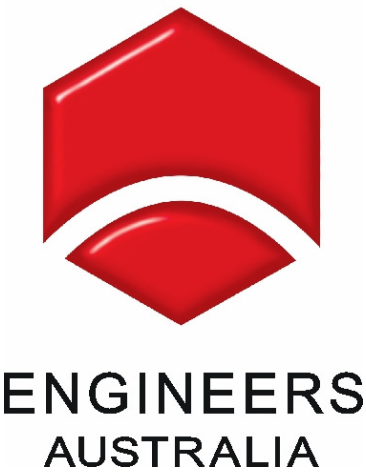
Naval Shipbuilding in Australia

Submission to the Senate Foreign Affairs, Defence and Trade References Committee



March 2006

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EXECUTIVE SUMMARY

Australia's naval shipbuilding and repair (NSR) sector is of importance to the strategic interests of the nation, as well as an important contributor to the national economy.

Of immediate concern to the Inquiry is to examine the costs and benefits of running two major building programs concurrently, namely Project SEA 4000 Air Warfare Destroyers (AWD) and JP2048 Phase 4A/B Amphibious Ships, and whether the Amphibious Ships should be built in Australia.

These issues cannot be resolved without consideration of two other issues.

1. the available domestic engineering capacity for the Amphibious Ships once the AWD project commences; and
2. the strategic direction of the Australian naval shipbuilding and repair sector.

As the Government has determined that the AWD vessels should be built in Australia, much of the nation's naval engineering capacity will be utilised in this project. This means that there will be less capacity available for the possible domestic construction of the Amphibious Ships. The question is how much capacity will be available and the cost of expanding this capacity to meet the demand imposed by the Amphibious Ships.

A clearer picture is needed of the volume of the AWD work for all Australian ship builders and how much excess capacity remains. While this information is not available to Engineers Australia, it appears that there would not be sufficient existing capacity to build the Amphibious Ships without investing in more physical assets and engineering skills.

Engineers Australia would welcome this expansion, provided there was an ongoing commitment to construct other naval vessels for Australia or for niche markets overseas. However, if there is no commitment for further work, it may not be wise to invest in additional capabilities to cope with the large workload required only in the short-term. This boom-bust cycle is highly undesirable from both an economic and human capital perspective.

Australia has two choices concerning the future direction of the Australian naval shipbuilding and repair sector.

Australia could choose to continue with its current approach. This involves assessing the costs and benefits of Australian industry involvement in each program, and selecting the option that provides the best value for money in each case. The consequence of this is a series of decisions which, while providing valuable work to Australian companies and employees, lacks strategic coherence. That is, the work has little long-term value in developing new large scale industries or capabilities.

Alternatively, Australia could choose to develop a long term strategy for Australia's naval shipbuilding and repair sector, which would involve and evaluation of the costs and benefits of each project's option in terms of the national strategy. That is, the option that provides best value for money in terms of achieving the longer term strategy would be selected.

There are numerous long term strategies and one could be to develop Australia as a niche naval shipbuilder as Spain has done. Spain, like Australia, constructed FFGs in the early 1980s and, unlike Australia, leveraged off this experience to develop a series of naval vessels including surface combatants, the F-100 for the Spanish Navy and the F-310 for the Norwegian Navy, an aircraft carrier for the Royal Thai Navy, Amphibious Ships LPD and LHD for the Spanish Navy, and Scorpene Class conventional diesel-electric submarines.

Once the above issues have been clarified, the decision to determine where the Amphibious Ships should be built can be made.

Engineers Australia recommends that the Committee:

1. Identify the volume of work for all Australian ship builders flowing from the AWD project and how much excess capacity is available for building the Amphibious Ships.
2. Clarify the strategic direction of the Australian naval shipbuilding and repair sector so as to determine the weighting that Australian industry development should have in the value for money calculation in the source selection of the Amphibious Ships' preferred tenderer and potential prime contractor.

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1 INTRODUCTION

This submission addresses the terms of reference by providing background, analysis, discussion and concluding remarks. The submission points to key sources of reference material and supporting data, but does not present either demand or supply data in a consolidated form. It is expected that Defence will provide projected demand data for naval shipbuilding, maintenance and repair, and that Australian Defence Industry will provide data on the projected capacity available to supply the demand.

Of immediate concern to the Inquiry is to examine the costs and benefits of running two major building programs concurrently, namely the Project SEA 4000 Air Warfare Destroyers, and JP2048 Phase 4A/B Amphibious Ships.

The key issues facing these projects can be categorised into the three time periods of:

- **Short term (1-2 years):** the capability and capacity of the Australian naval shipbuilding sector to ramp-up for the construction of two major programs running concurrently, comprising three Air Warfare Destroyers (AWD) and two amphibious ships (LHD). The short term includes issues of capital investment needed in new infrastructure to construct large steel ships in different locations around Australia, and source selection of the designer and design for the AWD and LHD.
- **Medium term (2-5 years):** the availability of skilled resources to deliver two major programs.
- **Longer term (5-20 years):** the future demand for naval ships and how to maximise the use of facilities and expertise built up during the preceeding years.

The Government has already made significant decisions that will result in the design, systems engineering[1] and construction activities for the AWDs being located in Adelaide, South Australia. This commitment effectively ensures a future for naval engineering in Australia for at least the next ten years.

Minister Hill indicated that 70% of the module fabrication work[2] for the Project SEA 4000 Prime Contract will be sub-contracted to other fabricators outside South Australia. A clear picture is needed of the volume of this workload on other shipbuilders, to identify how much capacity will be available in the Australian industrial base to work on JP2048 Phase 4A/B Amphibious Ships, as well as ongoing ship maintenance, repair and adaptation. It is possible that insufficient capacity will remain to undertake the work required for JP2048 Phase 4A/B.

Naval shipbuilding in Australia is complex because the larger Projects are dependent upon intellectual property that must be sourced from overseas ship/submarine designers and builders, and often subject to export licence restrictions imposed by foreign governments. The larger projects include submarines, combatant ships, mine warfare vessels, amphibious ships and auxiliaries.

[1] Senator The Hon Robert Hill, *AWD Headquarters to be built in S.A.*, Media Release 179/2005, 10 Nov 2005.
[2] Senator The Hon Robert Hill, *Media Conference for AWD Announcement*, Transcript. 31 May 2005.

Australia is dependent upon overseas ship designers and builders, to provide the pre-requisite intellectual property to inititiate these projects, even though the ship designs may be extensively modified for construction in Australia. Since the 1970s, this dependency on access to overseas-sourced intellectual property to start-up major projects has increased, rather than decreased.

Analysis might show that the Amphibious ships can be built overseas at a lower monetary cost, however when the other benefits, such as political, economic and industry development, are factored in, then it may be most cost effective to build HMAS Canberra[3] and Adelaide in Australia.

2 BACKGROUND TO POLICY AND ECONOMIC ISSUES

To understand the domain relating to the construction of large steel ships in Australia, it is necessary to follow a logical progression of NSR sector development.

Globally, the commercial shipbuilding industry shows evidence of distortions in price structures between different countries, with a variety of assistance measures available to shipbuilders and/or prospective customers. It is not regarded as a "level playing field".

2.1 Commercial Shipbuilding in Australia

The 1973 Oil Crisis triggered Australia's exit from the commercial shipbuilding market for large steel ships. The Oil Crisis coincided with a boom in Japan for the building of Very Large Crude Carriers (VLCCs), and rapid industrial development in South Korea that included new steelmaking and shipbuilding capabilities. Excess supply of new ships resulted in increased competition for new orders from builders, and significantly reduced prices for new ships. A comment from an Australian shipbuilder was that: "the Korean price for the same vessel …. was less than the cost of the materials in Australia"[4]. This situation was also prevalent in the US[5]. In Australia *"in 1977 the government announced the abolition of restrictions on import of vessels over 6,000 tons gross register, and this led directly to the cessation of production in Australia of larger ships. The Whyalla yard and the Sate Dockyard at Newcastle closed."*[6]

Over the past thirty years, the state of the art in the design and construction of large commercial steel ships has progressed significantly. In 2004, the Asian countries of South Korea, Japan and China were the dominant players with 40%, 24% and 14% respectively of the world market[7]. There has also been a revitalisation of shipbuilding capability in Eastern European nations following the break-up of the Soviet Union during the 1990's.

[3] Senator The Hon Robert Hill, *Next Generation of Naval Ships to Reflect a Rich History of Service*. Media Release 008/2006, 20 January 2006.
[4] B. Chapman, August 2003, *Letters to the Editor*, The Australian Naval Architect, Volume 7, Number 3.
[5] http://www.nationaldefensemagazine.org/issues/2002/Mar/Shipbuilding.htm
[6] W.J. Rourke, 1995, *History of the Australian and New Zealand Shipbuilding Industries*, Maritime Studies, Volume 80, pp 1-14, Australian Centre for Maritime Studies, ISSN 0726 6472, January/February 1995.
[7] NSNET, 1 May 2005, *World shipbuilding production*, source: http://nsnet.com./item-3769.html.

Amongst the Europeans, Spain[8] warrants special attention due to technological progress[9] and similarities in strategic alliance relationships with the US. Investment in infrastructure has been directed towards the mechanisation and automation of panel fabrication and assembly lines[10]. The emphasis has been towards handling larger structural modules that are fully outfitted prior to consolidation as part of the ship's structure[11].

