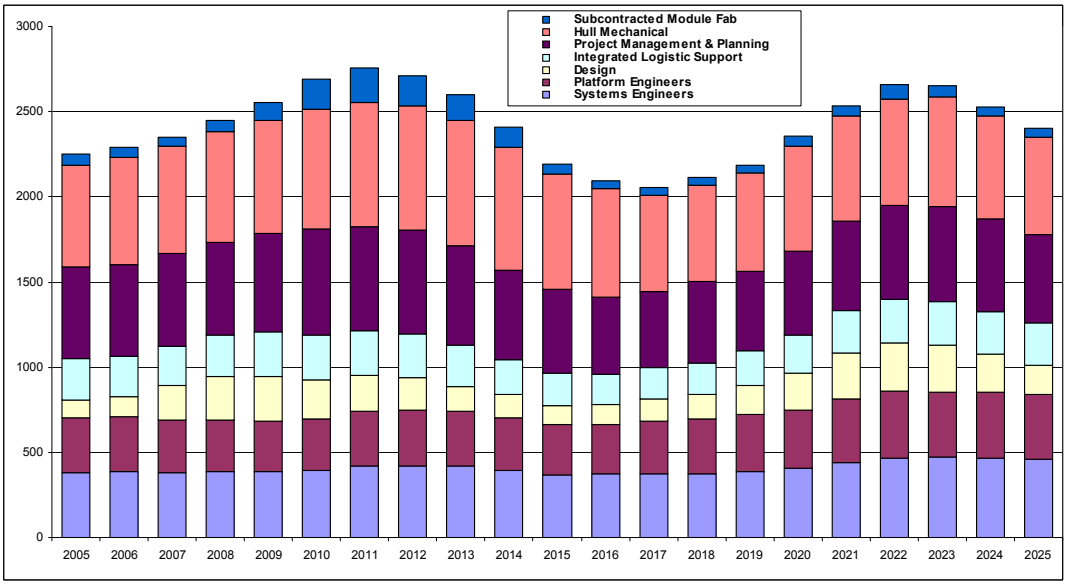

FIGURE 22: TOTAL SUSTAINMENT REQUIREMENTS BY SKILL SETS (2005 – 2025)

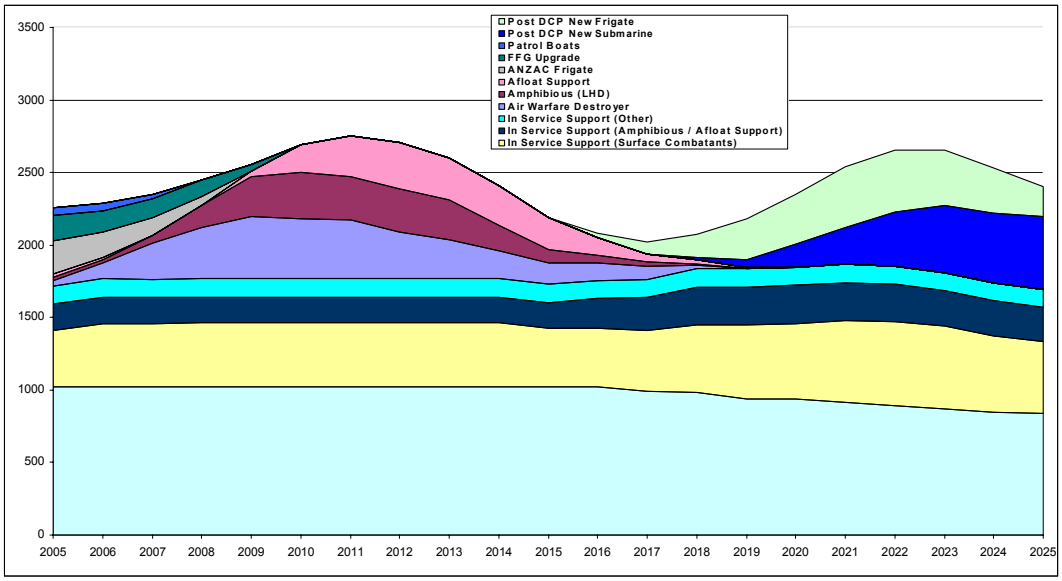

FIGURE 20: TOTAL SUSTAINMENT REQUIREMENTS BY PROJECT (2005 – 2025)

3.19 Once again, Figures 22 and 23 need to be considered in comparison to Figures 11 and 12 (indicating the total workforce requirement for all naval shipbuilding and repair work). Figures 22 and 23 represent a 35% reduction in the total naval shipbuilding and repair workforce requirements detailed in Figures 11 and 12. Specifically, Figures 22 and 23 indicate that Defence's sustainment requirement is, on average, approximately one third less than Defence total workforce requirements. As would be expected, the reduction is even more pronounced (up to 50%) over the peak construction period (2009 – 2014).

