

## Chapter 9

### **The comparative economic productivity of the Australian shipbuilding industrial base and associated activity with other shipbuilding nations**

9.1 While Australia may have the shipbuilders, the supply chain, the infrastructure and the skills base capable of sustaining a naval shipbuilding industry, it is quite another matter whether this industry can match or better the productivity of overseas competitors. This chapter considers the data available that would enable a comparative analysis of Australian shipbuilders and their overseas counterparts. It then endeavours to compare the economic productivity of the Australian shipbuilding industrial base and associated activity with other shipbuilding nations.

#### **Difficulties in comparing the productivity of shipyards in Australia and overseas**

9.2 The difficulty in undertaking a comparative analysis of the productivity of shipyards is underscored by the findings of a recent work, *First Marine International findings for the global shipbuilding industrial base benchmarking study, Part 1: Major shipyards*. The study was to provide a direct international comparison and a comparison of the performance of U.S. naval and commercial builders. It compared the practices and technology employed in six major U.S. shipyards with those of seven selected leading international commercial and naval shipbuilders in Europe and Asia.

9.3 A key component of the study was to establish the productivity of U.S. shipbuilders in order to make comparisons with the international yards and to determine how effectively the U.S. yards use the technology applied.<sup>1</sup> The analysis was hampered, however, by a lack of information. The study acknowledged this weakness:

As the majority of the U.S. shipyards benchmarked were unable to supply the information required to calculate shipyard performance, productivity has been estimated from information available in the public domain...the resulting estimates are considered to be indicative only and would need to be validated by calculations supported by the shipyards before any robust conclusions could be drawn. Even so, the estimate of overall industry productivity is in-line with the expectations resulting from the technology survey carried out in the shipyards.<sup>2</sup>

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1 First Marine International, *Findings for the Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major shipyards*, August 2005, p. 3.

2 First Marine International, *Findings for the Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major shipyards*, August 2005, p. 14.

9.4 In order to provide a direct international comparison, the study used man-hours per Compensated Gross Tonnage (CGT)<sup>3</sup> and \$US per CGT as overall measures for productivity and cost performance respectively.<sup>4</sup> Again the study warned:

This method has produced very rough estimates, based on very limited information, and extreme caution is advised regarding its use. Shipyard cooperation is required to produce a more definitive estimate.<sup>5</sup>

9.5 The study produced very helpful advice to the U.S. shipyards on how they could raise their productivity. This advice also has direct application to all shipbuilders including those in Australia. It provides a best practice guide for governments who are major purchasers of naval vessels on how to manage better their practices in order to assist their shipyards become more efficient and cost effective. The study, however, did not help the committee in its task of comparing economic productivity. It should be noted that Defence considered the study to be 'the only public comparator of productivity factors across US/Europe/Australia'.<sup>6</sup>

### *Quality of available data*

9.6 According to witnesses and the committee's research, there is a lack of clear and solid comparative economic and productivity data on the naval shipbuilding industry.<sup>7</sup> Engineers Australia believed that the type of detailed benchmarking and analysis required to compare Australian shipyards with shipyards overseas has never been done. Certain that no results have been published, it concluded:

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3 Compensated Gross Tonnage is the measure of work content that forms the basis of the productivity estimate. It is the international gross tonnage (a measure of internal volume) of the vessel multiplied by a compensation coefficient which represents the complexity of the vessel design. It allows the productivity of different shipyards to be compared even though they may be ...the man-hours required by a particular shipyard to execute the work content are determined by multiplying the CGT for the vessel by the productivity of the yard in terms of man-hours per CGT. First Marine International, *Findings for the Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major shipyards*, August 2005, p. 13

4 First Marine International, *Findings for the Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major shipyards*, August 2005, p. 33.

5 First Marine International, *Findings for the Global Shipbuilding Industrial Base Benchmarking Study, Part 1: Major shipyards*, August 2005, p. 33.

6 Question 1, answer to question on notice, 18 August 2006 (received 31 October 2006).

7 See for example, Rear Admiral Kevin Scarce, Port Adelaide Maritime Corporation, *Committee Hansard*, 19 April 2006, p. 21; ASC Pty Ltd, *Submission 17*, p. 14. ASC's submission stated: 'it is very difficult to make direct comparisons between the cost efficiency of Australia's naval shipbuilding industry and those in foreign countries. in nearly every case Australia has built significantly different ships to those built elsewhere and, coupled with the fact that comparative pricing data rarely exists, assumptions about life-cycle costing and the relative costs of through-life support differ'.

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.<sup>8</sup>

9.7 The South Australian government also found that there was 'little definitive information available to assess the economic productivity of constructing naval vessels in Australia compared with overseas'.<sup>9</sup> The Department of Industry, Tourism and Resources (DITR) agreed with the view. It said:

The sort of information that is available can be the market outcomes of who is actually producing these things which have been sold in world markets. That tends not to apply to naval shipbuilding, so you cannot find analysis from market outcomes. In terms of industry level statistics, we provided some statistics for various countries on the relative productivity of Australia versus other countries. We also point out the difficulty as to those numbers. They are imperfect numbers in various ways. The output measures are problematic and the input measures are problematic.

In terms of specific firm or company level data, we have not been able to find publicly available data that enables us to compare Australia with other countries. People have made reference to the First Marine International study which was done for the US Department of Defense, and I understand they visited some of the Australian companies. But that material on Australian companies has not yet been published.

It is really the nature of the beast of government procurement, defence procurement and commercial in confidence that that sort of data at a company level is not going to be available.<sup>10</sup>

9.8 Aside from this lack of data, the degree of regulation and government control or intervention in the naval shipbuilding industry is another factor when considering the productivity of shipyards.

### ***A protected industry and distorted data***

9.9 A number of submitters cited the protected nature of the naval shipbuilding industry as a major complication when comparing productivity between different countries.<sup>11</sup> Indeed, as noted in chapter 2, a number of shipyards are government owned or controlled enterprises. Furthermore, the range of direct or indirect

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8 *Submission 24*, p. 22.

9 *Submission 9*, p. 5.