Australian shipbuilders could not compete in this market in the 1970s due to the low cost of labour and materials available in some overseas countries. Now, thirty years later, the industrial capability gap has widened further. It would be very difficult today to determine the price premium for a large commercial ship built in Australia, versus Asia or Europe, due to the infrastructure, management and training costs needed to re-establish a significant shipbuilding capability in Australia.

In shipbuilding, economies of scale are very important to reduce costs and a mechanised steel fabrication plant would require a high throughput to justify the investment. The necessary investment in mechanisation would only be justified if there is some continuing demand for commercial steel ships built in Australia. With the increasing numbers of foreign flagged ships operating on international routes to Australia[12], and coastal routes, it is doubtful if any domestic or overseas demand exists for large commercial steel ships built in Australia. Infrastructure is a key topic, particularly for the sustainability of Australian industry, and is discussed later.

Specialisation in different ship types is increasing. Passenger cruise ships are the domain of specialist designers and builders competing in a niche market. Container ships are growing larger and more sophisticated every year. Marine pollution regulations now require oil tankers to be double-hulled, demanding more sophisticated design and construction techniques. Gas carriers are perhaps the most specialized ships of all to design and construct. None of these ship types are particularly suited to building in Australia. This leaves the simpler ship types such as Roll-On/Roll-Off ships and bulk carriers where price competition is intense and profit margins are low. These types of ships (Ro/Ro and bulk carriers) were previously built in Australia[13,14].

2.2 Naval Shipbuilding and Repair in Australia

Defence demand in Australia for naval shipbuilding is characterised as being very uneven. The building programs initiated in the late 1980s for ANZAC Ships and Collins Submarines are now effectively complete.

[8] DIC, 1995, *ANZ Ship Construction and Repair Industry*, Section 1.1.6 *The Worlds Shipbuilders - Spain*, p.11
[9] A. Serabia & R. Gutierrez, *A Return to Merchant Ship Production: The International Impact of he NSRP and American Technology*, Journal of Ship Production, Feb 1992.
[10] Rolf-Atle Tomassen, 2005*, Shipyard Technology and Trends*, TTS Handling Systems, presentation to INMEX, India 2005, refer http://www.tts-se.com/upload/TTS_HS_PDFs/trends-shipb-industry.pdf, refer Attachment K.
[11] TTS Handling Systems, *Samsung's 'Mega-Block' Revolution*, refer http://www.tts-se.com/upload/TTS_HS_PDFs/TTS_HS_Mega-Block.pdf
[12] Australia's Maritime Strategy, *Use of Merchant Shipping for Defence Purposes*, p.110, June 2004.
[13] Union Steam Ship Co. of New Zealand, Seaway Prince, Seaway Princess, Union Rotorua, Union Rotoiti, refer: http://www.mattmar.com.au/fleet_list_union_ss.co.htm
[14] BHP fleet, Iron Monarch, Iron Duke, refer: http://www.mattmar.com.au/fleet_list_bhp.htm

The new programs initiated in the 1990s and 2000s were for two Hydrographic Ships awarded to NQEA, six Huon Class Mine Hunters awarded to ADI, and fourteen Armidale Class Patrol Boats awarded to Defence Maritime Services, in cooperation with Austal shipbuilders.

The Hydrographic Ships and Mine Hunters have been delivered, and construction of the Armidale Class Patrol Boats is well advanced. In 2003, Tenix was awarded a contract by the New Zealand Government for Project Protector, a multi-ship order that involves some shipbuilding work in Australia, and some sub-contracted work overseas[15]. Other than these projects, Defence demand since the mid-1990s has been relatively low. Consequently, the Australian naval shipbuilding industry has had excess capacity.

Defence and Navy view Australia's maritime sector primarily in terms of its capability and capacity to maintain, repair, modify and adapt naval platforms. Design and construction is not considered a priority because there is a prevailing view that defence capability can be sourced anywhere, usually from either US or European sources.

In 2000, the Defence Materiel Organisation (DMO) Industry Division commenced studies to develop Sector Strategic Plans for each of the main technology domains: Maritime, Land, Aerospace, and Electronic and Weapon Systems. The *Naval Shipbuilding and Repair (NSR) Sector Strategic Plan*[16] identified key future Acquisition Programs within the NSR Sector, in particular Projects SEA1654, SEA 4000 and JP2048.

The report took a collaborative approach to the relationship between Defence and Industry, and discussed the importance of acquisition strategies for these projects. The report stated that:

> *these strategies will be developed in accordance with the objectives of the Sector Plan and would primarily feature:*
>
> - *a "design driven" approach;*
> - *an approach that offers best value for money;*
> - *an appropriate level of inter-operability; and*
> - *an approach that would probably involve a multi-participant project alliance arrangement.*

The report went on to discuss the construction of major surface ships[17], future industry structural models[18], competition principles[19], and a conceptual model for *"the relationship between Defence and a single shipbuilding entity, its relationship with the supply chain and the risks and benefits of vertical integration"*[20] [21].

[15] Project Protector website: http:///www.navy.mil.nz/Visit-the-fleet/project-protector/default.htm,
[16] Defence Materiel Organisation, Industry Division, *The Australian Naval Shipbuilding and Repair Sector Strategic Plan*, p.32, paras 2.9 to 2.12 inclusive, and Annex B, pp.185 and 186, September 2002.
[17] Ibid, (Chapter 4, pp.43-53)
[18] Ibid, (Chapter 7, pp.80-101)
[19] Ibid, (Chapter 8, pp.103-106)
[20] Ibid, (Chapter 10, pp.131-139)
[21] The US naval shipbuilding industry was experiencing similar pressures and there has been much discussion about the rationalisation to a single supplier. United States Naval Institute, 2004, *US Shipyards Navigate between a Rock and a Hard Place*, http://www.usni.org/proceedings/Articles04/PRO03 truver-2.tm

Chapter 9 of the NSR Sector Plan concluded with the following summary[22]:

- *Significant benefits for Defence can be derived from a sole source environment.*
- *The removal of competition carries inherent risks and costs, primarily the potential to stifle innovation and cost control.*
- *With appropriate measures in place a monopoly/monopsony may have greater potential to capture the benefits and mitigate the risks.*
- *There may be substantial advantages to be gained from a more pro-active role by Government in influencing the shape, timing and costs of an emerging monopoly/monopsony situation.*

The NSR Sector Report was submitted to the Minister for Defence in September 2002 and until about mid-2004, major projects including SEA 4000 and JP2048 Phase 4A/B followed the guidance of the NSR Sector Plan with regard to the "design driven" approach to the acquisition strategy, and alliance style contracts to establish the relationships between the major participants.

The Australian Strategic Policy Institute (ASPI) commented on the NSR Sector Plan and expressed concern about a Government-initiated reduction in levels of competition: *On balance, we do not believe that the problems in the industry are great enough to warrant the adoption of a reform model that carries these risks. …. the government should adopt five proposals for modest but valuable reform for the naval shipbuilding industry:*

- *Do not force an outcome on the industry as a whole. Let commercial forces decide how many shipbuilders we can support in this country.*
- *Smooth out the shipbuilding workload later in the decade, so the industry does not face a boom and bust cycle.*
- *Reform naval repair and maintenance to better support the ships at sea and the industry.*
- *Sell ASC to the highest competent bidder, allowing new firms to enter the industry which might be able to bring non-defence work to the corporation.*
- *Avoid buying Australian-unique systems which seldom offer operational advantages to offset the very high costs and risks they impose.* [23]

Australia's National Security - A Defence Update 2003[24] strengthened Australia's response to security issues, including the proliferation of weapons of mass destruction, terrorism, failing states and trans-national crime. The corresponding *Defence Capability Plan 2004-2014*[25] provided an overview of future capability acquisition. The thinking for the DCP changed the direction for Project SEA 1654 into a commercial procurement of an existing products tanker built overseas, with local adaptation to meet Navy requirements. In addition to Project SEA 4000 for three Air Warfare Destroyers, the DCP allocated additional funds to JP2048 Phase 4A/B and upgraded the requirement for two large Amphibious Ships to support helicopter operations.

[22] Ibid, (Chapter 9, p.130)
[23] Australian Strategic Policy Institute, *Setting a Course for Australia's Naval Shipbuilding and Repair Industry*. 2002.
[24] Department of Defence, *Australia's National Security – A Defence Update 2003,* 2003.
[25] Department of Defence, *Defence Capability Plan 2004-2014*, 2003.

The *Defence Procurement Review 2003*[26] strengthened and formalised the Government's call for Defence to provide a range of costed capability options, when submitting capability proposals to Government: an Initial Business Case (IBC) for 1st Pass Approval, and an Acquisition Business Case (ABC) for 2nd Pass Approval.

ASPI revisited the subject of Australian naval shipbuilding in 2004 and reviewed the options available, based on an indicative naval construction schedule for 2004-2018 consistent with the increased demand from the DCP (refer Figure 1 from ASPI Report)[27]. ASPI stated: "*all the government has to decide is how to proceed for the two projects slated for this decade*".

