Australian Maritime Industries - Priorities in Science and Technology - Summary Report of the ASTEC Shipping Partnership

1996
AUSTRALIAN MARITIME INDUSTRIES
PRIORITIES IN SCIENCE AND TECHNOLOGY

SHIPPING PARTNERSHIP—SUMMARY REPORT
The Australian shipbuilding and defence-related industries have experienced much-welcomed sustained growth in recent years. Their continued growth, however, will depend upon their ability to continue to meet market needs and to stay ahead of international competition in product design, construction efficiency, quality, applied research and skills development.

In November 1994, Australia assumed international rights and obligations for one of the world’s largest ocean areas—an area larger than its land mass. The preservation of this maritime environment and the many activities associated with the commercial exploitation and management of the resources will need vessels and floating platforms of various kinds—and some will be entirely dependent upon them.

With so many maritime and marine opportunities now opening up for Australia, prioritisation of Australian industry and government support efforts is absolutely necessary.

In 1995–96, the Shipping Partnership, a broadly-based group of industry, government, research organisations and learned societies members, with secretariat support from ASTEC, the Australian Science, Technology and Engineering Council, used the Delphi survey of informed opinion technique to assess likely trends in the Australian shipping and shipbuilding industries and then match Australian science and technology and skills to future needs.

The results of this study are summarised in this paper. They focus on Australian S&T requirements to meet future needs of shipping, including fast ship transportation for passengers and cargo, maritime defence opportunities and Exclusive Economic Zone (EEZ) resources and management. The study’s conclusions amply demonstrate the value of foresighting and collaboration between industry, research centres and government in identifying future needs.

The Shipping Partnership’s full report contains a series of recommendations addressed, respectively, to industry, cooperative research centres (CRCs) and government. These, and proposed future actions by the Partnership, are outlined in this summary report.

Don Lennard
Chairman, Shipping Partnership
ABOUT ASTEC

The Australian Science, Technology and Engineering Council (ASTEC) was established as a statutory authority in 1979 under the Australian Science and Technology Council Act 1978.

ASTEC is a principal source of independent advice to the Commonwealth Government on a wide range of policies and programs related to S&T, which are of concern to Commonwealth departments and agencies, higher education institutions and private enterprise. It works closely with the Prime Minister’s Science and Engineering Council and other major bodies providing policy advice to the Government.

ASTEC is in a unique position to provide advice to the Government because of its independent status, its broad, longer term perspective and its links to the S&T community and to industry.

The Council is empowered to operate by conducting inquiries, gathering information, engaging consultants, appointing committees and producing reports.

Chaired by Dr Don Williams, ASTEC currently has ten members (listed in Appendix A) who broadly represent all areas of the S&T community, many with strong industry links.
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Mr Brian Corrigan (Assistant Director, Marine Industries Section)

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Mr Andrew Beresford-Wylie (Director, Marine Policy Section, 1996)
Mr John Cope (Assistant Director, Marine Policy Section)
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Lloyd’s Register of Shipping
Mr Stuart Ridland (Group Regional Manager for Australasia)

Learned Societies*

The Royal Institution of Naval Architects
Mr Robert Herd (Immediate Past President, Australian Division)

The Institute of Marine Engineers
Mr Doug Porter (Fellow)

Institution of Engineers, Australia
A number of partners are members of the Institution

*Non-financial contributors to the Partnership

ASTEC Secretariat
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INTRODUCTION

What the report is about
The Shipping Partnership’s Report examines the science and technology (S&T) and skills required for innovative and sustainable shipping and shipbuilding industries in Australia to the year 2010.

Significance of the priority areas identified in the survey
The study focuses on three priority areas of industry development where science and technology and skills are expected to play a key role in maintaining and enhancing Australian comparative advantage, namely:

Fast ship transportation for passengers and cargo
The export of Australian designed and built fast ferries for passengers and vehicles has been an Australian shipbuilding industry economic success story in the 1990s. In the future, the development of an Australian high-speed vessel regional cargo service appears to be a viable option. Australia’s leading position, however, is under increasing threat as overseas suppliers recognise the commercial opportunities and endeavour to exploit them.

Maritime defence opportunities
The last decade has seen a resurgence in Australia’s naval shipbuilding capability and capacity and the Royal Australian Navy (RAN) is still the major customer for the Australian shipbuilding industry. However, there is insufficient planned new build, repair and modification work to support the current number of indigenous warship design, construction and repair facilities to the year 2010. The Australian industry, therefore, will need to be alert to regional export opportunities and be prepared to undergo a degree of rationalisation.

EEZ resources and management
In November 1994, Australia assumed rights and responsibilities under the United Nations Convention on the Law of the Sea (UNCLOS) for marine zones covering an area larger than Australia’s land area. Only small sections of these zones have been systematically explored but their resources are considered to be substantial. The UNCLOS also charges Australia with a range of responsibilities to further advance exploration and marine research. Failure to act on these responsibilities may lead to loss of the privileges bestowed under the Convention.

Benefits
The Report’s findings and its recommendations in respect of the above three key areas are designed to help Australian industry to:
• exploit export opportunities;
• keep ahead of the competition;
• better focus the research and development effort; and
• promote the development of an appropriate skills base for the future.