Discussion

3.20 Over the next two decades, Defence requires a significant amount of naval construction, upgrade and in-service support work. If this work is to be managed in-country it will place a significant burden on available naval shipbuilding workforce resources. Specifically, the peak construction period (AWDs, LHDs and Afloat Support ships) from 2009 to 2014 will require a 50% increase in workforce numbers (see Figures 11 and 12). This is a significant workforce 'peak' that will be hard to meet and cannot be sustained. Poaching from the in-service support resource pool is to be avoided at all cost as it would likely reduce the operational effectiveness of the current naval fleet.

3.21 If Australian industry was to meet the challenge and provide sufficient workforce numbers to meet Defence's demand, the next question that arises is what will happen to the workforce when it rapidly constricts post 2014. Specifically, is it feasible and cost effective to double naval shipbuilding workforce numbers for a six-year period? History would suggest that the non-recurring expenditure and workforce redundancy costs associated with such a large workforce 'peak' will inevitably be met by Government.

3.22 It is important to note that, from a Defence capability perspective, in-country construction is a means to an end. Specifically, it provides for sufficient skills development, technology transfer and attrition management, to allow for a cost effective indigenous in-

service support capability. It also provides for a sufficient core capability to meet any future naval shipbuilding requirements. Defence refers to this as its 'sustainment requirement'.

3.23 Projected workforce skill estimates indicate that Defence's 'sustainment requirement' is about one third of the new construction and upgrade workforce requirements (Figures 20 & 21); or about two thirds of Defence's total construction, upgrade and in-service support workforce requirements (Figures 22 & 23). This raises an interesting question, namely, whether or not the AWDs, LHDs and Afloat Support ships need to all be built in Australia to meet Defence's total sustainment requirement.

3.24 Figure 24 provides an indication of the total workforce requirements in comparison to Defence's sustainment requirements. Included in this figure is an indication of the workforce requirements if only AWDs are built in Australia and a similar indication of the workforce requirements if only the LHDs and Afloat Support ships are built in Australia. This figure suggests that either build program on its own is likely to provide sufficient workforce numbers to meet Defence's sustainment requirement. This noted, the AWD program is likely to provide more of the high-end skills (ie. Systems and Platform Engineering) required by Defence to meet its sustainment needs.

3.25 Figure 24 is not intended to infer that the AWDs, LHDs and Afloat Support ships should not all be constructed in-country. Rather, it is intended to highlight that if Defence's sustainment requirement is a key objective of an in-country construction program, then it is not necessary to build the AWDs, LHDs and Afloat Support ships all in Australia to meet that sustainment requirement. Furthermore, Figure 24 indicates that building only the AWDs or LHDs and Afloat Support ships in-country would significantly flatten the workforce resource 'peak' to a more manageable level for industry.

3.26 Such a situation (ie. In-country build of only AWD or only LHD/Afloat Support) would also be likely to have a positive impact on program cost. Specifically, Defence would not be required to bear the significant Non-Recurring Expenditure (NRE) costs associated with the ramping up and ramping down of workforce requirements. The steeper the ramp-up/ramp-down the higher the NRE costs borne by Defence.