In 2005, the consultancy Carnegie-Wylie was engaged by the Government to provide advice[28]. A report[29] was prepared and submitted to Government. Unlike the NSR Sector Plan that was published by Defence and received wide consultation, the Carnegie-Wylie Report was tightly held with restricted distribution. Details of this report are not available to Engineers Australia but it is believed to address issues of competition principles and sale of ASC[30]. It is understood that the Government did not endorse the NSR Sector Plan, except for some sections, such as the policy in Chapter 13 on Small to Medium Enterprises (SME).

Subsequent to the Carnegie-Wylie Report, the Government released the statement *Naval Shipbuilding: Moving Forward*[31]. As a consequence, there have been some changes in direction for Project SEA 4000 and JP2048 Phase 4A/B. Projects SEA 4000 and JP2048 Phase 4A/B subsequently achieved Government 1st Pass Approval in August 2005. Meanwhile, Project SEA 1654 is pioneering an innovative acquisition strategy involving the purchase of a new Products Tanker built in South Korea by the Hyundai Mipo shipyard. The ship is currently being modified by Tenix Defence Systems in Western Australia and is due to be delivered in July 2006.

For Navy ship maintenance and repair on the East and West coasts, the commercial arrangements are currently being reviewed by the DMO. An In-Service Support contract has been awarded to ASC to provide through life support for the Collins Class Submarines. The Prime Contract with DMS for the Armidale Class Patrol Boats includes through life support. Future sustainment activities for the Surface Combatant fleet and Afloat Support ships are also likely to include longer term arrangements.

[26] Department of Defence, *Review of Defence Procurement*, (Kinnaird) 2003.
[27] Australian Strategic Policy Institute, *Weapons of Mass Construction - Australian naval shipbuilding*, 2004.
[28] Senator the Hon Nick Minchin, Minister for Finance and Administration, and Senator the Hon Robert Hill, Minister for Defence, *Expert to provide advice on the Naval Shipbuilding and Repair Sector and the Australian Submarine Corporation,* Joint Media Release 5/2004, Wednesday 14 January 2004.
[29] Carnegie-Wylie & Company, *The Restructuring of the Naval Shipbuilding Industry in the context of the Sale of ASC*, May 2004.
[30] Senator The Hon Robert Hill Minister for Defence and Senator The Hon Nick Minchin Minister for Finance and Administration, *The Australian Submarine Corporation,* Media Release 29/2004, Friday 20 Feb. 2004.
[31] Senator The Hon Robert Hill Minister for Defence and Senator The Hon Nick Minchin Minister for Finance and Administration, *Naval Shipbuilding: Moving Forward*, Media Release 95/2004, 27 May 2004.

3 POLICY AND ECONOMIC ISSUES

There are various drivers of government policy in naval shipbuilding including:

- National security policy
- Defence strategic policy and capability development planning
- Macro economic policy
- Availability of intellectual property
- Industry policy

3.1 National Security Policy

Naval sea power is a key element of national security. The Hon Bruce Scott MP, Chairman of the Senate Inquiry into Australia's Maritime Strategy, stated the following:

> *The inquiry found that there was a need for a comprehensive national security strategy (NSS) which would articulate all the elements that the Australian Government has at its disposal to address issues of national security. A national security strategy would address more than just issues of defence. It would address Australia's key interests such as economic, business, diplomatic, trade and environmental. The NSS should indicate where our military strategy fits within this 'grand strategy'. ...*
> *The proposed new (Defence) White Paper should ensure that the Australian Defence Force can implement the key features of a modern maritime strategy, including sea denial, sea control and power projection ashore for the purpose of peace keeping and regional assistance missions.*[32]

The Committee needs to determine the contribution of naval shipbuilding and repair to the delivery of naval sea power and defence capability.

3.2 Defence Strategic Policy and Capability Development Planning

In December 2005, Defence Minister Hill launched *Australia's National Security – A Defence Update 2005*[33]. The Update confirmed that counter-terrorism, counter-proliferation and countering the impacts of state fragility remain the Government's highest priority. Minister Hill's media release noted:

> *the diffusion of technologies, the increasing assymetrical nature of threats, and the impacts of globalisation mean that traditional defences built around geographic advantage or traditional military practices are less relevant than in previous times. ... the contribution the ADF will be called upon to make to future national security will go far beyond traditional warfighting against traditional types of adversaries. So decisions about the use of and development of defence capability must be concerned as much with forestalling future threats and shaping the choices of potential*

[32] The Parliament of the Commonwealth of Australia, Joint Standing Committee on Foreign Affairs, Defence and Trade, *Australia's Maritime Strategy*, Canberra, June 2004.
[33] Senator The Hon Robert Hill Minister for Defence, *Australia's National Security: A Defence Update 2005*, Speech at Victoria Barracks, Sydney, 15 December 2005.

> *adversaries before they become threats, as they will be with responding to specific contingencies.*

The Defence policy aims to: *"shape and build an ADF that is versatile and adaptable…. (and) … to build a strong set of security relationships – regionally and globally – that allows the ADF to … help shape the international environment … and to lead … and enable military coalitions as appropriate."*

To meet all of these strategic and policy needs, the Government will continue to develop future forces that are: *"versatile, robust, joint and integrated … aimed at increasing the ADF's combat weight, mobility, and sustainability". "For the Royal Australian Navy, the 2005 Update confirmed the direction laid out in the White Paper*[34] *and the previous Update*[35]*, that includes a substantial investment in new amphibious ships and air warfare destroyers, an upgrading of the capability of the frigate and submarine forces, new helicopter fleets and communications capabilities and a substantial increase for Australia's border security provided by the new fleet of Armidale class patrol boats. This will give the fleet the capability for extended and assured reach and for the deployment of larger and heavier forces." "For the Australian Army, we are announcing a new phase in the Army's development….These improvements will be delivered under the banner of the Hardened and Networked Army, a ten year plan that will allow the Army to be more capable, more survivable, and more able to provide a broader range of options that can be employed for longer and if necessary, in more lethal scenarios."*

The Committee needs to determine if the expertise that derives from naval shipbuilding and repair is an essential contributor to defence strategic policy and capability development planning.

3.3 Macro Economic Policy and the relevance of competition as a procurement tool

Another driver is macro economic policy and the application of competition to shipbuilding.

Macro economic policy has been driven by a series of measures, notably encouraging market competition, sale of government assets, regulatory creation of a level playing field, encouragement of global trade and deregulation.

One of the consequences of this has been a decline of Australia's manufacturing sector.

In 2003, the Productivity Commission reported that: *"At the current rate of decline, manufacturing would account for only around one-tenth of GDP some time between 2010-11 and 2015-16."*[36] With regard to productivity, the Commission Report stated:

> *In general, given international wage relativities, the Australian manufacturing sector cannot compete in non-differentiated traded goods that rely on low skill, highly labour intensive processes. …*

[34] Department of Defence, Defence White Paper: *Defence 2000 – Our Future Defence Force,* 2000.
[35] Department of Defence, *Australia's National Security – A Defence Update 2003,* 2003.
[36] Productivity Commission, *Trends in Australian Manufacturing*, http://www.pc.gov.au/research/crp/tiam, Commission Research Paper, Ausinfo, Canberra, August 2003.

> *However, the large cross-country disparities in manufacturing worker wage rates are not matched by similar disparities in the salaries of engineers, indicating that cost competitiveness in processes that draw more on high skilled workers is less affected by wages.*

While it is widely accepted that market competition is appropriate in sectors where there are large numbers of informed buyers and sellers, Engineers Australia questions its application to areas where the competitive pre-conditions do not exist. The pre-conditions include large numbers of informed buyers and sellers, no information asymmetry, no public goods creation, no externalities and rapid response by producers to market signals.

Naval ship building is one area where market competition pre-conditions do not exist. This means that the reliance on competition or the creation of artificial competition as a procurement tool may not be appropriate.

For example, the tactic of using one competitor to provide leverage on another may not lead to the most appropriate outcome. To pursue a traditional competitive approach, such as the RFI, RFP, RFT and bidder competition selection for ship construction, is unrealistic and, in most cases, can result in additional cost to industry and frustration for bidders. Ultimately it will not lead to the outcome Defence requires and the procurement process will then have to be changed completely. There are previous examples of this.

Another factor which influences the market is the sale of ASC. When the Government owns an asset, it can choose to direct the organisation to undertake or not undertake certain tasks. When it is privately owned, it cannot. What is required when an organisation moves from government to the private sector is that in the projects won by the formerly government-owned enterprise, there is a very clear statement of what is expected from them in terms of Australian industry involvement.

The Committee needs to appreciate that the NSR Sector does not constitute a pure market and therefore the use of competition as the primary procurement tool has limited relevance.

3.4 Availability of intellectual property

Another driver of naval shipbuilding policy is the availability of intellectual property to design and build vessels.

Due to the rationalisation of industry worldwide and the sale of government shipbuilders, the majority of intellectual property is owned by a few very large private shipbuilders.

During the 1990s, following the end of the Cold-War, defence budgets around the world were slashed, and the defence industry was faced with rationalisation to restrict its supply capacity in line with the reduced demand. For example, the six major US shipyards: Bath Iron Works, Electric Boat and NASSCO; and Newport News, Ingalls and Avondale; have been grouped under two major companies: General Dynamics and Northrop Grumman.

In the market segment for Defence systems integration, Raytheon, Lockheed-Martin and Boeing have grown through acquisitions and mergers.