1 The full report is published separately under the title Australian Maritime Industries: Priorities in Science and Technology—Report of the ASTEC Shipping Partnership.
Foresighting
The study is an exercise in foresighting which can best be described as a process which leads to a better understanding of the forces likely to shape the long term future and which, therefore, should be taken into account in planning and decision-making. Foresighting is considered to be particularly suited to S&T planning because it takes account of the long lead times needed for R&D investments.

The Delphi survey
The Partnership used the Delphi survey as its foresighting tool. Delphi surveys seek to arrive at a consensus of informed opinion on likely developments. They have been used for some time by industry-government panels in Europe and Japan to identify industry needs and technological trends in a number of sectors, including transport.


INTERNATIONAL PERSPECTIVES

Australia's share of the world market

Australia is the fifth biggest user of shipping in the world, measured by tonnes-kilometres. The Australian shipbuilding industry, however, is small by world standards. It contributes less than 0.1 per cent of total world construction tonnage and represents less than 1 per cent of total turnover in the Australian manufacturing industry. Australia, nevertheless, has a significant global market share in the construction of light-weight, high-speed vessels.

Overseas experience

The Delphi survey focused on developments in Australia, Australian conditions and Australian constraints. These are a small subset of wider international developments. In conducting its study, the Partnership was aware that:

1. The United States has an industry-government collaborative National Shipbuilding Research Program, which has been in existence, in one form or another, for over twenty-five years. Whilst the program is managed by the Society of Naval Architects and Marine Engineers (SNAME), it is regarded as being industry-driven: industry contributions are understood to equal government contributions in a total program of about $US 8-10 million.

2. The 1995 UK Foresight Transport sector study identified the key problem for UK marine transport as being the interface costs of land to sea transfer. The study identified UK comparative advantages in S&T in the areas of port interface, containerisation, UK skills in design and improved manufacturing and materials. The UK has since established a Marine Panel and has conducted a study of the fast ferry market.

3. The 1992 Japanese Delphi survey report postulated that high-speed vessels of the 50 knot, 1,000 Deadweight Tonnage Class will be in operation by year 2003. It predicted the widespread use of commuter and business sea traffic transportation systems and stressed the importance of innovations in traffic control for high-speed services.

4. The OECD Agreement Respecting Normal Competitive Conditions in the Commercial Shipbuilding and Repair Industry, which was to have entered into force on 15 July 1996, has, as its goal, the establishment, in a legal binding manner, of a "level playing field" for competition between the shipbuilding industries of the OECD countries, Norway and Korea. While the Agreement imposes a subsidies discipline, barring direct and indirect subsidies as well as official regulations and practices in favour of the shipbuilding industry, it does, however, contain specific provisions permitting assistance to R&D.

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2 Office of Science and Technology, Technology Foresight: Progress Through Partnership: Transport, 1995
DELPHI SURVEY OUTCOMES

Conduct of the survey
The Shipping Partnership Delphi Survey on S&T Directions in the Maritime Industries to 2010 was conducted in two rounds, in September 1995 and December 1995/January/1996. An Australian Bureau of Statistics Consultancy Group compiled and analysed the survey results for the Partnership.

The survey’s questionnaire sought views from people with knowledge and experience in the maritime industries on 76 ‘topic statements’, which postulated developments in the areas of: ship design; ship manufacture; ship ownership and operation; research and development; transport; warship design and production; industry suppliers; the EEZ and cargo handling. This summary report discusses only the 36 salient topic statements.

Response
A total of 550 survey forms were dispatched to nominated persons. 135 people completed both round one and round two of the survey, representing a final response rate of 24.5 per cent. This response rate is low when compared with ABS national surveys but not unreasonable for a survey of this kind which was voluntary, difficult and time-consuming to complete and the first of its kind conducted in the maritime industry in Australia.

Wealth creation and quality of life impacts
Foresight is concerned with how science and technology can contribute to wealth creation and quality of life. Twenty topic statements received high ratings (beneficial–highly beneficial) for their expected contribution to both wealth creation and quality of life.

Timeframe
A high percentage of respondents considered that most of the postulated developments would have first occurred in Australia by the year 2005.

Necessity for collaboration
Respondents saw the need for global collaboration for the realisation of most topic statements. More than 50 per cent of respondents considered collaboration in the Asia Pacific Economic Cooperation (APEC) area to be important in relation to the management of oceans and seas in Australia’s proximity, joint ventures in ship manufacture, Australian export of services and marine equipment to the region and regional markets for specialised ships.

Australia’s capabilities compared with other countries
Respondents were asked to compare Australia’s capabilities (ie leading, average, lagging) with other countries for each topic statement. The most common response for all categories was that Australia’s position was “average”.

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4 The Partnership has published a series of background papers on issues relating to the subsectors examined in the survey under the title, Science and Technology Directions in the Maritime Industry to 2010: Shipping Partnership—Background Papers (ISBN 0644 45799 4).

5 The Partnership believes that its experience in conducting the Delphi survey in Australian conditions would be useful to record, should the Partnership or others wish to conduct a similar exercise in the future. It has, therefore, recommended that the ASTEC prepare an Occasional Paper on the Partnership’s experience in conducting the survey.
However, Australian capabilities received overall positive endorsement in respect of 23 topic statements where there were a preponderance of “Australia in lead” statements over “Australia lagging” statements (discussed further below).