10 *Committee Hansard*, 3 July 2006, p. 80–81.

11 For example, the Western Australian government, the AMWU and Tenix refer to distortions in the naval shipbuilding market created by government interventions which make robust international comparisons of the costs of naval shipbuilding in different countries difficult. They believed that it was unsafe to make direct comparisons between the costs of building in Australia with overseas countries who receive government benefits in the form of subsidies and protective legislation to support/protect the local industry.

government assistance given by overseas governments to their local shipbuilders takes on many and various forms—money grants, soft loans, debt guarantees, tax shelters, tariffs and provision of equity capital (see also paragraphs 2.15–2.18).

9.10 The Government of Western Australia was one of many participants in the inquiry who urged the committee to bear in mind the distortions in the naval shipbuilding market that stem from government interventions, particularly since the end of the Cold War. In its view, this interference makes 'any attempt to estimate such premiums and make robust international comparisons of the costs of naval shipbuilding in different countries notoriously difficult'.<sup>12</sup>

9.11 The Australian Manufacturing Workers Union (AMWU) also argued that the differing levels of protection by other shipbuilding nations creates difficulties in comparing productivity.<sup>13</sup> Tenix voiced its concerns about making direct comparisons between the costs of building in Australia and some overseas countries who receive government benefits in the form of subsidies and protective legislation to support the local industry.<sup>14</sup> To the same effect, the Australian Shipbuilders Association noted that 'Some countries still maintain industry protection in the form of hidden tariffs and subsidies that provide a false perspective on their efficiency'.<sup>15</sup>

9.12 Rear Admiral Doolan and the RSL similarly spoke of the difficulties in establishing the cost effectiveness of overseas naval shipbuilders because of government assistance to that sector which provides 'a false perspective on their efficiency'.<sup>16</sup> The RSL argued that 'With so many variables and questionable data it would be imprudent to make any firm judgment about this issue'.<sup>17</sup>

9.13 The committee sought advice from Defence about the difficulties conducting comparative analysis on the productivity and cost effectiveness of Australian shipyards against overseas yards. Defence's assessment confirmed the view that there are significant difficulties in comparing this type of economic performance. It also cited the use of subsidies by previous and current governments in Australia and overseas which hampers the production of 'meaningful comparative data'. It explained further that the difficulty is exacerbated by the range of national funding arrangements for military ships in areas covering:

- design development and R&D costs of ships and equipment relevant to a particular acquisition;

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12 *Submission 23*, p. vi.

13 *Submission 21*, p. 7.

14 *Submission 26*, p. 3.

15 *Submission 36*, p. 7.

16 *Committee Hansard*, 3 July 2006, pp. 67–68.

17 *Submission 6*, p. 4.

- other cost attributions (or cost recovery) available from other related defence programs (eg staff allocations/skilling, etc); and
- broader infrastructure investment and other operating costs that may be hidden or charged differently to a specific ship program to suit commercial interests.<sup>18</sup>

9.14 The lack of reliable data coupled with the difficulties in ascertaining the extent to which the shipbuilding industry benefits from direct and indirect government assistance prevents the committee from making any definitive finding about productivity in Australian or overseas shipyards. There is evidence, however, that provides some indication of the economic productivity of the Australian industrial base.

### **Data on Australian productivity**

#### ***Australian shipyards, the construction of commercial steel ships and niche capabilities***

9.15 Despite the lack of sound data, most studies and commentators generally accept that countries such as South Korea, China and Japan dominate, and are highly competitive in, the construction of commercial ships, notably large tankers and carriers. Chapter 2 provided detail on the shipbuilding industry in these countries (see paragraphs 2.48–2.54). Australia is simply not in their league. Indeed, DITR informed the committee that, 'In large commercial steel ships the evidence is equally clear that Australia is not as productive as other countries. We have not produced large commercial steel ships for around thirty years'.<sup>19</sup> Austal asserted that:

Australian industry is not able to compete with the well-established, highly productive steel shipyards in Asia whose main threat comes from the rapidly expanding Chinese industry which has access to a large, low cost workforce and inexpensive land for the development of the necessary infrastructure.<sup>20</sup>

9.16 On performance, however, some Australian companies, notably Austal and Incat, have clearly demonstrated that they have a competitive edge in niche markets of the commercial and naval shipbuilding industry.<sup>21</sup> The Australian Shipbuilders Association also referred to the demonstrated world class competitiveness of Australian shipbuilders as the leading manufacturer and exporter of large fast ferries

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18 Question 1, answer to question on notice, 18 August 2006 (received 31 October 2006).

19 Mr Lawson, DITR, *Committee Hansard*, 3 July 2006, p. 71.

20 *Submission 7*, p. [4].

21 DITR noted that Austal and Incat 'have designed and exported naval ships based on indigenous commercial designs. They have been able to capture economies of scale based on having unique capabilities and intellectual property in the aluminium fast ferry businesses, which they have been able to carry over into naval vessels'. DITR, *Submission 38*, p. 2.

as an indicator of the potential in Australia. It suggested that 'export success by the sector generally would re-enforce the comparative economic productivity of the Australian shipbuilding industry'.<sup>22</sup>

9.17 The committee's delegation witnessed the success of Austal's overseas enterprise when it visited the company's facility in Alabama which was opened in 2001. Since then Austal USA has built and delivered eight ships in the yard, including a 192 foot high-speed vehicle-passenger ferry, two 150 foot fast crew/supply monohulls, an 86 foot high-speed passenger catamaran, a 111 foot dinner cruise catamaran, a 135 foot dinner cruise monohull, a 143 foot high-speed passenger/excursion catamaran and a 102 foot surface-effect ship. Austal is currently constructing the largest aluminium catamaran in the U.S., a 107 metre high-speed cargo/passenger ferry for Hawaii Superferry. In terms of naval vessels, as the designer and builder of the Littoral Combat Ship (LCS) platform, Austal is part of the General Dynamics team offering a unique trimaran solution for the US Navy.