In Europe, to compete against these US Defence Industry giants, there has been similar rationalisation through acquisition and mergers. For example, Thyssen-Krupp Marine Systems represents four shipyards: Blohm+Voss AG, Thyssen-Nordseewerke, HDW and Kockums; and ARMARIS represents a merger between the French state-owned naval engineering group DCN, and Thales[37]. Further rationalization is possible, and could result eventually in one European Defence company to compete with one US Defence company, similar to the competition in the commercial aircraft industry between EADS and Boeing.

Since the reduction of Australia's government-owned naval ship design expertise for large ships, Australia has had to rely heavily on the use of overseas ship design expertise. While Australia has built state-of-the-art submarines, surface combatants, and mine hunters, the basic ship designs have all been produced overseas, with local modification in Australia. For the Air Warfare Destroyers and Amphibious Ships, the same strategy is being used to obtain intellectual property via a design licence from an experienced overseas designer/shipbuilder.

Whilst it might make cost sense to reduce investment in design and development, and technical and commercial risk, the consequence of this are lost opportunities for Australian engineers, technicians, and research staff to "learn by doing". Australia's technical capacity has been eroded, and this is evident from the substantially reduced numbers of professional and technical staff employed by Defence. Some might claim this capability has been transferred to Australian Defence Industry, but Industry can only invest in the recruitment and retention of professional and technical staff if there are profitable contracts for project work.

The Committee needs to appreciate that the more the Australian Department of Defence buys ship designs and weapon systems from overseas, the less self-reliant we become as a nation in terms of technical capability.

3.5 Industry Policy - Local Content & Strategic Industry Development Activities

The final driver for shipbuilding policy is Defence's industry development policy.

Australia has been through various iterations of defence policy including[38] the 1986 Cooksey Report[39], and the 1986 Australian Government Offsets Program[40]. More recently the Australian Defence Offsets Program[41] has provided policy direction for the Collins Submarines and ANZAC Ships Projects, and introduced a management process designed to account for Local Content achievement and the delivery of Defence Offsets. In 1992, the Price Report[42] looked at the relationship between Defence and Industry in the context of Australia's defence policy based on self-reliance. A further review in 1998 resulted in a publication entitled *Defence and Industry Strategic Policy Statement*. This policy statement was to be superseded by individual Sector Plans.

[37] Australian Defence Business Review, *New Strength for French JP2048 bid*, December-January 2006.
[38] *Development of Australian Defence Industry Policy*, Draft 7 April 2001, refer Attachment F.
[39] Robert Cooksey, *Review of Australia's Defence Exports and Defence Industry*, 1986.
[40] Department of Industry, Technology and Commerce and Department of Defence, *Australian Government Offsets Program – Guidelines for participants*, Australian Government Publishing Service, March 1986.
[41] Department of Defence, *Australian Defence Offsets Program*, October 1989, Canberra.
[42] The Hon Roger Price MP, *Defence Policy and Industry"*, November 1992.

Following the Government's non-endorsement of the NSR Sector Plan, and Carnegie-Wylie's advice to return to a competitive market, the Australian Industry Involvement (AII) policy environment is unclear. It is unclear how AII will be managed for Project SEA 4000 and JP2048. Specifically, it is unknown if new projects will be required to deliver targeted levels of Local Content and Industry Development, or whether the AII policy will be targeted on developing specific industry capabilities.

The Committee needs to seek clarification on this aspect of Defence AII Policy as it is unclear what this is currently.

4 DEFENCE CAPABILITY PLAN 2004-2014

This section provides details of the future Australian naval ship projects that offers some guidance on the potential ongoing Australian naval shipbuilding work.

4.1 Project SEA 4000 – Air Warfare Destroyers

Phase Schedule Highlights	Year-of-Decision	Phase 3 – FY 2006/07
	In-service Delivery	Phase 3 – 2013 to 2015
Estimated Phase Expenditure		Phase 3 - $4500m to $6000m

SEA 4000 is a complex Project that achieved Government 1st Pass Approval in 2005. The project has progressed further than might be expected prior to 2nd Pass Approval, because the Government has already committed $1 billion towards the purchase of three AEGIS Weapon Systems from the U.S. Navy that will form part of the Aegis Combat System[43]. This Combat System provides the core of the AWD's Command and Control System, linked to the Mk41 VLS Missile Launcher and other weapons and sensors.

The competition to be selected as the successful ship designer is between the Spanish company NAVANTIA, and the US company Gibbs and Cox[44]. NAVANTIA is offering its existing design, the F-100, that incorporates the AEGIS Command and Control System using the SPY-1D phased array radar[45]. Gibbs and Cox is offering an evolved design, derived from the DDG-51 Arleigh Burke Destroyer. These ships will provide area defence and force protection for other military assets engaged within the maritime theatre of operations. Raytheon (Australia) has been selected to perform the function of Combat System Systems Engineer[46], and Lockheed Martin will develop and deliver the AEGIS System under Foreign Military Sales arrangements via the U.S. Navy.

[43] Senator The Hon Robert Hill, Minister for Defence, *Purchase of Aegis Combat System for Destroyers*, Media Release 196/2005, Friday 9 December 2005.
[44] The Royal Institution of Naval Architects, *Air Warfare Destroyer builds up a head of steam*, Warship Technology, supplement to the Naval Architect, March 2006, p.15.
[45] Peter La Franchi, *AWD First Acquisitions*, Asia-Pacific Defence Reporter, Dec.2005/Jan.2006, pp.15-22.
[46] Senator The Hon Robert Hill, Minister for Defence, *Media Conference for AWD Announcement*, Russell Theatrette, Defence, Transcript, 31 May 2005.

In the media conference[47], Minister Hill announced ASC as the selected Shipbuilder for Project SEA 4000, with the expectation that the three ships will be constructed at ASC's greenfield shipyard site at Port Adelaide. Contracting strategies to engage all of these parties might reflect an alliance-style contract[48].

4.2 Project JP2048 Phase 4A/B – Amphibious Ships

Phase Schedule Highlights:	Year-of-Decision	Phase 4A – FY 2004/05
	In-service Delivery	Phase 4B – FY2008/09 to 10/11 (with 4A)
Estimated Phase Expenditure		Phase 4A/B - $1500m to $20000m in total

From 2003 to mid 2004, prior to the Carnegie-Wylie Report[49], the acquisition strategy followed a collaborative approach, consistent with the NSR Sector Plan, Annex B[50]. This approach was conditioned by the view that construction of the first of two amphibious ships in Australia by 2010, a schedule previously agreed with the Defence Minister[51], would require the combined resources of all of the Australian shipbuilders that were not involved with the Air Warfare Destroyer Project. The ambitious schedule initially planned for the first Amphibious Ship to be constructed before the first Air Warfare Destroyer. To expedite the technical and commercial aspects, two overseas designers, the French company ARMARIS, and the Spanish Company NAVANTIA, provided technical data for the options required by Government to initiate a cost estimating process involving four Australian shipbuilders for ship construction in Australia. The Australian shipbuilders represented in the discussions were ADI, ASC, Austal and Tenix. The aim of the cost-estimating activity was to establish a "Sailaway Price" for two ships built in Australia, and a Life-Cycle Cost. It was also a requirement to compare the prices for local construction with prices for overseas construction, to quantify the "cost premium" for local construction. This information was needed to support the Initial Business Case for 1st Pass Approval by Government.

In late 2004, the acquisition strategy for JP2048 Phase 4A/B changed to a competitive process, consistent with the advice of Carnegie-Wylie. The schedule for the first Amphibious Ship was revised to follow the AWD Project, rather than to lead[52]. This corresponded to a delivery date of 2012+, and allowed more time to conduct the competitive process. It also allowed the Commonwealth to defer some key decisions: it allowed selection of the designer and the design to be deferred (a change from the "design driven" approach), it allowed Defence to deal with the Australian shipbuilders separately rather than collectively, and it allowed the full scope of work for design, construction and through-life support to be combined into a 'Prime Contract' subject to RFT, rather than seeking to negotiate a mutually agreed work share allocation amongst all the parties as potential alliance partners.

[47] Senator The Hon Robert Hill Minister for Defence, *Media Conference for AWD Announcement*, Transcript, p2, 31 May 2005.
[48] Senator The Hon Robert Hill, Minister for Defence, *Media Conference for AWD Announcement*, Russell Theatrette, Defence, Transcript, p.3, 31 May 2005.
[49] Carnegie-Wylie & Company, Report to Government on: *The Restructuring of the Naval Shipbuilding Industry in the context of the Sale of ASC,* 2004.
[50] The Australian Naval Shipbuilding and Repair (NSR) Sector Plan, Annex B, p.186, September 2002.
[51] Speech by Senator The Hon Robert Hill, Minister for Defence, *Opening Address, Pacific 2004 International Maritime Exposition and Congress*, Sydney Convention and Exhibition Centre, Tuesday 3 February 2004,
[52] Senator Robert Hill, *Naval Shipbuilding: Moving Forward*. Media release 95/2004, 27 May 2004.

In theory, it also allows the Commonwealth to transfer risk to the potential Prime Contractor. To facilitate the provision of technical information to Australian shipbuilders necessary to prepare an RFT response, teaming arrangements were encouraged between Australian builders and overseas designers. It is instructive to note that this is similar to the change of strategy that occurred for the ANZAC Ship Project in 1987.