For the science and technology capability and innovative capability categories, there were many more topics where Australia was seen to be leading than lagging. However, the reverse was true for Australia’s perceived capabilities for production capability/service delivery and for its exploitation and commercialisation potential.

On all topic statements where Australia received positive endorsement by respondents for production/delivery and/or exploitation/commercialisation capabilities, it also received positive endorsement for S&T and innovation capabilities. This suggests a causal pattern: high ratings on S&T are together necessary, but not sufficient, for production/delivery capability; which, in turn, is necessary, but not sufficient, for exploitation/commercialisation.

Constraints on occurrence in Australia
The main constraints varied according to subsector, as shown Table 1.

| Table 1: Constraints\(^6\) which were rated highest in most of topics in each subsector. |
|---|---|
| SECTOR | CONSTRAINT |
| Ship Design | Lack of funding (4 of 9 topic statements) |
| Ship Manufacture | Industrial/Commercial (4 of 10) |
| Ship Ownership and Operation | Technological feasibility (3 of 9) |
| Research and Development | Technological feasibility (5 of 9) |
| Transport | Industrial/Commercial (4 of 7) |
| Warship Production and Design | Technological feasibility (6 of 9) |
| Exclusive Economic Zone | Commonwealth/State (3 of 9) |
| Industry Suppliers | Industrial/Commercial (5 of 8) |
| Cargo Handling | Economic Viability (4 of 6) |

Research and Development
More than 65 per cent of respondents considered that a substantial increase in expenditure on R&D was desirable, even though 54 per cent thought that, at best, only some increase was likely. Just over 20 per cent of respondents who completed the survey provided written comments on this item (not just ticked boxes). Every response stressed the need for R&D and, in different ways, to increase it.

\(^6\) The descriptions were explained in the Guidance Notes to the survey questionnaire:
Lack of funding = inadequate investment capital or research funds;
Industrial/Commercial = the possibility that competitive circumstances (eg dominant producers, attractive substitutes, intellectual property, etc) inhibit development;
Technological feasibility = the technology is theoretically possible but development is likely to prove difficult or risky;
Commonwealth-State = divided responsibilities or differing policies or regulations likely to inhibit occurrence;
Economic viability = unsatisfactory return on investment.
Skills development

Over 90 per cent of respondents considered that some increase or a substantial increase in workforce skills is necessary but only 63 per cent thought that some increase was likely. Overall, respondents considered that the availability of management and professional skills would be the main constraint on the industry skills base to year 2010.
The Partnership adopted a rational basis for selecting priorities, rather than simply placing ticks and crosses against topic statements, or seeking to pick winners or 'divining' the priorities from the survey results. The steps in this process are shown in Box 1.

**S&T priority clusters**

The process outlined in the Box resulted in 36 topic statements being identified as having first claims for consideration as S&T priorities. Twenty-nine of these statements formed themselves logically into main clusters around a nucleus topic statement or two or three joint nucleus topic statements. The principal clusters thereby identified by the Partnership were:

- fast ship transportation for passengers and cargo;
- maritime defence opportunities; and
- EEZ resources and management.

The remaining seven topic statements with combined high-rankings which did not fit neatly into these clusters are discussed below, under the heading 'other important issues'.

The clusters identified by the Partnership include a total of ten other topic statements which ranked highly on wealth creation/quality of life criteria but for which Australian capabilities were considered to be below average. Individual topic statements have been included in a cluster where their association with the cluster was considered to be important for the success of the group. These statements have been placed below the double lines in relevant tables and can be so identified. They represent areas of development which require special attention, since Australia is considered to be lagging the rest of the world in these areas.
Box 1

The Five Steps for establishing science and technology priorities in the maritime industry.

**Step 1. Assessment of wealth and quality of life impacts.**

*Rationale:* Foresight is ultimately concerned with how science and technology contribute to wealth creation for Australian industry, Australian economic well-being and quality of life.

*Method:* Topic statements were examined for their assessed ability to contribute jointly to wealth creation and quality of life, i.e., a sustainable industry.

**Step 2. Identification of Australian capabilities.**

*Rationale:* S&T and innovation can only contribute to wealth creation and quality of life if they are embodied in commercial products, processes, services or regulatory activities.

*Method:* The Partnership used a weighted formula to arrive at a composite rating for Australia's capabilities (i.e., science and technology capability, innovation capability, production capability or service delivery and exploitation and commercial potential) for each topic statement.

**Step 3: Identification of topic statements rated highly on both wealth creation/quality of life grounds and for positive overall/above average overall Australian capabilities.**

*Rationale:* Topic statements rated high on both grounds have the greatest claims for consideration as priorities.

*Method:* A comparison between topic statements with high capability ratings and those with high wealth creation/quality of life impacts ratings.

**Step 4: Exclusion of non-starters**

*Rationale:* The Partnership considered there was no point in pursuing topic statements which respondents rated low on wealth creation/quality of life impact and on Australian capabilities.

*Method:* The lowest rating topics (Steps 1–3) were excluded from further consideration as S & T priorities.

**Step 5: Identification of S&T priority clusters**

*Rationale:* The sub-sector categories in the Delphi survey, e.g., ship design, industry suppliers, included topic statements which were related to one another or to topic statements in other categories. In assessing overall priorities it is logical to treat these inter-related topic statements as groups or clusters.