9.18 Delegation members discussed with Austal representatives the Littoral Combat Ship (LCS) program. The LCS is intended to operate in coastal areas globally, be highly manoeuvrable and configurable to support mine-warfare, anti-submarine and surface ship warfare. Austal's LCS is based on its trimaran underwater hull design, which offers superior seakeeping and speed, along with the capacity to configure a range of weapons packages. It is a 127 metre long craft, with maximum hull draft of 4.5 metres and speed over 40 knots. The mission bay comprises 1000 m<sup>3</sup> and the ship has aviation capacity for one H-53 or two H-60 helicopters. Mission specific system modules, such as submarine seeking or minehunting modules, can be added to the generic vessel (the 'sea frame') to tailor the ship's specific capabilities. Open architecture systems are therefore critical.

9.19 The LCS is being built using the principle of 'cost as an independent variable'. Austal offers capability options within its capped price of \$220 million. Where further specification changes are required the resulting cost and capability outcomes are assessed.

9.20 The committee also visited the Incat shipyard in Hobart where it inspected one of the high-speed craft on lease to the U.S. Army (see chapter 4). In April 2006, Mr Craig Clifford, Managing Director of Incat Australia, informed the committee that currently the company had leased three vessels to the U.S. military—*Joint Venture*, a 96-metre vessel chartered on a long term basis (nearly 5-years), *Spearhead* and *Swift* both 98-metre catamarans. He explained the nature of the company's relationship with the U.S. military which has been developing since 2000 'when HMAS *Jervis Bay* in the north of Australia opened the eyes of the military world as to what an aluminium, catamaran, high-speed craft could achieve'. He stated:

A dialogue was opened up with various arms of US military which led to the charter of our hull No. 50, which up until that point in time had been in

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22 *Submission 36*, p. 7.

a commercial operation between the North and South Island of New Zealand. A combination of Navy, Army and other arms within US military chartered the vessel. It was appropriately called Joint Venture because it was a joint venture between a numbers of arms. They have chartered that vessel on what has turned out to be a long-term basis to operate in various field sectors that they are interested in.<sup>23</sup>

9.21 Mr Clifford noted the political obstacles in the U.S. that prevent the U.S. purchasers from buying a foreign asset of the size and cost of the types of vessels on lease to the U.S. Defence. He maintained that the leasing arrangement was operating successfully and that the company had explored the option of building vessels in America. Looking to the future, he advised the committee that the company's next stage is a 112 metre vessel made entirely of aluminium:

Today we are building 98-metre vessels for the commercial market and 112-metre vessels for the commercial market and are pursuing additional military opportunities as they present themselves.<sup>24</sup>

He suggested that the vessels are popular with the commercial world because of their speed, their carrying capacity and their competitive costs.<sup>25</sup>

### ***Australia's record in the construction of naval ships***

9.22 Returning to steel-hulled naval vessels, however, the absence of reliable data on these ships makes any assessment of Australia's competitiveness in naval ship construction difficult. To gain some appreciation of the productivity of Australian shipbuilders, many witnesses, as a starting point, drew on the industry's proven capability over recent decades to construct modern naval vessels on a sustainable basis.<sup>26</sup> For example, the RSL noted the way in which the naval shipbuilding sector has adapted to changing circumstances with teaming arrangements and by other collaborative means to meet varying government needs. It stated:

With this track record there is no reason to believe it cannot continue to adapt. Given the high probability of the ongoing need to continue to replace all major Australian warships over the next half century, there is a clear opportunity to continue to grow a national industrial capacity to meet the need. A consistent government policy of building all Australian warships in Australian shipyards would strengthen the industrial basis of the industry and give it the best chance of evolving efficiently and effectively.<sup>27</sup>

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23 *Committee Hansard*, 28 April 2006, p. 3.

24 *Committee Hansard*, 28 April 2006, p. 2.

25 *Committee Hansard*, 28 April 2006, p. 2.

26 *Submission 9*, p. 26. See also Australian Academy of Technological Sciences and Engineering, which stated it belief that a viable naval shipbuilding industry is possible in Australia based on past performance and potential future Defence demand. *Submission 18*, p. 1. See also *Committee Hansard*, 19 April 2006, p. 21.

27 *Submission 6*, p. 3.

9.23 Taking the same approach, Rear Admiral (Ret'd) W. J. Rourke submitted that the productivity of local shipbuilders is practicable and appropriate. He argued that local construction can usually compete well with U.S. construction costs and those of Europe.<sup>28</sup> Thiess provided an example of where it believes Australian shipbuilders are competitive:

If we compare raw productivity figures in terms of welding for offshore purposes, Australia competes very successfully against US standards achieved on the Gulf of Mexico coast, where most of the efficiency standards in that industry are set.

Therefore in global terms, the Australian shipbuilding industry is capable of competing successfully against world standards.<sup>29</sup>

9.24 Tenix commissioned a benchmarking study of its performance as a shipbuilder against companies through Asia, Europe and the U.S. According to Tenix, the study indicated that Tenix is 'above the midpoint of where many of the best yards in the worlds are in'. Although the study showed the company's strength in planning systems and organising work, it had specific suggestions to improve its modular assembly.<sup>30</sup>

9.25 Raytheon Australia noted that it had conducted a benchmarking test against its parent company in the U.S. The study showed that Raytheon Australia 'could conduct many of the functions associated with systems engineering and systems integration at less than two-thirds of the cost of doing them in the U.S.'<sup>31</sup>

9.26 Many submitters cited the construction of the ANZAC frigates and the Minesweepers as evidence of Australia's capability to build naval vessels on time and on budget and with economic benefits to the nation (see chapter 4).<sup>32</sup> The AMWU observed that:

The ANZAC frigate project, based at Williamstown, Victoria, was extremely efficient. The project for 10 frigates, costing \$5.6 billion (in 1999 dollars) over 10 years, was, until the new Air Warfare Destroyer project, the largest single defence contract ever entered into by Defence. All of the frigates have been delivered on time and on budget.

In 1994, Defence awarded ADI Limited a contract to build 6 Italian-designed minehunter vessels at a contract value of \$917 million. ADI delivered the first minehunter, HMAS Huon, on time and on budget in March 1999.<sup>33</sup>

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28 *Submission 1*, p. 4.