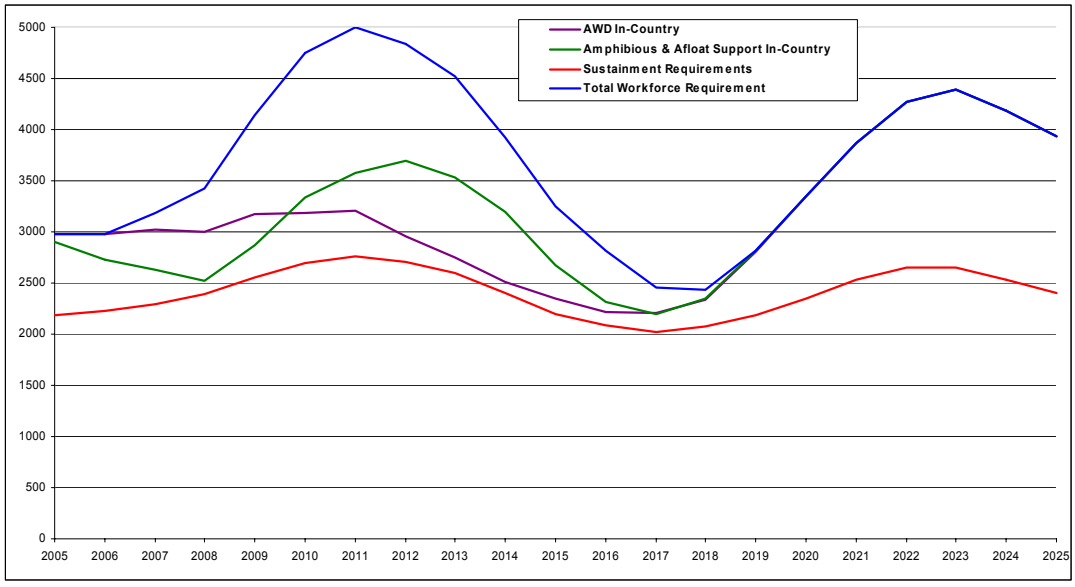

FIGURE 24: TOTAL WORKFORCE, SUSTAINMENT AND IN-COUNTRY BUILD PROJECT REQUIREMENTS (2005 – 2025)

SECTION 4. CHALLENGES FACING THE AUSTRALIAN NAVAL SHIPBUILDING SECTOR

4.1 Defence has identified three key areas of challenge facing the Australian maritime sector:

- The capacity of industry to meet Defence naval shipbuilding needs whilst also being able to provide in-service support,
- Cost effective and efficient performance, and
- Retention and exploitation of the skills, competencies and products developed during the construction phase.

Industry Capacity

4.2 Industry capacity (in addition to its capability) to meet Defence demand for naval shipbuilding and in-service support over the coming decades is a major challenge for the Australian maritime sector. As the Defence demand graphs and tables in section 3 indicate, industry must contend not only with a sustained period of major warship construction and support, but must also cope with an uneven demand curve that is far from constant on a year-to-year basis. The demand curve implies that industry will need to rapidly and frequently surge and contract its capacity. This will have serious implications for the ability of industry to plan, manage and sustain its workforce, and may also have a profound effect on the very make up of the Australian maritime sector.

4.3 Any expansion necessary to meet the construction demand would need to occur in an environment where there is already a high demand for skilled engineering resources across Australia. Defence industry is already having difficulty in maintaining its skilled workforce as the demand for skilled personnel necessary in the ship construction areas competes directly with the demands of the mining and construction sectors. Skilled labour in Australia is only partly mobile and this further limits the ability of industry to adapt its workforce to the fluctuating demand.

Cost effective and efficient performance

4.4 The Defence failure to deliver a number of recent major warship construction and modernization projects on time and to the required capability has been widely reported as has the actions being taken by Government and Defence to address these deficiencies. Shortfalls in the performance of the Australian maritime industry have also contributed to this poor performance. Defence is assisting industry to address a number of systemic issues – including addressing workforce skill shortfalls through the Skilling Australian Defence Industry program discussed in Section 1. Other major shortfalls remain with Industry to address – the failure to adequately scope, resource and manage major maritime projects is an example. Defence must independently assure that industry has the capacity to deliver on time and to budget the required capability and accordingly must seek objective evidence that potential industry suppliers are able to deliver on time, on budget and at the required performance

levels. It will be a challenge for industry to demonstrate and provide evidence that it is able to do this.

4.5 Defence considers that a major weakness in the shipbuilding industry is that management teams are relatively thinly resourced to take on the major projects foreshadowed by Government. In the past there has been a high level of transition of management teams between projects that would not be possible if the current projects were conducted in parallel or with major overlaps as is required to meet the current DCP. If one company were to capture this work then the current management and skills resource levels are unlikely to be able to cope and delays will occur to smooth the peak load. This will be commercially driven and detrimental to the Commonwealth.

4.6 As stated previously, Defence now believes that maintaining an ongoing competitive environment is an essential ingredient in developing and sustaining the Australian maritime industry. An appropriate level of competition within the ship repair industry promotes innovation, efficiency and value for money to the Commonwealth and therefore the tax-payer. Accordingly Defence should seek to ensure that Australian shipbuilding costs are appropriate. Strategies to achieve this include benchmarking and where appropriate competing ship acquisition and construction with foreign suppliers. This is not new. For example, a replacement for HMAS WESTRALIA was sourced overseas in 2004. This ship, to be commissioned as HMAS SIRIUS, was purchased at a fraction of the cost of construction of a similar vessel in Australia. Modifications to convert the ship to its military role are being conducted in Australia. This project will deliver a cost effective and capable replenishment ship to the RAN. The taxpayers probably saved over $50m and this strategy allowed the delivery of a replacement for HMAS WESTRALIA approximately 4 years ahead of an in country build option.