*Method:* By examining the topic statements identified in step 3 above, it was possible to identify clusters of topic statements with linkages and logical connections between individual items.
Priority Area A: Fast Ship
Transportation for Passengers & Cargo

This priority area is where Australia is currently amongst the world's leaders in design technology and in its share of the international light-weight fast ferry market. A number of major international operators now employ Australian designed and built fast ferries on major routes for passenger and vehicle transportation. However, as can be seen from Figure 1, Australia's share of the international market increased from 9 per cent in 1985 to 34 per cent in 1994, but fell to 25 per cent in 1995.

Figure 1: Fast Ferries World Market—Number of Vessels constructed—1985–1995
The legislative framework which covers the design and operation of high-speed craft is complex and will become even more so. Representation of Australia’s interests in international fora such as the International Maritime Organisation, is increasingly important.

A December 1995 cargo demand study concluded that such a service would be viable, initially, between Australia and Japan and possibly also on other trade routes, depending on suitable cargoes. Its development will impact on cargo handling/terminal operations, multi-modal transport services, whole systems logistical approaches to domestic and international transport, management styles and crew training. In addition, Australian primary industry and manufacturers stand to benefit because producers of high value cargoes of a time-sensitive nature, for example, processed food, horticultural products and manufacturing components, would have a high speed freight option available to meet expanding market demand in the region.

This priority area (see Figure 2) is structured as a core cluster containing two key topic statements relating to the production of specialised ships and shipping and storage technology for fast cargo transportation and six subclusters of 2–8 topic statements each relating to design initiative, design technology, construction efficiency, maritime safety and environmental impact, port infrastructure and export opportunities.

**Figure 2: Fast ship transportation cluster**

### Table 2: Fast Ship Transportation Cluster

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Shipping and storage technology, which provides a competitive advantage in the transport of quality perishable food products, is in widespread use.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Professionals</td>
<td>Joint nucleus for the cluster. A fast ship service is attractive to exporters of high value perishables and has the potential to meet just-in-time and other high-value cargo demands.</td>
</tr>
<tr>
<td>67. Australia has gained a substantial share of the regional market for specialised ships.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Upper Managers</td>
<td>Joint nucleus for the cluster. Fast ferry exports are one of the fastest growing components of Australian designed and engineered exports.</td>
</tr>
</tbody>
</table>

The importance of the individual topic statements comprising the sub-clusters for this priority area, the expected time frame for realisation, main constraints and skills required are outlined in Tables 3–8.
1. **Design initiative**

This subcluster relates to imaginative and technology intensive concepts to improve ship performance.

**Table 3: Design Initiative Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
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<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>29. Technologies which substantially reduce water and air resistance of vessels have been developed.</td>
<td>1995–2000</td>
<td>Funding</td>
<td>Professionals</td>
<td>Nucleus for the subcluster. Continuing refinement of existing technologies to improve hydro-dynamic and aero-dynamic performance will be needed to increase propulsion efficiency and reduce operating costs.</td>
</tr>
<tr>
<td>9. New materials, ie other than conventional steels and aluminium, are in widespread use.</td>
<td>1995–2000</td>
<td>Technological feasibility</td>
<td>Professionals</td>
<td>New materials, for example, high-performance composites, could be used in much larger vessels to reduce displacement, increase load capacity and reduce through-life costs.</td>
</tr>
<tr>
<td>31. Substantially improved condition and stress monitoring technologies for ships have been developed.</td>
<td>1995–2000</td>
<td>Funding</td>
<td>Professionals</td>
<td>Increasingly important as light-weight vessels increase in size, speed, range and are exposed to less restricted marine operating environments. Also relevant to stresses in, for example, bulk carriers and ensuring structural safety throughout vessels’ whole-life.</td>
</tr>
<tr>
<td>32. Advances in ride control and reduction in ship motion permit higher speeds in all weather conditions.</td>
<td>1995–2000</td>
<td>Technological feasibility</td>
<td>Professionals</td>
<td>Ride control technology has been significant for the development of both high-speed catamarans and monohulls. Relevant to both stress level and passenger comfort.</td>
</tr>
</tbody>
</table>
2. Design Technology

This subcluster relates to technologies that can make the design process faster and more cost effective.

**Table 4: Design Technology Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. A wide range of ship designs can be selected and customised interactively, and detailed design for production information can be accessed by using commercially available software.</td>
<td>1995–2000</td>
<td>Funding</td>
<td>Professionals</td>
<td>Nucleus for the subcluster. Information technology developments will lead to increasing globalisation of work and interdependence of designers. Software packages for designs are likely to become more widely used and will reduce unit design and modification costs.</td>
</tr>
<tr>
<td>5. Ship performance can be accurately predicted by computational methods rather than physical model tests.</td>
<td>2001–2005</td>
<td>Industry/commercial</td>
<td>Professionals</td>
<td>Japan has demonstrated benefits of research in this field. Computer analysis will improve but some form of experimental verification using physical modelling will still be required. These methods have the potential to reduce design development time and cost.</td>
</tr>
</tbody>
</table>
3. Construction efficiency

This subcluster relates to technologies that can reduce construction costs. Such reductions are accomplished through design innovation reducing lead time and increasing procurement efficiency as well as by improved construction technology and employee relationships.