29 *Submission 22*, p. 12.

30 *Committee Hansard*, 27 April 2006, p. 7.

31 *Committee Hansard*, 3 July 2006, p. 3.

32 AMWU, *Submission 21*, p. 3.

33 *Submission 21*, p. 3.

9.27 Two significant studies inform most commentary on the productivity of Australia's naval shipbuilding industry—*A case study of the ANZAC Ship Project*, and *Impact of Major Defence Projects: A case study of the Minehunter coastal project*.<sup>34</sup> Although they were not comparative studies, they did demonstrate clear savings.

9.28 The Australian Industry Group (AiG) represented the views of many witnesses in submitting that Australia's naval construction industry has proven its capacity to deliver major defence capabilities within the time schedule and budget. It also cited ADI and Tenix's involvement in the recent 'highly successful' naval construction projects—the Minehunters and ANZAC frigates.<sup>35</sup> It stated:

The ANZAC frigate project, based at Williamstown, Victoria, provides a first-class template of success. The project for 10 frigates, costing \$5.6 billion (in 1999 dollars) over 10 years, was, until the new Air Warfare Destroyer project, the largest single defence contract ever entered into by Defence. All of the frigates have been delivered on time and on budget.<sup>36</sup>

9.29 The Australian Shipbuilders Association contended that the costs of building most categories of naval vessel in Australia can be comparable with, if not better than, those achieved in foreign countries. It also cited data gathered from the ANZAC and Minehunter studies to strengthen its argument, asserting the 'after the initial learning curve, production in each program was efficient and globally competitive'.<sup>37</sup>

9.30 The Submarine Institute of Australia Inc was of the view that 'The Collins Class submarine program demonstrated that the Australian naval shipbuilding industry competitiveness is on a par with overseas countries (for example, Europe and the U.S.). According to the Institute the submarine program demonstrated that the key to controlling and minimising costs is the use of advanced manufacturing techniques and processes (such as modular construction), maximising competition throughout the materiel/equipment supply chain and an ongoing workload'.<sup>38</sup> Overall it argued that:

The Collins and ANZAC programmes demonstrated that Australian Industry is competitive with international shipbuilders for cost and quality...The Collins Class program demonstrated that the cost of Australian construction equated closely to the cost of overseas construction.<sup>39</sup>

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34 Denise Ironfield, Tasman Asia Pacific, *Impact of Major Defence Projects: A case study of the ANZAC Ship Project*, Final Report, Prepared for Australian Industry Group Defence Council, February 2000 and Tasman Economics, *Impact of Major Defence Projects: A case study of the Minehunter coastal project*, Final Report, January 2002.

35 *Submission 8*, p. [2].

36 *Submission 8*, p. [2].

37 *Submission 36*, p. 7.

38 *Submission 3*, p. 14.

39 *Submission 3*, p. 13.

9.31 Defence, however, was reserved in its assessment of the productivity of Australia's shipbuilding industry. It observed that apart from Tenix's obtaining orders for small and or less complex warships and Austal's success with the Littoral Combat Ships for the USN, Australian industry has been unable to secure orders for major warships construction from overseas. It added:

Industry might be best placed to comment on why they have not been able to secure orders but Defence would observe that the market is very competitive and the Australian industry is unlikely to have a cost advantage in steel monohull ships or product advantage such as a unique design except in the high speed multi-hull sector.<sup>40</sup>

### **Factors influencing productivity in Australia's shipbuilding and repair industry**

9.32 Defence's assessment points to a significant hurdle for Australian shipbuilders in endeavouring to be internationally competitive; namely, economies of scale.

#### *Costs and economies of scale*

9.33 Some submitters drew attention to the diminishing costs associated with the number of vessels built.<sup>41</sup> According to Defence, when shipbuilders build the first of class, they 'always find that it is a significantly more expensive vessel than the second, third and fourth'. Mr Gregory Copley of Future Directions International Pty Ltd, advised the committee that economies of scale in terms of the shipbuilding process for warships are achieved after the second vessel—three or more vessels onwards.<sup>42</sup>

9.34 Supporting this view, ASC stated that one of the most serious problems preventing Australian shipbuilders from meeting high building efficiency on a routine basis are those relating to the management of vessel demand. It cited in particular 'the small scale of the demand for particular classes of ship, and hence production is frequently confined to the steep end of the learning curve'.<sup>43</sup> It found:

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40 Department of Defence, answer to question on notice, 28 March 2006 (received 19 May 2006), p. 34.

41 See for example, David John Truelove, *Submission 12*, p. [5]; ASC Pty Ltd, *Submission 17*, p. 15.

42 *Committee Hansard*, 3 April 2006, p. 5. Professor Keith Hartley maintained that 'small-scale production means a sacrifice of learning economies. A labour learning curve shows how the man hours to build each ship decrease as more ships of that type are built. For a group of 25 UK and US naval ships programmes, the average learning curve was 87%. This suggests that if an output of a class is increased from 6 to 12 ships, man hours per ship will fall by some 13%'. Keith Hartley, 'Naval Shipbuilding in the UK and Europe: A Case for Industrial Consolidation'. See also John Craggs, Damien Bloor et al, *Naval CGT coefficients and shipyard learning*, Ministry of Defence (UK), 2003.

43 *Submission 17*, p. 15.