This Project highlights a significant deficiency of the present Australian naval shipbuilding industry structure – for new major shipbuilding projects in the capability development cycle, no individual Australian company possesses the relevant experience to generate the design solutions and intellectual property to prepare cost estimates for the options typically requested by Government to support the Kinnaird two-pass process. The approach used by Defence has been to obtain this information from overseas ship designers/builders, by providing partial funding and advocating that this is a competitive business development activity[53].

The new strategy for JP2048 Phase 4A/B carries a different set of risks and consequences, some of which were apparent on the ANZAC Ship Project for the transition of design work to Australia for an in-country build. These risks and consequences would be very different if the Government opted for an overseas build.

4.3 JP2048 Phase 4C – Strategic Sea Lift Capability

Phase Schedule Highlights:	Year-of-Decision	FY2013/14 to 2015/16
	In-service Delivery	FY2016 to 2018
Estimated Phase Expenditure		$150m to $200m

The *Defence Capability Plan (DCP) 2004-2014*[54] stated *"Phase 4C will acquire a Strategic Lift capability to provide the ADF with the means to conduct strategic sealift in support of enhanced deployed force."* There is no information available yet as to what type of solutions might fulfil this capability requirement – it could be a Ro/Ro ship, a fast ferry, a vessel fitted with a dock[55], or a combination of more than one vessel type. However, the budget allocated in the DCP is between $150m to $200m, with an "In-service Delivery" of 2016-2018. JP2048 Phase 4C is unlikely to sustain Australia's naval shipbuilding industry by means of an ongoing program.

4.4 SEA 1654 Phase 2B – Maritime Operational Support Capability – AOR

Phase Schedule Highlights:	Year-of-Decision	FY2014/15 to 2016/17
	In-service Delivery	FY2018 to 2020
Estimated Phase Expenditure		$150m to $200m

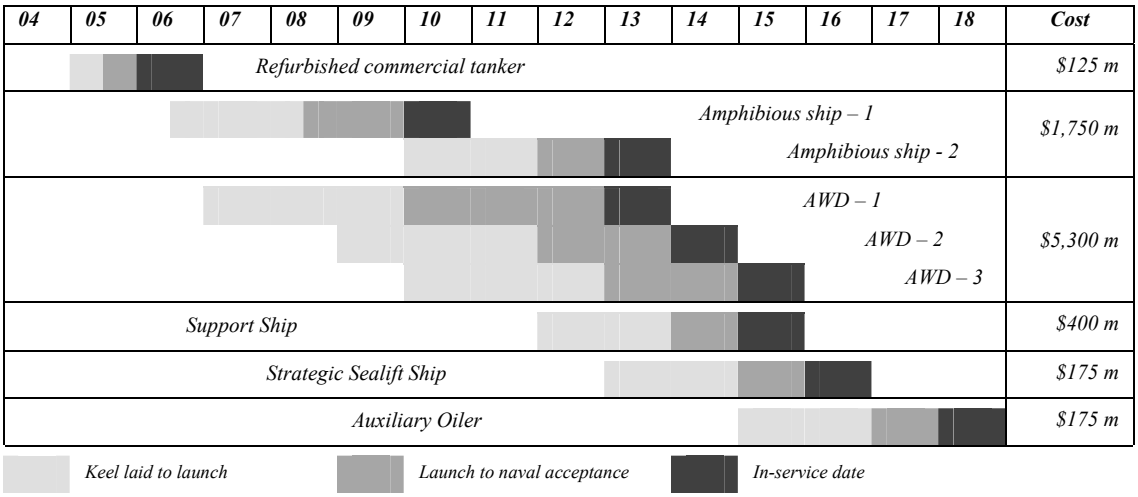
The options for this capability are not yet known, but should provide opportunities for Australian shipbuilders.

[53] The Royal Institution of Naval Architects, *Two designs competing for Australia's LHD project*, Warship Technology, supplement to the Naval Architect, March 2006, p.17.
[54] Department of Defence, *Defence Capability Plan 2004-2014*, Public Version, 2004.
[55] Ian Bostock, 2006, *RAN makes early decision on sealift capability*, Jane's Defence Weekly, Vol. 43, Issue 6, 8 February 2006, p.15.

4.5 Other Future Programs

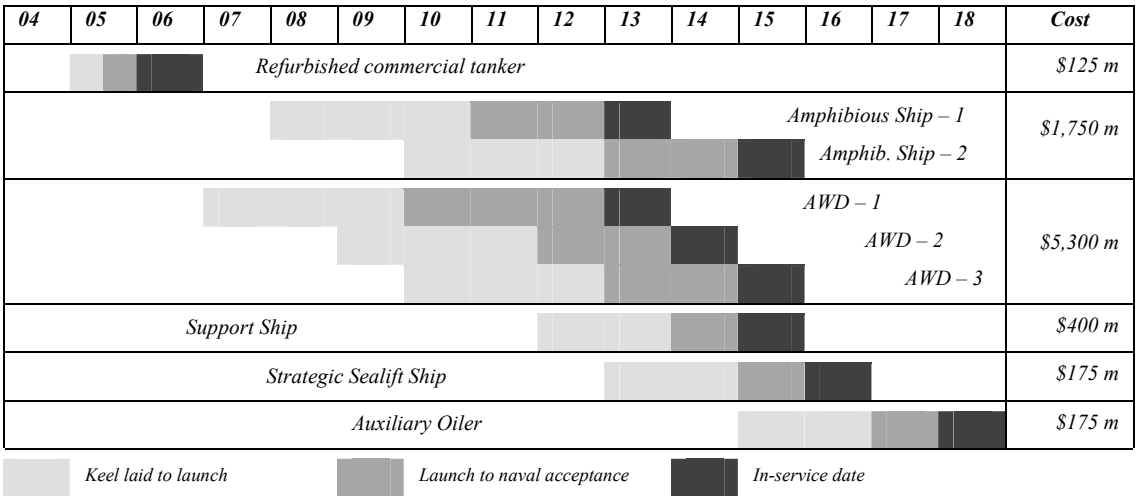
Other future programs are likely to include new generation submarines to replace the Collins Class, and new Surface Combatants to replace the ANZAC Ships. Planning for these programs is expected to start in 2012-14.

Figure 1 Indicative naval construction schedule 2004 – 2018 (Source: Mark Thomson[56])



Sources: The Australian Naval Shipbuilding and Repair Sector Plan*, Department of Defence (September 2002) and* Defence Capability Plan 2004-2014*, Department of Defence (February 2004)*

Figure 2 Revised naval construction schedule 2004 – 2018 (Post Carnegie-Wylie, 2004)



Sources: Mark Thomson, ASPI, and updated to reflect Media Release 95/2004, and the change of strategy for JP2048 Phase 4A/B.

[56] Mark Thomson, *Weapons of Mass Construction – Australian naval shipbuilding*, Australian Strategic Policy Institute, Strategic Insights, March 2004.

5 PROJECT MANAGEMENT & ENGINEERING ISSUES

This section identifies the significant project management and engineering issues in shipbuilding and repair in Australia.

5.1 Industry Participants, Teaming Arrangements and Rationalisation

Australian companies engaged in naval shipbuilding and repair as Tier 1 Suppliers are:

- ADI – based in Sydney and teamed with Forgacs for JP2048 Phase 4A/B.
- ASC – based in Adelaide SA, and HMAS Stirling, WA,
- AUSTAL – based at Henderson in WA, and
- Tenix – based VIC & WA, teamed with SAAB Systems in ANZAC Alliance.

Programs including the Collins Submarines, Air Warfare Destroyers and Amphibious Ships provide opportunities for overseas Defence companies to participate as either ship designers, systems integrators, or potential prime contractors, depending upon the outcome of the future sale of ASC. These companies include:

- ARMARIS (DCN and Thales) – short-listed designer for JP2048 Phase 4A/B,
- BAE Systems – Prime Contractor/shipbuilder for Type 45 Destroyer Program.
- BOEING – aerospace, systems integration, system vendor to US Government.
- GENERAL DYNAMICS – owner of BIW, EB, NASSCO, builder of DDG51.
- GIBBS & COX – short-listed designer for Project SEA 4000.
- NAVANTIA – short-listed designer for Projects SEA 4000, JP2048 Ph4A/B.
- NORTHROP GRUMMAN – owner of Newport News, Ingalls, and Avondale.
- RAYTHEON – (Aust.) is SEA 4000 Combat System Systems Engineer.
- THYSSEN-KRUPP Marine Systems – owner B+V, TNSW, HDW, Kockums.
- LOCKHEED MARTIN – system vendor for the AEGIS Air Warfare System.

Teaming arrangements have been established between some Australian and overseas shipbuilders. For example, ADI has teamed with ARMARIS for JP2048 Phase 4A[57], and has sought assistance from NASSCO. ASC has worked with Electric Boat on the COLLINS Project and Bath Iron Works for Project SEA 4000. Tenix is teamed with TKMS for the ANZAC Program, and NAVANTIA for JP2048 Phase 4A/B[58].

Many of the above companies are actively positioning themselves to bid for ASC, when it is put on the market, as well as bidding as Prime Contractor for JP2048 Phase 4A/B. The sale of ASC could be a catalyst in shaping the future structure of the Australian shipbuilding industry, including some form of rationalisation.