**Table 5: Construction Efficiency Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Ship manufacture has become a priority component in the ship design process.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Professionals</td>
<td>Nucleus for the subcluster. Design for Manufacture and Assembly (DFMA) offers significant advantages in improving construction efficiency and reducing unit costs.</td>
</tr>
<tr>
<td>12. A systems integration approach to ship manufacture, using modular assembly, is in widespread use.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Professionals</td>
<td>Increased use will be made in commercial vessels of modular design concepts to further improve construction efficiency.</td>
</tr>
<tr>
<td>14. Australian shipbuilders with certification to ISO 9000 series are able to deliver vessels with certification of compliance with regulations.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Upper managers</td>
<td>Australia is moving ahead in this area in line with international standards. Certification of compliance to foreign national standards is vital to achieve success in export markets, eg Japan.</td>
</tr>
<tr>
<td>34. Computer integrated manufacturing (CIM) is in widespread use in ship manufacture.</td>
<td>1995–2000</td>
<td>Funding</td>
<td>Professionals</td>
<td>There is scope for improvement in production management in many Australian yards. Considerable cost-efficiency benefits can be obtained through the use of CIM techniques.</td>
</tr>
</tbody>
</table>
### Table 5 (continued)

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
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</tr>
</thead>
<tbody>
<tr>
<td>2. Nearly all ships will be designed for whole-life, with particular stress on economic repair and maintenance.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Professionals</td>
<td>Whole of life considerations apply in respect of the RAN’s naval production requirements and are increasingly taken into account by commercial shipowners.</td>
</tr>
<tr>
<td>11. Mechanisation, automation and advanced robotics are in widespread use in ship manufacture.</td>
<td>2001–2005</td>
<td>Industry/commercial/skills</td>
<td>Upper managers</td>
<td>More advanced in overseas shipyards. Will become more important as the volume of Australian ship construction increases and labour costs increase.</td>
</tr>
<tr>
<td>16. Benchmarking and comparative productivity assessments are widespread.</td>
<td>1995–2000</td>
<td>Industry/commercial</td>
<td>Professionals</td>
<td>Benchmarking the performance of Australian shipbuilders against overseas competition could help identify areas where productivity improvements can be achieved more effectively.</td>
</tr>
<tr>
<td>17. New joining technologies are in widespread use.</td>
<td>1995–2000</td>
<td>Industry/commercial/skills</td>
<td>Professionals</td>
<td>The necessary technologies (and skills) are available but their increased application in the shipbuilding and repair areas has the potential to improve efficiency and reduce costs.</td>
</tr>
</tbody>
</table>
4. Maritime safety and environmental impact

Although the priority attached to safety and environmental issues, both during construction and operation is not uniform on a world-wide basis, the rapidly escalating concern for these issues worldwide is manifest and of great commercial impact.

**Table 6: Maritime Safety and Environmental Impact Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
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</tr>
</thead>
<tbody>
<tr>
<td>39. Government has an expanded role in the development and enforcement of technical standards for safety and environment protection.</td>
<td>1995-2000</td>
<td>Regulation/policy</td>
<td>Upper managers</td>
<td>Nucleus for the subcluster. Increasing international concerns about maritime safety and the environment are leading to the development of more stringent standards which will need to be applied and enforced to maximise the benefits to Australia.</td>
</tr>
<tr>
<td>1. Environmental regulations have a significant impact on ship design.</td>
<td>1995-2000</td>
<td>Economic viability</td>
<td>Professionals</td>
<td>Ship design will have to satisfy environmental requirements cost-effectively if restrictions on ship operation are to be avoided.</td>
</tr>
<tr>
<td>27. Surveillance systems, which enable avoidance of floating and submerged obstacles by vessels moving at up to 100 knots, are in practical use.</td>
<td>2001-2005</td>
<td>Technological feasibility</td>
<td>Professionals</td>
<td>Fast vessels are vulnerable to floating debris, eg submerged and half submerged containers. Floating debris constitute a major hazard to fast shipping in regional waters.</td>
</tr>
<tr>
<td>38. Intelligent marine traffic management for navigation in congested and environmentally sensitive waters is widespread.</td>
<td>1995-2000</td>
<td>Regulation/policy</td>
<td>Professionals</td>
<td>This is a critically important issue for Australia, particularly in our northern waters, Torres Strait and the Great Barrier Reef.</td>
</tr>
</tbody>
</table>
5. Port infrastructure

As the rapid growth of air transport has amply demonstrated, passengers and perishable cargoes delivered by fast point-to-point transport are intolerant of delays.