Plotting, in a general conceptual sense, the learning curves of the Australian destroyer/frigate, submarine, minehunter, and other naval ship programs of recent decades, highlights the fact that Australian shipbuilding programs have rarely been of a size to permit the full benefits of economies of scale to be reaped...it was only in the case of the ANZAC frigates and, to a lesser extent, the Collins Class submarines and the Huon minehunters, that production was of a sufficient scale to permit the flatter parts of the learning curve to be reached. Even when relatively high efficiencies were achieved, this was generally from ship 4 or 5 onwards and so the real cost per vessel across the entire program was still relatively high.<sup>44</sup>

9.35 The Victorian government agreed with the general principle of economies of scale and learning curve. It noted that while not always the case, construction of major vessels in Australia is:

...generally more expensive than construction overseas, because international shipyards benefit from greater economies of scale in activity as well as productivity improvements generated by experiential learning on larger production runs of a particular ship type.<sup>45</sup>

9.36 DITR argued that 'a driving factor determining whether Australia can produce on a long term and sustainable basis is whether Australia can achieve the required economies of scale to be competitive'.<sup>46</sup> Indeed, Defence attributed the success of the ANZAC, in some measure, to the relatively large number of ships (10) that 'generated substantial learning/improvement'.<sup>47</sup>

The data from Anzac...is that when the tenderer put in their submission on Anzac, their statement was that they would be equivalent to any foreign or European builder. What happened was that it took until the sixth vessel for the Australian industry to be equivalent to the Europeans, and with vessels seven, eight, nine and 10 we actually bettered the Europeans in some of our productivity factors. What it really came down to is that it took a learning curve to get there.<sup>48</sup>

9.37 Defence informed the committee, however, that:

With a small Navy it is unlikely Australia will have a need for a build of more than 2–4 ships in each class until the capability provided by the

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44 *Submission 17*, p. 15.

45 *Submission 31*, p. 5. The South Australian government contended that the available data suggests that Australian productivity would be on par with Europe and North America but would be unlikely to match the economy of scale that can be achieved by Japan, Korea or China. It argued that Australia would need to consolidate shipbuilding skills and infrastructure if it were to derive economy of scale of benefits. *Submission 9*, p. 5.

46 DITR, *Submission 38*, p. 1.

47 Department of Defence, answer to question on notice, 28 March 2006 (received 29 May 2006), question no. 20.

48 *Committee Hansard*, 18 August 2006, p. 39.

submarines and ANZAC ships has to be replaced. The numbers and types of ships required for Navy will be decided by this capability analysis. Defence will take into account of the economies of scale benefits when modelling capability acquisition options.<sup>49</sup>

9.38 It should be noted that even with the ships constructed in Australia that benefited from a larger production run, such as the ANZACs, there was a local build premium.

9.39 A 2005 report by the Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, pointed to the often cited cost premium of 3 to 3.5 percent for the ANZAC Project. It accepted that this was a relatively low cost but equates to over \$200 million on a \$7 billion acquisition.<sup>50</sup> It also referred to the cost premium for the Collins class but stated that it was impossible to estimate because of the uniqueness of the submarine. The report stressed, however, that:

...the cost premium for each of these classes was low for particular reasons that may not apply to the acquisitions currently in the pipeline. This is because a significant number of both the Collins and Anzac classes were produced in Australia even by world standards.

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In the case of the Collins and ANZAC classes, therefore, there was a beneficent coincidence of minimum local production costs, because of the availability of scale and learning economies, and maximum benefits in terms of self-reliance, because of the use of domestically engineered and integrated systems. The pay-off to Defence from the investment in local capability was almost certainly positive.<sup>51</sup>

9.40 The report noted that the AWDs and LHDs are to be built in production runs of three and two respectively and suggested the outlook for the future acquisitions was 'less rosy'. It suggested that the cost premium of a local build of the AWDs could be high because of the inability to benefit significantly from scale or experience economies.<sup>52</sup> The report was also of the view that the relative costs of local procurement for the two LHDs was likely to be higher because of the smaller number

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49 Department of Defence, answer to question on notice, 28 March 2006 (received 29 May 2006), question on notice, p. 15.

50 The Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, May 2005, p. 45.

51 The Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, May 2005, p. 45. The Submarine Institute of Australia Inc stated that: 'the case of the Anzac ship program prices for overseas construction were not sought from potential shipbuilders. However, based on submarine cost data, it is estimated that the premium for construction of all Anzac ships in Australia was probably slightly less than for the submarines because of their lower complexity and lesser sensor/weapon fit'. *Submission 3*, p. 13.

52 The Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, May 2005, p. 46.

of ships being purchased.<sup>53</sup> It noted that the scale and learning benefits may be 'commensurately reduced'.<sup>54</sup>

9.41 Defence concurred with this view on both the AWD and LHD projects. It observed that the limited build run on naval ships in Australia limited the scope for productivity gains and cited the LHDs. Mr Kim Gillis, Deputy CEO of the DMO advised that on a two-ship class it would be 'very hard for us to get to that learning curve where we can compete with a European builder who is building modules in a process, in a production line'.<sup>55</sup> In his opinion it would take four or five LHDs to reach the stage approaching the productivity of the Europeans.<sup>56</sup>

9.42 Without doubt, the lower demand for naval vessels in Australia and the concomitant smaller economies of scale limit opportunities for Australian naval shipbuilders to gain efficiencies in their production runs.

9.43 Mr Gillis also noted that the difference in productivity between Australian shipbuilders and their European counterparts is due not only to a combination of infrastructure and learning curve but also the association between designer and builder. He said that there is an advantage 'if you are the designer of a product and you are building your own design as distinct from being a designer who is handing it over to a different builder'. He noted:

Whenever we took a design that was not worked on and developed in house, there was a significant loss in our productivity factors. The difference between being the designer and being the builder is significant.<sup>57</sup>

9.44 When purchasing vessels designed overseas, however, Defence must take account of the specific needs of its naval fleet. So, an important consideration in assessing productivity is the work and costs involved in customising a ship for Australian conditions. The following section considers Australia's unique operational requirements and the costs involved in customising a ship for Australian conditions. A closely related matter—Australia's national security interests—is discussed fully in chapter 12.

### ***Costs in meeting Australia's unique requirements***

9.45 Australia confronts a range of challenges protecting its shores and surrounding maritime approaches from external threats. The 2000 Defence White Paper stated:

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53 The Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, May 2005, pp. iii and 46.

54 The Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, May 2005, p. iii.

55 *Committee Hansard*, 18 August 2006, p. 40.

56 *Committee Hansard*, 18 August 2006, p. 40.

57 *Committee Hansard*, 18 August 2006, p. 40.