[57] ADI News Release, 30 January 2006, ADI teams with ARMARIS and DCN for Australian Amphibious Ships Project, refer: http://www.adi-limited.com/newsdocs/2006130151310.pdf
[58] Tenix News Details, 1 January 2006, *Tenix, Navantia team for Amphibious Ships Contract*, refer: http://www.tenix.com/News2.asp?ID=178

For the new major projects, many important project management and engineering matters, such as investment in infrastructure and people, management of the design process, build strategy, procurement policies, supply chain management and industry involvement, may not be resolved until after the sale of ASC has been concluded.

5.2 Cost, Schedule and Risk

Cost, schedule and risk are obvious areas of interest for JP2048 Phase 4A/B for a building program in Australia. Various costing models have been used for JP2048 Phase 4A/B, including CGT method of calculation[59,60], Navy Systems Command Costing Model "J-Cost", BMT's Cost Estimating Model[61], and local and overseas RFQ responses.

5.3 Infrastructure

Whilst future decisions cannot be anticipated, it is noted that a study of the existing shipbuilding infrastructure in Australia was commissioned by the ADAS Program Office in 2004 for JP2048 Phase 4A/B from the internationally recognized consultancy, Appledore International[62]. This independent report is a key document to support the shipbuilding Inquiry. Infrastructure costs for building Amphibious Ships are estimated as being anywhere between $80m to $200+m.

5.4 Skilled Personnel and Technological Capability

When Defence chooses an overseas ship design rather than developing an Australian one, it represents a lost opportunity for 'learning by doing' . This experience is critical to developing a design-based Australian shipbuilding capability. This lost opportunity affects every facet of professional engineering and members of the engineering team in Australia.

The cost of this includes lost opportunities to develop design and engineering skills, in areas such as:

- System definition to support Capability Options development.
- Determination of overall ship dimensions and internal arrangements to allocate space to operational functions for example: bridge, command and control, weapon systems and magazines, helicopters, weather decks, accommodation, medical and recreational facilities, propulsion and auxiliary machinery, electrical power generation and distribution, store rooms, fresh water, fuel and lube oil system arrangements.
- Human factors and safety engineering to determine the location of such aspects as fire zones, defence against biological or chemical attack, access and emergency escape routes, as well as onboard safety systems for firefighting, damage control, or magazine sprinkling.

[59] John Craggs, Damien Bloor, Brian Tanner and Hamish Bullen, *Naval CGT coefficients and shipyard learning*, Ministry of Defence (UK)", 2003.
[60] John Craggs, Damien Bloor, Brian Tanner and Hamish Bullen, 2003, *Methodology Used to Calculate Naval Compensated Gross Tonnage Factors*, SNAME Journal of Ship Production, Vol. 19, No.1, Feb.2003, pp.22-28.
[61] Commonwealth Contract ID1480133, *Independent Cost Estimator for Design and Construction of Amphib. Ships in Australia*, http://www.contracts.gov.au/OutputSearchContract.asp?ContractID=1480133, March 2005.
[62] BMT Defence Services Limited, July 2004, *Cost Model for the Australian LHD Program*, http://www.contracts.gov.au/OutputSearchContract.asp?Contract ID=1480133.

- Naval architecture to calculate ship weight, static buoyancy and stability, including the effects of damage to the ship, and dynamic characteristics of ship resistance, propulsion, seakeeping and manoeuvring.
- Structural engineering to determine the static and dynamic design loads applied by the maritime environment, and extreme operational loads such as imposed by an underwater explosion or a helicopter crash, material selection and the dimensioning of structural scantlings sufficient to provide adequate strength, and resistance to failure due to either buckling or fatigue. Also, to carry the ship's overall structural design through the detail design process and into the production environment using modern Computer Aided Design and Production Engineering software tools.
- Accommodation arrangements suitable for the ship's crew and any embarked personnel for aviation or other operational missions, including the design of hotel services for bathrooms, galleys, refrigerated storerooms, laundries, hospitals.
- Marine engineering to select major propulsion systems and auxiliary equipment, and integration, between the various systems and the ship, including foundations, piping and electrical systems.
- Marine electrical engineering, a specialist function, to identify the electrical loads of every item of equipment on board, and to design the power distribution system together with provisions for back up and redundancy in the event of a power failure. This also includes lighting, special power for combat system equipment and automatic control and monitoring, amongst many other things.
- System design and integration of weapon and electronic systems such as missile launchers, guns, surveillance radars, navigation radars, sonars, command and control, communications, computing, and electronic warfare systems. Integration must also avoid Electro-Magnetic Interference.
- The systems engineering task includes liaising with system and equipment suppliers to collate the information required, not only to design and construct the vessel, but also to gather the data needed to conduct the Logistic Support Analysis and prepare the Integrated Logistic Support package.

The opportunity is also lost to refine the engineering skills needed to execute the complex management task of detail design, to translate this design information into the form required to support the ship production environment, and the engineering management skills to manage the project on time, within budget, and to mitigate the risks.

5.5 Strategic Materials for Naval Shipuilding

There are also supply chain issues for major systems, equipment and materials, not the least of which is the current non-availability of some materials from Australian sources, including steel plates and rolled sections, certified by a Classification Society as suitable for use in ship construction.

6 ADDRESSING SPECIFIC TERMS OF REFERENCE

6.1 Australian Capacity To Construct Large Naval Vessels

Terms of Reference - item (a) - "The capacity of the Australian industrial base to construct large Naval vessels over the long term and on a sustainable basis."

Australia has demonstrated it has the capability to build large steel ships but the sustainability of this capability is in doubt.

The capacity of the Australian industrial base to construct large Naval vessels over the long term and on a sustainable basis is dependent upon a number of factors that are dynamic, including infrastructure, resources of skilled manpower, and technological capability.

The capacity of the Australian shipbuilding industry to deliver the ships required by the Defence Capability Plan is currently distributed amongst four Tier 1 Suppliers: ADI, ASC, Austal and Tenix; supported by a multitude of Tier 2 Suppliers; and Tier 3 System, equipment and material vendors. Included amongst the Tier 2 and Tier 3 Suppliers are a number of companies that are categorized as Small to Medium Enterprises (SMEs).

The capacity to build large steel ships exists if the work is sub-divided appropriately, and several builders work together to complete the project. Sustainability is more difficult, because there is no programmed continuing demand from Defence for large steel ships – only a spasmodic demand. However, it is unlikely that Australia could re-establish itself as an internationally competitive builder of large steel ships, either commercial or naval. This is not to imply that it cannot be done, only that it is unlikely due to the capital investment required in facilities and people, and cost pressures from Asia and elsewhere.

6.2 Comparative Economic Productivity for Ship Building

Terms of Reference - item (b) - "The comparative economic productivity of the Australian shipbuilding industrial base and associated activity with other shipbuilding nations;

To establish the comparative economic productivity of the Australian shipbuilding industrial base with other shipbuilding nations requires detailed analysis using an established methodology. With this in mind, in 1996 the Australian Maritime Industries Shipping Partnership[63] proposed the following recommendation:

"Recommendation 15: The Partnership recommends that the partners identify a suitable set of benchmarking measures so that a basis for comparison of international competitiveness and continual improvement can be established for the Australian shipbuilding industry."

[63] Australian Maritime Industries Priorities in Science and Technology, *Report of the ASTEC Shipping Partnership*, Commonwealth of Australia, September 2006.

This recommendation proposed further work to benchmark shipbuilding in Australia, and to extend work documented in a Report (NSRP 0434)[64] prepared in March 1995 by the US National Shipbuilding Research Program entitled: 'Requirements and Assessments for Global Shipbuilding Competitiveness'. This Report was prepared jointly by Richard Lee Storch, A&P Appledore International Ltd. and Thomas Lamb. It evaluated the potential international competitiveness of US shipyards. The approach was *'to perform a technology assessment of US and overseas competitor shipyards, and to benchmark competitiveness in terms of man-hours per compensated gross ton produced, cost per man-hour, and shipbuilding cycle times.'*

This benchmarking study was updated in May 2005 and published in another subsequent Report entitled: "Global Shipbuilding Industrial Base Benchmarking Study". The Report and all appendices can be viewed online[65]. This report was produced for the Under Secretary of Defence (Acquisition, Technology, & Logistics) by the Deputy Under Secretary of Defense (Industrial Policy) from March 2004 through to May 2005. The US government production group acknowledged the contributions of John Craggs and the team from First Marine International[66], whose benchmarking assessments and recommendations formed the basis for this study.

The reasons for mentioning the above two reports, is to direct the Inquiry towards an established methodology for benchmarking assessments of comparative economic productivity in the international shipbuilding industry. This methodology is understood to be proprietary: one in which two UK-based companies share expertise. Appledore International and First Marine International – these companies, now competitors, share a historical link to the international shipbuilding consultancy, A&P Appledore, originally based in Newcastle-Upon-Tyne.

Representatives of Appledore International recently visited Australia to assess shipbuilding infrastructure requirements for both SEA 4000 Air Warfare Destroyer Project[67], and JP2048 Phase 4A/B Amphibious Ships[68]. The survey of existing infrastructure and review of proposed build strategies for JP2048 Phase 4A/B was performed in 2005 as a sub-contractor to British Maritime Technology (BMT) Defence Services Limited, as part of an activity for Independent Cost Estimating advice to the Commonwealth via Contract ID 1480133.