Table 7: Port Infrastructure Subcluster

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>43. Advanced information technology which facilitates cargo movement is in widespread use (eg EDI, chartering via Internet, paperless trading).</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Middle managers</td>
<td>Australia has taken a lead domestically and in APEC in facilitating adoption of compatible Electronic Data Interchange guidelines for commercial transactions.</td>
</tr>
<tr>
<td>20. Transport infrastructure which permits maximum efficiency in door to door delivery of cargo, both nationally and internationally, has been developed.</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Upper managers</td>
<td>Nucleus for the subcluster. Fast cargo transportation, in particular, relies upon the ability to move cargo over land and across the wharf to final destinations with minimum delays.</td>
</tr>
<tr>
<td>40. Automated port infrastructure including cargo handling equipment is in practical use.</td>
<td>2001–2005</td>
<td>Industry/Commercial</td>
<td>Labourers, plant and machine operators</td>
<td>All aspects of the freight transport system, including container handling, will need to become more efficient to reduce the costs of fast vessel cargo services and maximise the benefits from reduced sea transit times.</td>
</tr>
</tbody>
</table>
6. Export Opportunities

Australia's capabilities in respect of gaining a substantial share of the regional market for specialised ships is acknowledged in the fact that respondents gave T.S.67 by far the highest rating for Australian capabilities of any topic statement. Light-weight passenger and vehicle ferries are among the rapidly growing components of Australia's merchandise exports.

**Table 8: Export Opportunities Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>67. Australia has gained a substantial share of the regional market for specialised ships.</td>
<td>1995–2000</td>
<td>Industry/ commercial</td>
<td>Upper managers</td>
<td>Nucleus for the subcluster. See Table 2 above</td>
</tr>
<tr>
<td>22. An increased supply of special purpose shipping and facilities, which meets changing client needs, is available worldwide.</td>
<td>1995–2000</td>
<td>Economic viability</td>
<td>Upper managers</td>
<td>The supply of special purpose shipping and facilities must continue to keep pace with customer demand and technological capability.</td>
</tr>
<tr>
<td>65. Joint ventures between customers, builders and suppliers for local and regional ship manufacture are widespread.</td>
<td>1995–2000</td>
<td>Industry/ commercial</td>
<td>Upper managers</td>
<td>The relationships amongst Australia's industry stakeholders will need to be strengthened to maximise commercial leverage as Australia faces increasing competition from shipbuilding nations outside the region who have active programs in place to encourage joint-ventures.</td>
</tr>
<tr>
<td>66. Australian services related to ship support have gained a substantial share of the regional market (eg design, project management and training).</td>
<td>2001–2005</td>
<td>Industry/ commercial</td>
<td>Upper managers</td>
<td>The export of services will increase with Australian involvement in the region, eg through joint ventures.</td>
</tr>
</tbody>
</table>
**Priority Area B: Maritime Defence Opportunities**

The development of Australia’s self-reliant maritime defence capability is focused on three areas: presence and surveillance, defence of territories and contiguous zones, and trade protection. Coupled with the defence requirement for ships are the likely needs of a national authority tasked with enforcement of regulations which apply to Australia’s marine zones. The surveillance and enforcement role has yet to be determined.

The Royal Australian Navy (RAN) is still the major customer for the Australian shipbuilding industry. As a consequence of major war vessel construction projects, such as the ANZAC Class ships, the COLLINS Class submarines and the HUON Class minehunters, the RAN’s requirements exert considerable influence over the fortunes of the Australian shipbuilding and ship repair industry and the approximately 6,000 people who are directly employed in these industries.

As regional defence forces seek to replace ageing units or make improvements to existing capability, Australia’s industry needs to be alert to the opportunities for involvement for there is insufficient new build, repair and modification work programmed for the RAN to support the current number of indigenous warship design, construction and repair facilities in the period to year 2010.

To become involved in meeting these requirements, to retain existing expertise, and to remain financially viable, Australian industry, and shipbuilders in particular, must tender a product which offers ‘value for money’ when compared with competing offers. This can be interpreted in minimal terms as an offer meeting, if not exceeding, all capability requirements, being priced very competitively and, providing cost-effective through-life support.

This priority area cluster (see Figure 3) is structured as a core cluster containing the nuclei of the three subclusters relating to design initiative, construction efficiency and export opportunities. The importance of the individual topic statements comprising the sub-clusters for this priority area, the expected time frame for realisation, main constraints and skills required are outlined in the Tables 10–12.

![Figure 3: Marine defence opportunities cluster](image-url)
### Table 9: Maritime Defence Cluster

<table>
<thead>
<tr>
<th>Topic Statement</th>
<th>Timeframe for Realisation</th>
<th>Main Constraint(s)</th>
<th>Skills Development</th>
<th>Reason for Inclusion in Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>67. Australia has gained a substantial share of the regional market for specialised ships.</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Upper managers</td>
<td>Joint nucleus for the cluster. Australian industry needs to be even more alert to opportunities for involvement in defence ship construction in the region.</td>
</tr>
<tr>
<td>16. Benchmarking and comparative productivity assessments are widespread.</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Upper managers</td>
<td>Joint nucleus for the cluster. Benchmarking the performance of Australian shipbuilders against overseas competition could help identify areas where productivity improvements can be achieved more effectively.</td>
</tr>
<tr>
<td>48. A sustainable Australian industry base is capable of the design and development of all types of warships.</td>
<td>1995–2000</td>
<td>Economic viability</td>
<td>Professionals</td>
<td>Joint nucleus for the cluster. An Australian naval shipbuilding industry base can be sustained but this will require the development of export markets, diversification, and strategic alliances and industry rationalisation.</td>
</tr>
</tbody>
</table>
1. **Design Initiative**

Developing and sustaining a capability advantage is heavily dependent on the degree of innovation exercised by all involved in the design, construction, operation and maintenance of warships. It is only through innovation and being smarter than the competition, that Australian industry and the RAN will be able to field capabilities which are affordable and which have an ‘edge’ over others. The Transfield bid for a joint-venture contract with the Royal Malaysian Navy to build offshore patrol vessels illustrates the advantage of having an indigenous design included in a competitive sales package.