The Government's primary goal for our maritime forces is to maintain an assured capability to detect and attack any major surface ships, and to impose substantial constraints on hostile submarine operations, in our extended maritime approaches. We also intend to maintain the ability to support Australian forces deployed offshore, to contribute to maritime security in our wider region, to protect Australian ports from sea mines, and to support civil law enforcement and coastal-surveillance operations.<sup>58</sup>

9.46 It stated further:

Australia's forces for maritime operations give us the ability to deny an opponent the use of our maritime approaches, and allow us the freedom to operate at sea ourselves...Capable maritime forces also provide important options for contributing to regional coalitions in support of our wider strategic interests and objectives.<sup>59</sup>

9.47 Australia pursues these objectives in a unique environment that places particular demands on its naval ships. Mr Derek Woolner pointed out:

Traditionally, the Europeans have designed equipment to look at something like a campaign from London to Moscow as being horrendously large. We have to contemplate distances greater than that in simply moving our equipment around in our areas of strategic interest and getting them to apply the various military capabilities in ways that suit the national interest. That for a start demands different sets of design parameters.

It is a question not only of putting enough fuel in to get them there, but also of how you sustain the crew. You have to keep them efficient, keep them operating. You have to put them in an area with a big enough load of weapons and ordnance and so on to make them effective. You have to develop communication systems that enable you to transmit intelligence or whatever other information you are gathering back to headquarters, and enable you to operate them with allies that want to operate further afield than you would normally plan, with the same sort ability for your deployed units to operate under Australian command.<sup>60</sup>

9.48 The Navy has underlined the fact that not only are great distances involved in its line of duty but Australian naval ships are expected to endure extremes of climate from the calmer warm tropics to the icy conditions in the Southern Ocean:

The area of direct interest to Australia's security encompasses a substantial percentage of the Earth's surface. Australia adjoins the Pacific Ocean in the east, the Indian Ocean in the west, the South East Asian archipelago in the north—and sometimes forgotten—the Southern Ocean. Our maritime jurisdictional areas alone comprise more than eight million square nautical miles (or almost 16 million square kilometres). Our security requirements

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58 Commonwealth of Australia, *Defence 2000—Our Future Defence Force*, pp. XIV and 88.

59 *Defence 2000—Our Future Defence Force*, p. 88.

60 *Committee Hansard*, 4 September 2006, p. 31.

are such that maritime forces can find themselves rapidly moving from one extreme of climate and local sea environment to another within a few weeks, major units may transit from the tropical calm and heat of the dry season in the South East Asian archipelago to the huge seas and swells of the Southern Ocean.<sup>61</sup>

9.49 Naval vessels may also be called upon to participate in a range of non-combat operations such as disaster relief. On such occasions they may be required to provide short term or long term assistance not only for coastal locations, but inland as well:

While shipborne helicopters can be particularly useful and ships may act as logistic support bases, hospitals and command posts for long periods, the specialist skills available in ships also mean that their personnel can be invaluable sources of trained manpower for rehabilitation and repair work. Naval forces are self-supporting and do not create logistic burdens in situations where infrastructure has been destroyed or severely damaged.<sup>62</sup>

9.50 Participants in the inquiry readily recognised Australia's special operational requirements and the need to modify off-the-shelf purchases. Mr Ron Fisher, Managing Director of Raytheon Australia, asserted that 'no one off-the-shelf platform can address the unique strategic circumstances in Australia'.<sup>63</sup> Mr Peter Hatcher, Chief Executive Officer of ThyssenKrupp Marine Systems Australia Pty Ltd, cited in particular the need to take account of distance and endurance. He understood that Australia developed with Kockums its own design for the Collins-class submarine because the capability that was required was 'very much an Australian capability requirement'.<sup>64</sup> Mr Woolner supported this view:

The Navy wanted to use those vessels in a particular way that exploited the ability of submarines to disrupt an opponent's preparations for naval warfare by being able to attack them near their bases. Given Australia's geographical position, and particularly the position of its naval ports, that meant a submarine with long range, high endurance and very great weapons carrying and systems capacity.<sup>65</sup>

9.51 In turning to the AWDs, he noted:

It is seen as being able to operate in conjunction with US task force groups. With the Aegis system, the US navy insists that those operating with it have the system certified. That will mean that this particular ship will be more like an aircraft than a ship in terms of the way it is handled. Instead of going through major midlife refits that generate workload in a period of 10-

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61 Royal Australian Navy, *Australian Maritime Doctrine*, 2000, chapter 2.

62 RAN, *Australian Maritime Doctrine*, 2000, chapter 7.

63 *Committee Hansard*, 3 July 2006, p. 4. See also Mr Peter Hatcher, CEO ThyssenKrupp Marine Systems Australia Pty Ltd, *Committee Hansard*, 18 August 2006, p. 8.

64 *Committee Hansard*, 18 August 2006, p. 8.

65 *Committee Hansard*, 4 September 2006, p. 16.

to-12-year cycles, the software for those vessels will have to be continually updated so that they remain in sync with US naval standards, so that those vessels can be certified by the US navy as capable of operating in what they call a 'network warfare mode'—without the Americans worrying about any technological data system glitches.

At the same time, there is a component in the concept of operations that calls for those vessels to operate as what they call private ships. In other words, it accepts the fact that the Australian Navy, unlike the US navy, is not often going to operate in large task force groups and that we will be looking at those vessels to operate not always in US naval groups but independently for Australian national interests. That requires a somewhat more capable fit than those vessels and that there be a more thorough investigation of what they are under. That might cause conflicts between some of the equipment that is mounted on US vessels, which is supplied by some of the people who are currently major members in the alliance contract organisation, and choosing other equipment, some of which is made by local companies.<sup>66</sup>

9.52 Indeed, DITR noted that the FFG, ANZAC, Collins and prospectively, the AWDs and the LHDs, are 'typically modifications of overseas designs'.<sup>67</sup> The 2004 ACIL Tasman report on the Australian Defence Industry similarly noted that 'the surface combatants, submarines, mine warfare and oceanographic ships were all built to overseas designs but adapted in Australia to suit Australian circumstances'. It stressed that such modifications can 'entail substantial innovation'.<sup>68</sup>

### ***The costs of customising a ship for Australian conditions***

9.53 Defence acknowledged that modifying a standard military off-the-shelf design 'will always involve a cost increase, wherever construction occurs'.<sup>69</sup> Other witnesses were convinced that modifications to an off-the-shelf model should be conducted in Australia. Mr Tunny of ASC, explained that it is 'not nearly so easy' to modify a ship for particular needs at a distance. He suggested that such an undertaking was possible but questioned whether it would be efficient or cost effective. He explained:

I think there is a close interaction between the customer iteratively defining its requirements and the alliance iteratively refining potential solutions. Attempts to do that sort of work at great distance lead to mistakes, misunderstanding and inefficiencies.<sup>70</sup>

9.54 Saab Systems Pty Ltd was of the view that:

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66 *Committee Hansard*, 4 September 2006, p. 17.