The Global Shipbuilding Industrial Base Benchmarking Study (GSIBBS) Methodology is described on page 19 of the Report[69].

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[64] The National Shipbuilding Research Program NSRP 0434, *Requirements and Assessments for Global Shipbuilding Competitiveness*, U.S Department of the Navy Carderock Division, Naval Surface Warfare Center, in cooperation with Newport News Shipbuilding, March 1995.
[65] First Marine International: *Global Shipbuilding Industrial Base Benchmarking Study*, http://www.acq.osd.mil/ip/docs/fmi_industry_report.pdf.
[66] First Marine International, Findings for the Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major shipyards, August 2005.
[67] Senator The Hon Robert Hill Minister for Defence, *Media Conference for AWD Announcement*, Transcript, p.2, 31 May 2005.
[68] AusTender–Contracts Reported, *Independent Cost Estimator for Design and Construction of Amphib. Ships in Australia*, http://www.contracts.gov.au/OutputContract.asp?ContractID=1480133, 14 March 2005.
[69] (US) Department of Defense, Part II: *The Global Shipbuilding Industrial Base Benchmarking Study (GSIBBS) Methodology*, pp.19-26, May 2005.

The Report states:

> *The GSIBBS is based on a systematic, rigorous methodology that focuses on business and manufacturing practices and allows comparisons among other companies and across products. The GSIBBS uses the First Marine International (FMI) benchmarking system. The benchmarking system was established in 1975 and has been refined through more than 150 world-wide benchmarking surveys since. This benchmarking system is a widely recognized method of assessing shipyard manufacturing and business practices. The process also includes a normalized measure of shipyard productivity, accounting for disparate ship complexity and varying customer profiles, to further evaluate the effective implementation of manufacturing and business best practices. The FMI benchmarking system, as outlined in the chart below, is used to:*
> 1. *Evaluate individual shipyard manufacturing and business practices in fifty benchmarking elements using best practice criteria;*
> 2. *Estimate a shipyard's current productivity; and*
> 3. *Compare use of best shipbuilding practices and productivity to identify improvement opportunities.*
>
> *This FMI methodology allows for the comparison of military and commercial shipyards with products ranging from liquid natural gas carriers to nuclear powered fast attack submarines.*

A copy of the benchmarking methodology used by First Marine International is provided at Attachment J.

For the purpose of this submission, it is believed that the type of detailed benchmarking and analysis required of Australian shipyards with shipyards overseas has never been done. Certainly, no results have been published. In the absence of such analytical data, any assessment of comparative economic productivity of the Australian shipbuilding industrial base and associated activity with other shipbuilding nations is subjective in nature.

In a subjective comparison, Australian naval shipbuilders have claimed to be competitive with European naval shipyards for longer running projects, where the inefficiencies of establishing a new program are offset by economies of scale and learning curve effects over a series ship build program. In the case of aluminium fast ferries, Australia claims market leadership in terms of both technology and price. For large steel ship construction involving small numbers of vessels, perhaps only one or two ships, it would be difficult for Australia to be competitive with other established players in the international market. The productivity and cost-competitiveness of Australian shipyards for large steel ships could reasonably be expected to be less than that of established shipyards in Europe, Japan, South Korea, or low labour-cost countries including China.

In the absence of specific data about comparative economic productivity, reference is made to two reports by Tasman Economics, prepared for the Australian Industry Group Defence Council:

- *Impact of Major Defence Projects: A Case Study of the ANZAC Ship Project*[70], February 2000, refer Attachment M, and

[70] Tasman Asia Pacific, *Impact of Major Defence Projects: A Case Study of the ANZAC Ship Project*, Final Report, February 2000.

- *Impact of Major Defence Projects: A Case Study of the Minehunter Coastal Project*[71], January 2002, refer Attachment N.

6.3 Comparative Costs of Maintenance, Repair and Refitting

Terms of Reference - item (c) - "The comparative economic costs of maintaining, repairing and refitting large naval vessels throughout their useful lives when constructed in Australia vice overseas;

For the Defence sector, it is expected that the DMO will provide data and quantify the costs of maintenance, repair and modification for Navy's surface combatants, submarines, afloat support ships and patrol boats.

In the commercial sector, ship maintenance, repair and refitting is a highly competitive activity, where schedule is critical to minimise the ship owner's loss of earnings. Effective ship repair yards go to great lengths to plan and resource an activity to meet schedule deadlines, often working around the clock to deliver on time. Technical support for ship repair activities is provided from resources internal to the ship repair yard, and a variety of external resources including Classification Society Surveyors, Original Equipment Manufacturers, System Vendors and Sub-contractors.

Ship repair is a global industry and it makes little difference where a ship was originally built. Labour rates are a significant determinant in the cost of ship repair work, so those countries where labour rates are low have a natural competitive advantage. Nevertheless, ship owners have geographic operational centres and established voyage routes, and there are times where schedule pressures are such that the ships must be repaired in the nearest readily-available location. What this means is that the country of origin of the design, or where a ship was built, has little effect on arrangements entered into for maintenance and repair. Ship maintenance, repair and refitting can often be ad hoc and opportunistic to fit in with voyage schedules.

In the naval ship repair industry, the conduct of repair, maintenance and refitting activities is much more likely to be done in-country. This is partly due to national security issues, where weapons must be offloaded for work to proceed, and also due to personnel considerations for home-porting crews. Complex systems also require more extensive support arrangements for technical information, trained maintainers, and inventory of spare parts stock holdings. Naval ships operate in an environment where maintenance availabilities can be planned in advance, and loss of profits is not necessarily the primary motivation for the ship's owner (Navy) to demand delivery on schedule. However, operational pressures also drive naval ship maintenance and repair.

To facilitate maintenance, repair and refitting, Defence requires the development and delivery of a number of items that are collectively called an Integrated Logistic Support (ILS) Package that includes a Planned Maintenance Schedule. This is usually contracted as a deliverable from the acquisition phase. More recently, for in-country acquisition projects, it has become standard practice to negotiate a Through Life Support contract concurrent with the initial acquisition contract.

[71] Tasman Asia Pacific, *Impact of Major Defence Projects: A Case Study of the Minehunter Coastal Project*, Final Report, January 2002.

Depending upon the specific nature of the task, it is expected that routine maintenance, repair and refitting of large naval vessels can be performed in Australia, as cost effectively as it can be performed overseas, subject to the availability of pre-requisite intellectual property, parts and/or materials, and appropriately trained and experienced personnel.

For ships bought from overseas, there are some pre-requisites to facilitate the maintenance, repair and refitting. The first pre-requisite is access to sufficient intellectual property, in the form of ship specifications, drawings and system technical manuals, to define the configuration of the ship, its fitted systems and equipment, and the integration of repairable items and supply support for spare parts into the Standard Defence Supply System catalogue. The next pre-requisite is suitably skilled, trained and qualified personnel. Suitable supply chains with local agents are also needed to provide technical support and repair parts for major systems and equipment in a responsive manner.

When ships are built in country, these industrial capabilities are developed in parallel with the build program and are available for through-life support. Often the challenge is how to sustain these skills once the ship transitions from the construction phase into naval service.

In conclusion, the country of origin is not considered to be a major driver of the economic costs of maintaining, repairing and refitting large naval vessels throughout their useful lives. However, tangible and valuable benefits in through-life support are expected if ships are built in Australia, rather than purchased overseas.

6.4 Broader Economic Development from In-Country Build

Terms of Reference - item (d) - "The broader economic development and associated benefits accrued from undertaking the construction of large naval vessels."

Engineers Australia is aware of work performed by Tasman Economics as economic management and policy consultants to the Australian Industry Group Defence Council to look at the economic Impact of Major Defence Projects. Tasman published a Report in 2002 for the ANZAC Ship Project (refer copy of Executive Summary at Attachment M)[72]. Tasman also published a Report in 2002 for the Minehunter Coastal Project (refer copy of Executive Summary at Attachment N)[73]. Engineers Australia is also aware that Acil Tasman has recently provided a Report to the Department of Defence on the availability of critical skills to support the build of Amphibious Ships and Air Warfare Destroyers. However, specific details of this report are not available to Engineers Australia.

There is little more that Engineers Australia can add at this time, other than to note that there are extensive benefits that flow-on to the community if ships are built in Australia, rather than purchased from overseas. The benefits are more substantial if the ship design is 'Australianised' to meet ADF Operational requirements and 'Local Content', consistent with supportability and sustainability objectives.

[72] Tasman Asia Pacific Report, *Impact of Major Defence Projects: A Case Study of the ANZAC Ship Project*, Final Report, February 2000, refer copy of Executive Summary provided at Attachment D.
[73] Tasman Asia Pacific Report, *Impact of Major Defence Projects: A Case Study of the Minehunter Coastal Project*, Final Report, January 2002, refer copy of Executive Summary provided at Attachment E.

7 DISCUSSION

Engineers Australia supports the current naval shipbuilding program according to the Defence Capability Plan, comprising:

- SEA1654 Phase 2, the conversion of the Products Tanker Delos into an Auxiliary Oiler, HMAS Sirius;
- SEA1654 Phase 3, a new Auxiliary Oiler Replenishment (AOR - Success replacement);
- SEA4000, three Air Warfare Destroyers; and
- Project JP2048 Phase 4A/B, two Amphibious Ships and associated Watercraft (JP2048 Phase 3).
- Project JP2048 Phase 4C, Strategic Sea Lift Capability.