**Table 10: Design Initiative Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>53. Light weight vessels with speeds in excess of 50 knots are in widespread use in military operations</td>
<td>2001–2005</td>
<td>Funding</td>
<td>Professionals</td>
<td>The development of lightweight high speed vessels has potential application to military and para-military operations (relating to the surveillance of EEZ coastal areas).</td>
</tr>
<tr>
<td>2. Nearly all ships will be designed for whole-life, with particular stress on economic repair and maintenance</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Professionals</td>
<td>Whole of life considerations have been applied since the 1980s in naval production for the RAN. Whole of life design is an important element in a competitive export package.</td>
</tr>
<tr>
<td>48. A sustainable Australian industry base is capable of the design and development of all types of warships.</td>
<td>1995–2000</td>
<td>Economic viability</td>
<td>Professionals</td>
<td>Nucleus for the subcluster. See Table 9.</td>
</tr>
</tbody>
</table>
2. Construction Efficiency

The pricing of an offer is determined by the cost of the elements that comprise the offer, the margin required for profit and an estimation of what the buyer might expect to pay. In order that elemental costs be minimised, efficiency must be maximised. This result can be achieved by a suitably motivated contractor and subcontract workforce, stability in the cost of basic materials, and continuous improvement in all areas of endeavour.

**Table 11: Construction Efficiency Subcluster**

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Ship manufacture has become a priority component in the ship design process.</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Professionals</td>
<td>See Table 5.</td>
</tr>
<tr>
<td>12. A systems integration approach to ship manufacture, using modular assembly, is in widespread use.</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Upper managers</td>
<td>Increased use will be made in both naval and merchant vessels of the modular design concepts exemplified in the design of the RAN’s new ANZAC ships and COLLINS submarines.</td>
</tr>
<tr>
<td>34. Computer integrated manufacturing (CIM) is in widespread use in ship manufacture.</td>
<td>1995–2000</td>
<td>Funding</td>
<td>Professionals</td>
<td>See Table 5.</td>
</tr>
<tr>
<td>45. Commercially available technology is in widespread use in warships.</td>
<td>1995–2000</td>
<td>Industry/Commercial</td>
<td>Professionals</td>
<td>Increasing use is made of commercially available technology that meets military specifications but this is not yet widespread. The use of commercial technologies has the potential to reduce both acquisition and through-life costs.</td>
</tr>
</tbody>
</table>
3. Export Opportunities

The continued viability of the indigenous ship design, build and repair industry is dependent on a steady workload which cannot be guaranteed by R&I programs alone. The industry has the skills and expertise to successfully bid into offshore markets and diversify but needs to be encouraged to do so through such mechanisms as access to low interest financing, incentivised training and R & D programs. Strategic marketing, product development and ownership of intellectual property are also important factors.

Table 12: Export Opportunities Subcluster

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>67. Australia has gained a substantial share of the regional market for specialised ships</td>
<td>1995–2000</td>
<td>Industry/ Commercial</td>
<td>Upper managers</td>
<td>Nucleus for the subcluster. See Table 9.</td>
</tr>
<tr>
<td>52. Surface combatants capable of hybrid amphibious operation with speeds in excess of 50 knots have been developed.</td>
<td>2001–2005</td>
<td>Technical. feasibility</td>
<td>Professionals</td>
<td>Australian shipbuilders are capable of building a design suitable for Australian conditions, eg for operation in the north of Australia where there is a large tidal range and a considerable distance between ports.</td>
</tr>
<tr>
<td>63. The generation and retention of intellectual property rights for suppliers of equipment used in ship manufacture are widespread.</td>
<td>1995–2000</td>
<td>Industry/ Commercial</td>
<td>Professionals</td>
<td>Ownership of intellectual property for new product development is considered important to realise export opportunities.</td>
</tr>
<tr>
<td>65. Joint ventures between customers, builders and suppliers for local and regional ship manufacture are widespread.</td>
<td>1995–2000</td>
<td>Industry/ Commercial</td>
<td>Upper managers</td>
<td>See Table 8.</td>
</tr>
</tbody>
</table>
Table 12 (continued)

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>66. Australian services related to ship support have gained a substantial share of the regional market (eg design, project management and training).</td>
<td>2001–2005</td>
<td>Industry/Commercial</td>
<td>Upper managers</td>
<td>The trend of countries in the region to foster the development of their indigenous defence industries will provide considerable opportunities for the export of services by Australian industry.</td>
</tr>
</tbody>
</table>

**Priority Area C: EEZ Resources and Management**

There are very considerable opportunities for Australian industry arising from the creation of Australia's Exclusive Economic Zone (EEZ) but the scale of the opportunities must be quantified. Natural fishstocks are in decline and opportunities exist in mariculture beyond the 12 nautical mile limit. Offshore oil, gas and engineering currently contribute over $8 billion to the economy and 90 per cent of untapped resources are thought to be offshore. Leisure pursuits are a growing important revenue earner. The extraction of deep sea bed minerals (eg cobalt) could become important for Australia after year 2010, if technological and economic viability hurdles can be overcome.