Retention and exploitation of the skills, competencies and products developed during the construction phase

4.7 As discussed at Section 1 there is no strong Defence strategic reason to build the Navy's warships here in Australia, but there is a high priority to be able to repair, maintain and upgrade warships in-country. Section 1 also highlights that knowledge, support infrastructure and competencies developed during the acquisition phase of a warship are required to support the ship through life. The more important capabilities that are required to flow on from construction into support are associated with the ability to adapt the design and integrate new systems and the ability to support complex unique systems. The competencies of fabrication and fitout associated with shipbuilding are less critical.

4.8 Experience with the Collins, Anzac and Minehunter Coastal (MHC) programs shows that the transition from the ship construction phase to support phase poses a challenge for industry in retaining the necessary competencies. Industry has normally built up a significant workforce to meet the acquisition program and is challenged to retain sufficient capability in the face of much smaller and less certain defence demand during the in-service phase. While long term support contracts help industry to predict the future defence demand, industry must also look at the nature of its products and services and ensure that it is able to adapt to the lower demand from defence during the in service phase.

4.9 In the case of major combatant such as the Air Warfare Destroyer, where there will be a large on going requirement for unique specialised support, access to this support throughout its life is a significant factor in the project acquisition strategy.

SECTION 5. NAVAL SHIPBUILDING ECONOMIC IMPLICATIONS

5.1 There is a general perception that a naval shipbuilding project provides an economic benefit roughly equal to the published total project cost. This is not realistic and is not correct. 'Economic benefit' is most often expressed in terms of expenditure (numbers of dollars) and employment. There is a large element of expenditure on overseas systems and services embedded within most elements of warship projects. This makes it difficult to calculate the level of direct benefit to the Australian economy. Therefore it is important to look at the levels of Australian Industry Involvement and quantify the possible employment and other impacts that flow from projects when gauging the economic impact.

5.2 Table 1.1 provided a typical cost breakdown for warship acquisition projects. The following table provides estimated Australian Industry Involvement in each of the project phases based upon historical information.

Project Element	Combatant Ship Build	Support Ship Build	Weapons Upgrades
Platform Design	2%	2%	2%
Hull, Machinery and Equipment	18%	15%	8%
Logistics support including Training	9%	14%	14%
Combat Systems	7%	5%	5-30%
Project Management	9%	10%	10%
Total	45%	46%	39-64%

TABLE 4.1: AUSTRALIAN INDUSTRY INVOLVEMENT

5.3 Australian warships will normally be based on proven overseas designs and most equipment and systems will be sourced from overseas suppliers. This reality is reflected in Table 2. The national effect will be that around 45%-64% of the total project expenditure on warship projects will be put towards work generated from Australia.

Additional Economic effects

5.4 Other significant benefits flow from Australian industrial activity such as the sophistication of the technology captured, generated, developed or enhanced; the level of education and skills employed/generated; and minimisation of production costs. These factors influence the competitiveness of various location options and enhance Australia's export competitiveness, which in turn has a more permanent effect on employment.

5.5 It is likely that new and innovative technology will be developed to meet the growing capability requirement. Some of this will be based on existing Intellectual Property (IP) from SMEs and major companies with the rest developed to meet the emerging requirement. This will cause a knock-on effect in that new industrial capability and IP will be generated which most likely (as proven in the Anzac and Minehunter Coastal projects) will be competitive on the world stage and lead to export sales. The indirect capability of industry to generate future

wealth from the base requirements and further developments of warship construction provides Australia with further potential benefit of 20-50% in industrial capacity.

5.6 It is estimated that the through life support costs of a typical warship will require approximately three times the initial acquisition costs.

5.7 As has been discussed the demand for resources to conduct the warship construction program will be in competition to other demands from the Australian economy for these resources. Constructing the ships identified in the DCP in Australia has the potential to impact adversely on the overall wealth of the nation. Given the competition for scarce, skilled resources these may be better focused on non-Defence projects (such as export orientated investments) aimed at the long term good of the nation and wealth generation rather than being employed in new ship construction.

Glossary of Terms

ADAS	Amphibious Deployment and Sustainment project
ADF	Australian Defence Force
ASPI	Australian Strategic Policy Institute
AWD	Air Warfare Destroyer
DCP	Defence Capability Plan
FBE	Fleet Base East
FBW	Fleet Base West
IP	Intellectual Property
LHD	Landing Helicopter Dock
MHC	Minehunter Coastal
NRE	Non-Recurring Expenditure
OEMs	Original Equipment Manufactures
RAN	Royal Australian Navy
RNZN	Royal New Zealand Navy
SADI	Skilling Australia's Defence Industry Program
SM	Submarine
SME	Small and Medium Enterprise