Engineers Australia also supports the Government's strong preference that these ships will be built in Australia.

In terms of Defence capability development, Engineers Australia considers that the current Defence Capability Plan should attempt to look further ahead than the 10 year period. Noting that HMAS ANZAC and HMAS Collins were delivered in 1996 and are now ten years old, it might be timely to program new surface combatant and submarine capabilities to follow-on from these vessels. Preliminary work on planning these new vessels can be expected from about 2012 if the vessels are to enter service by about 2024, given that the lead-time required to develop, construct and deliver the first of a new class of combatant ships in Australia is about twelve years.

The demand should also be extended to include para-military applications, such as for Customs, immigration duties, coastal patrol and fisheries protection needs.

Australia should be working closely with Regional neighbours to align our respective capability needs and to promote closer industrial and defence collaboration. This is consistent with the Closer Economic Relations (CER) with New Zealand, and the Free Trade Agreements (FTA) with Singapore and Thailand, and should also include other neighbouring countries in the Pacific and Indian Ocean regions.

The substantial commitment by Project SEA4000 to establish a Systems Engineering Centre in South Australia is a major initiative to ensure the future of a naval ship design and engineering capability in Australia. It is expected that this engineering capability will work closely with ASC's production operation at Osborne.

The role of Carnegie-Wylie in providing commercial advice to Government provides a clear message that the sale of ASC is on the agenda at the earliest convenient opportunity. Presumably, the Government will arrange the timing of this sale to occur after the risks associated with SEA4000 have been identified and mitigated, as far as possible. Nevertheless, the conduct of the sale could destabilise the AWD Program for some time. For example, the sale of the government-owned Williamstown Naval Dockyard in the 1980's caused an 18 month schedule delay to the Australian Frigate Project.

A range of potential bidders for ASC can be identified, including three of Australia's current Defence shipbuilders, ADI, Austal, and Tenix, and a strong group of overseas interests including Armaris (DCN-Thales), BAe, General Dynamics, Northrop Grumman, Raytheon, and Thyssen-Krupp Marine Systems. Careful consideration must be given to the selection criteria for the sale of ASC to balance domestic interests versus overseas commercial interests, and to safeguard sensitive intellectual property on behalf of the Commonwealth. It could also be argued perhaps that an early sale of ASC could effectively minimise the longer term impact on Project SEA4000.

Engineers Australia notes that, as a consequence of Carnegie-Wylie's commercial advice, and other factors, JP2048 Phase 4A/B has been delayed in the capability program, and the first Amphibious Ship will not be delivered until 2012 or later.

ASC has indicated that work to the value of about 70% of the Prime Contract for SEA 4000 will be outsourced to other major Suppliers in the NSR sector. The resource demands for SEA 4000 will need to be quantified, to assess the capacity and capability remaining within the industry to deliver the two Amphibious Ships, and to perform the maintenance, repair and adaptation work needed to sustain the Navy.

Whilst Engineers Australia supports the Government's strong preference for future naval ships to be built in Australia, the argument to build the Amphibious Ships in Australia, is not as clear cut as it is for the Air Warfare Destroyers. With little future demand currently programmed by Defence for large steel ships to be built in Australia, the establishment costs for new infrastructure and training must be amortised over the two ship LHD program. Defence should provide clear guidance on the level of any premium attributable to construction in Australia, versus construction overseas, and particularly for the costs of any new infrastructure and training of personnel. Funds committed by State Governments to the program for infrastructure development should be transparent.

Resource data for skilled personnel available from industry needs to be compiled to match the demand imposed by AWD and Amphibious Ships, as well as the base load of Navy maintenance, repair and adaptation. The relative timing of these projects and their scale, is an important consideration as to whether to proceed with an in-country build option for JP2048 Phase 4A/B. There may be little benefit to be gained from enlarging employment opportunities within the naval shipbuilding and repair sector, if there is no follow-on work. This would only create a future discontinuity for work force management.

Details of a recent study by BMT (DSL), as Independent Cost Estimator, and its subcontractor, Appledore International, regarding acquisition strategies, infrastructure requirements and risks for JP2048 Phase 4A/B, would be useful to inform the Committee, as the professional advice of an independent organisation with internationally recognised expertise in the shipbuilding industry.

Engineers Australia notes that Defence has encouraged teaming arrangements for JP2048 Phase 4A/B between Australian shipbuilders and overseas shipbuilders. Tenix and Navantia have announced their teaming arrangement, and ADI and ARMARIS have announced theirs. Austal has not yet confirmed any proposed teaming arrangements. It is not clear if ASC is prepared to bid. It has been claimed that ASC may be under some form of constraint that will preclude it from bidding for the Amphibious Ships Program.

It is not clear why this should be the case as there are possible efficiencies to be gained from maximizing the production output from one mechanized steel fabrication and assembly plant to serve the needs of several shipbuilders engaged in multiple projects and this means that ASC should be eligible to bid. The Committee needs to clarify if ASC can bid for the Amphibious Ships Program.

In the event that investment analysis for the Amphibious Ships favours an overseas build, it would be appropriate for Australia to seek a price for an Australianised version of the South Korean LPX Program ships. The price offered from a company working within the world's largest shipbuilding nation would provide a point of reference in assessing other offers. This strategy[74], involving purchase from a South Korean builder and local adaptation in Australia, appears to have worked effectively for Project SEA 1654, the new Auxiliary Oiler.

Lessons learnt from the ANZAC Ship Project were that there are many management, operational, engineering, logistic and sustainment issues that must be addressed in transitioning a naval ship design from overseas for production in Australia. Procurement aimed at optimising local content is often accompanied by significant schedule and integration implications for ship, system and equipment re-design and construction re-work.

In future programs, it would be prudent to plan a gap between the lead-ship and subsequent follow-ships to facilitate feedback of changes identified from testing the lead ship into the remaining build program.

There is a real need for Navy and Defence to work out a practical program of research and development, not only to support Australia's Defence capability, but also to foster export opportunities for Australian industry. Such a program might include a portfolio of different ship designs, including high speed craft, suited to operations within our region.

8 CONCLUSION

This submission has discussed a range of issues associated with naval shipbuilding in Australia. The approach suggested has been to categorise these issues as being short term (1 to 2 years), medium term (2 to 5 years), or longer term (5 to 20 years).

Short term: the emphasis will be on the development of Project SEA 4000 and risk reduction to establish the project scope, including source selection of the ship designer and design, and supporting the organizational and contractual relationships. Scoping the demand on Australian, New Zealand and possibly other shipbuilding yards for module fabrication is critical to establish the remaining capacity available to other major projects including JP2048 Phase 4A/B, and maintenance and repair activities to sustain Navy. Engineers Australia supports these activities as being in the interests of developing and sustaining a naval ship design and systems engineering capability and capacity in Australia.

[74] P. Lucey, 2002, *Commercial Off the Shelf Ships for Naval Applications*, Pacific 2002, International Maritime Conference.

Medium term: the emphasis will shift to JP2048 Phase 4A/B to determine if these two ships will be built in Australia, or purchased from an overseas builder. The estimated cost premium for construction in Australia, including the cost of pre-requisite facilities and infrastructure, are expected to be the deciding factor in determining value for money, noting that the Government has expressed a strong preference that the ships be built in Australia. The availability of skilled personnel is an issue, particularly in competition with the demands of other large infrastructure projects in Australia. Whilst Engineers Australia provides in-principle support for building these ships in Australia, no firm conclusions can be drawn about cost/benefit in the absence of reliable data about the cost premium, including new infrastructure and facilities, resource availability and schedule.

If Australia substantially expands the resources employed in naval shipbuilding to work concurrently on Project SEA 4000 and JP2048 Phase 4A/B, there will be questions about the future sustainability of this work force, given the limited scope of the forward program currently defined in the Defence Capability Plan 2004-2014.

Longer term: based solely on the projects currently included in the Defence Capability Plan 2004-2014, there is the prospect of a significant down turn in the industry from about 2015 to 2020. This need not be the case. Defence demand could include a new generation of Submarines and Surface Combatants, plus para-military vessels.

Engineers Australia would encourage Defence to revisit the naval shipbuilding component of the Defence Capability Plan, in consultation with our regional neighbours, and to identify naval shipbuilding projects that will smooth demand on the industry from 2010 to 2025. For new projects, Engineers Australia encourages Defence to give Australian builders an opportunity to create and own the intellectual property needed to initiate and develop these projects, rather than be dependent on licensing intellectual property from overseas ship designers and/or builders. Such an initiative would promote Australia's naval engineering capability and self-reliance in Defence.

Engineers Australia considers that Australia would benefit from a long term strategic plan and policy[75] for the development of the naval shipbuilding and repair sector to address issues including: the sector's capacity, the development of skills and competencies, the relevance of competition and benchmarking as a tool to achieve 'value for money'.

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[75] P. Cairns, VADM RCN (Ret'd), President, Shipbuilding Association of Canada, *Why Canada Needs a Shipbuilding Policy Too!*, Presentation to MARINE LOG, Shipbuilding Decisions '99, Dec. 7 & 8, 1999, http://www.navyleague.ca/eng/ma/papers/Shipbuilding%20Policy%20Article%20by%20P%20Cairns.pdf

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