67 *Submission*, p. 2.

68 ACIL Tasman, *A Profile of the Australian Defence Industry, Helping align defence industry, defence industry policy, and defence strategic planning*, November 2004, p. 31.

69 Department of Defence, Answer to question on notice from 28 March 2006, Overview.

70 *Committee Hansard*, 4 September 2006, p. 12.

The best outcome for the customer will be achieved when the systems selection, integration, test and delivery is performed by companies who are Australian based, understand the customer and the operational environment and who themselves have an ongoing stake in the outcome.<sup>71</sup>

9.55 Raytheon Australia noted further that even with a relatively less complex ship such as the LHD, the platforms may have to be modified to meet Defence's needs which 'are unique compared to the Spanish and French model'.

9.56 Ms Denise Ironfield, the author of the studies on the Minehunters and the ANZACs, noted that there are problems with international benchmarking of naval shipyards because governments choose to 'purpose-build their ships'. Put simply, 'we are not looking at like with like and that makes it very difficult'. The requirement to modify off-the-shelf vessels, which according to the evidence is best conducted in country, further highlights the difficulty in making comparisons between Australian built ships and those built overseas.

9.57 The flow of work, as distinct from the economies scale, also affect a shipyard's productivity. The government has set out a long-term acquisition and naval ship repair and upgrade program. The committee now considers the effect that the Navy's acquisition program has on industries efficiencies and hence its ability to minimise costs.

### ***Fluctuations in work flow***

9.58 The Australian Academy of Technological Sciences and Engineering argued that a viable industry requires a consistent long-term base workload. In its view, no industry can survive on a stop/start order book—that a viable industry is possible if steps are taken to manage a consistent flow of work to avoid costly stops and starts during which time skills and other capacity is lost'.<sup>72</sup> While it accepted that exports could fill in gaps, it noted 'a base load of reasonably predictable local demand can provide the platform on which a competitive export industry can be developed'.<sup>73</sup> The Academy submitted:

Costs cannot be divorced from the demand question and a steady flow of orders to naval shipbuilding yards will spread the establishment overheads, avoid recurring design or manufacturing errors, provide greater negotiation leverage over suppliers, amortise the training costs and reduce labour mobility. It would be particularly helpful if ship-procurement programs could be adjusted to ensure the timing of the order for the first in any class of ships allowed a sufficient interval before the rest were required, to allow

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71 *Submission 25*, p. 7.

72 *Submission 19*, p. 3.

73 *Submission 19*, p. 2.

full validation of design, construction and operating features, so avoiding costly later modifications.<sup>74</sup>

9.59 Indeed, it suggested that should a steady stream of work be available the Academy has every reason to believe Australian costs and productivity would match the European, American and Japanese yards who would be the alternative suppliers.<sup>75</sup>

9.60 The Australian Industry Defence Network Inc pointed out that shipbuilding tends to be work of varying intensity with the associated costs of start up and wind down. It noted that the peaks and troughs can be moderated by the benefit of in-service support contracts but they do not alter 'the risk and cash relationships of the initial task themselves—nor do they absorb the full compliment of the initial workforce.'<sup>76</sup> The Submarine Institute of Australia Inc also referred to the peaks and troughs in demand for naval vessels. It submitted:

The continuing competitiveness of Australian naval shipbuilding relies on maximising opportunities for local construction thereby smoothing as far as practicable the 'peaks and troughs' of supply and demand. The construction in Australia of large naval vessels is therefore critical to both maintaining an ongoing capability and further improving its efficiency and productivity. By this approach, the industry will realise its goals of continuing to be price competitive, technically innovative, consistent in quality, reliable in supply and profitable. It cannot exploit and develop intellectual property, new technology, new ideas and new methods of construction and support if it is not profitable.<sup>77</sup>

9.61 Mr Geoff Evans OBE VRD also referred to this problem of fluctuations in demand. He stated 'Australia's main problem as a naval shipbuilder is, and always has been, lack of continuity in orders for ships, making it difficult if not impossible for shipbuilders to hold a highly trained workforce together.'<sup>78</sup> The South Australian government noted that even with state and federal investment in the defence industry, 'when the bow wave of Air Warfare Destroyer (AWD) and Amphibious ship construction work is complete, remaining long-term demand will not be sufficient to support the existing ship builders'.<sup>79</sup>

9.62 The committee accepts that fluctuations in demand create difficulties for the shipbuilding industry which can affect their overall productivity. It should be noted that overseas countries face this same problem. To a degree, industry must accept and adjust to this problem. Defence, as the sole purchaser, also has a responsibility to

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74 *Submission 19*, pp. 2–3.

75 *Submission 19*, p. 2.

76 *Submission 2*, p. 2.

77 *Submission 3*, p. 18.

78 *Submission 4, The Navy*, vol. 67, no. 4, p. 18.

79 *Submission 9*, p. 8.

ensure that it plans naval acquisitions with a view to assisting industry manage the demand cycle. Indeed, as noted in chapter 2, recent overseas studies have pointed to the dominant position that governments have determining demands on the naval shipbuilding sector.<sup>80</sup> This matter of planning and scheduling is discussed in detail in Part IV.

9.63 Increasing demand through exports is one way of achieving efficiencies through economies of scale and by moderating fluctuating demands.

### ***Impediments to export trade***

9.64 The 2005 Allen Consulting report looked at the substantial barriers to trade in the international arena. It stated:

Government purchasing policy and subsidies have distorted the global market for warships to an extremely high degree and no matter how internationally competitive a particular shipyard may be, the lack of anything resembling a level playing field means it is very difficult for it to succeed internationally.<sup>81</sup>

9.65 The Australian Manufacturing Workers' Union (AMWU) suggested that 'the need to pay royalties and to negotiate marketing rights erodes the international competitiveness of Australian builders'.<sup>82</sup> Chapter 2 described the obstacles to trade in naval ships including direct and indirect government subsidies and legislation designed to protect local producers (paragraphs 2.37–2.40). The range of measures used by governments to protect their domestic shipbuilding industries means that Australian producers looking to export their products are effectively locked out of these highly protected markets. Also, when it comes to selling to a country that is not a naval ship producer, Australian industry must compete against shipbuilders who enjoy some form of subsidisation.

9.66 In addition to a relatively small domestic market, limited export opportunities further impact on industry's ability to achieve economies of scale and resulting efficiencies. With the exception of niche markets, Australia is limited in its export of naval ships and equipment.

### ***Comparative labour productivity***

9.67 Comparison of the costs and efficiencies of Australia's naval shipbuilding labour base with overseas industries is also hampered by a lack of data. Both ACIL Tasman and DITR have used a measure of 'value-added per employee' to approximate

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80 Roscoe Bartlett, Projection Forces Subcommittee, House Armed Services Committee, 5 April 2006.

81 The Allen Consulting Group, *Future of Naval Shipbuilding in Australia: Choices and Strategies*, May 2005, p. i.

82 AMWU, *Submission 21*, p. 13.

labour productivity. The ACIL Tasman analysis suggested that 'Australia's labour productivity might be comparable to that of Western shipbuilders, but behind that of Asian shipbuilders, notably Japan'.<sup>83</sup> DITR's assessment suggested that Australia is comparable with Norway and Denmark, somewhat ahead of the UK, France and Spain and well behind Japan and to a lesser extent the USA. However, there are major shortcomings in the measure used. DITR noted that the measure is not adjusted for hours worked per employee and is biased upwards for countries that protect their shipbuilding industries. Importantly, the data are not specific to naval shipbuilding.<sup>84</sup> It is therefore difficult to make an informed assessment of the comparative productivity of the Australian shipbuilding workforce using quantitative measures.

9.68 Qualitative assessments were put forward by a number of submitters. Observations included that in the area of hull construction Australia needs to compete with the lower labour costs of countries such as South Korea and China. However, some submitters suggested that design and efficient work practices, including the use of automation, are the principal drivers of construction costs rather than wage rates. Several submitters observed that other high labour cost countries such as Sweden, Israel and Japan maintain viable naval shipbuilding industries.

9.69 A number of submitters acknowledged the world class skills of Australia's welders, engineers, technicians and systems integrators. Several companies submitted that Australian labour costs for higher end skill sets are comparable or less costly than in Northern Europe and the United States.

## Summary

9.70 The lack of suitable data prevents any sensible or accurate comparative analysis of the productivity of Australian shipyards against overseas yards. The committee therefore finds difficulty in making a definite determination about the comparative economic productivity of the Australian shipbuilding industrial base with other shipbuilding nations. Evidence, however, suggesting that Australia may not be as productive as overseas producers included:

- Australia cannot compete with countries such as Japan, China and South Korea in the production of larger and less complex steel ships such as tankers and carriers;
- Australia is a relatively small market and the demand for naval vessels is not as large as for some overseas producers—Australia does not have the economies of scale enjoyed by some of its potential competitors;

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83 ACIL Tasman, *Naval Shipbuilding in Australia, A background briefing*, February 2006, Attachment to South Australian government *Submission 9*, p. 47.

84 Output measures relate to commercial shipbuilding while input measures cover all shipbuilding. DITR, *Submission 38*, pp. 10–11.

- the assistance or protection given by the governments of shipbuilding countries to their domestic naval shipbuilding industry limits Australia's export opportunities; and
- even with larger production runs, some projects in Australia such as the ANZACs are believed to have attracted a local build premium.

9.71 Evidence suggesting that Australia may be as productive as overseas producers in constructing naval vessels include:

- the naval shipbuilding industry in overseas countries is subsidised or protected in some way by government; (removing or discounting such barriers may show that Australian producers can match the productivity of overseas producers);
- the success of Incat and Austal in producing very fast vessels;
- the bench-marking studies carried out for Tenix and Raytheon Australia;
- greater efficiencies when it comes to modifying or customising a ship in Australia for Australian conditions; and
- the acknowledged world class standing of Australian welders, engineers and technicians.

## **Conclusion**

9.72 Given that overseas countries are unlikely to remove the various forms of assistance and protection given to their local naval shipbuilding industry, Australia's builders of large naval ships must compete on an 'unlevel playing field' to some extent. The committee however, believes that whenever non commercial considerations are made, such as the need to be self reliant in defence support industries, where there are direct or hidden subsidies, or where broader economic benefits not considered in commercial cost benefit analysis are included, there will be added costs which need to be quantified. Such costs must be known for otherwise there will never be a true measure of actual competitive design and construction costs, nor of those costs properly attributed to non economic or political motives. The committee believes that if this work has not already been done it must be done as a priority for all future projects. If it has been done, but not provided to the committee, it should continue to be as part of a whole of project costing through life for future benchmarking purposes.

9.73 Therefore, given the absence of any credible quantitative data to the contrary, the committee would like to believe that a revitalised Australian ship building industry may well hold its own when compared with overseas naval shipbuilders, particularly if the value of ships' through-life support, is considered. No categorical assertion however, could be made on the basis of current evidence available.

9.74 To this stage, the committee has not taken account of other important considerations including the through-life support of the ship nor the wider advantages

or benefits that accrue to the country when a major ship project is undertaken in Australia. These matters are taken up in the following chapters.