This priority area is structured as two subclusters relating to EEZ resources and EEZ management, containing 3 and 5 topic statements, respectively. See Tables 13 and 14.

**Figure 4: EEZ resources and management cluster**
### Table 13: EEZ Resources Subcluster

<table>
<thead>
<tr>
<th>TOPIC STATEMENT</th>
<th>TIMEFRAME FOR REALISATION</th>
<th>MAIN CONSTRAINT/S</th>
<th>SKILLS DEVELOPMENT</th>
<th>REASON FOR INCLUSION IN CLUSTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>55. Recovery of oil and gas at depths 50% greater than at present is widespread.</td>
<td>2001–2005</td>
<td>Economic viability/ Technical feasibility.</td>
<td>Professionals</td>
<td>The majority of Australia's reserves are off-shore and the majority of Australia's future reserves are also estimated to be in off-shore basins.</td>
</tr>
<tr>
<td>61. Marine farming has substantially replaced the fishing of wild stocks.</td>
<td>2001–2005</td>
<td>Technical feasibility</td>
<td>Upper managers</td>
<td>Natural fishstocks are in decline and substantial opportunities exist in marine farming to relieve the pressure on natural fishstocks and satisfy market demand.</td>
</tr>
<tr>
<td>60. The extraction of deep sea bed mineral resources is widespread.</td>
<td>2010+</td>
<td>Technical feasibility.</td>
<td>Upper managers</td>
<td>The extraction of deep sea bed minerals (eg cobalt) could be an important opportunity for Australia in the future.</td>
</tr>
</tbody>
</table>
## Table 14: EEZ Management Cluster

<table>
<thead>
<tr>
<th>Topic Statement</th>
<th>Timeframe for Realisation</th>
<th>Main Constraint/s</th>
<th>Skills Development</th>
<th>Reason for Inclusion in Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>57. A national authority has been established to regulate Australia’s marine zones.</td>
<td>2001-2005</td>
<td>Commonwealth/ Upper managers State</td>
<td></td>
<td>A national authority or central coordinating agency is critically important to properly manage and develop the opportunities and to fulfil Australia’s international obligations in relation to its marine zones.</td>
</tr>
<tr>
<td>58. A national authority has been established to enforce the regulations which apply to Australia’s marine zones.</td>
<td>2001-2005</td>
<td>Commonwealth/ Upper managers State</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Management systems, which provide an integrated and coordinated approach to the marine environment, are in widespread use.</td>
<td>2001-2005</td>
<td>Commonwealth/ Upper managers State</td>
<td></td>
<td>The implementation of management systems will be important to enable the effective maintenance and sustainable development of the sensitive marine environment.</td>
</tr>
<tr>
<td>59. A national marine database for the Exclusive Economic Zone is in widespread use including physical, resource and biological data.</td>
<td>2001-2005</td>
<td>Commonwealth/ Upper managers State</td>
<td></td>
<td>The nature, volume and location of the EEZ marine assets must be determined if their responsible management and exploitation are to be achieved.</td>
</tr>
<tr>
<td>62. Multi-lateral cooperation in the management of oceans and seas in Australia’s proximity is widespread.</td>
<td>2001-2005</td>
<td>Commonwealth/ Upper managers State</td>
<td></td>
<td>Essential to meet Australia’s UNCLOS obligations and important for Australia’s bilateral relations with neighbouring countries (e.g. fish do not recognise marine boundaries).</td>
</tr>
</tbody>
</table>

The EEZ Resources and Management priority area received the highest combined mean score for Australian opportunities and capabilities. This reflects the respondents' positive views about the opportunities for Australia arising from the EEZ, Australia’s capabilities to take advantage of these opportunities and their view that the creation of a national authority or central coordinating agency is critically important to exploit the opportunities and to fulfil Australia’s obligations arising from proclamation of Australia’s marine zones.
Other important issues

Other issues considered important by the Partnership are listed below but the Partnership did not make any specific recommendations on them.

Managing Ballast Water

The Partnership is aware that Australia has taken a leading position in improving the management of ballast water and that the Australian Quarantine and Inspection Service (AQIS) has to date coordinated management of the ballast water issue in Australia. Government actions include the establishment of an Australian Ballast Water Management Advisory Council and funding of research through a national Centre for Research on Introduced Marine Pests within CSIRO’s Marine Laboratories in Hobart. The Partnership strongly supports these activities.

Export of marine equipment and marine management expertise

The Partnership is aware that Australian marine equipment marine management suppliers have been successful in exports. Australia also has potential as a base for foreign companies marketing marine products in the Asia Pacific region.

Respondents ranked Australian service providers highly in respect of selling marine management capability overseas but considered that Australian capabilities were below average in respect of the export of marine equipment.

The Partnership believes that this is an issue which could become more important for Australian export of services nearer the expected time-frame for realisation, 2001–2005.

Cargo handling and measurement technologies

There were four topic statements postulating developments in regard to the widespread use of self-discharging vessels, slurry transport of coal with offshore loading and discharge, dust control technology permitting the loading and discharge of powdered bulk cargoes at increased rates and an alternative means of cargo measurement to draft survey. All were assessed as having significant influence upon wealth creation and the first three as beneficial to quality of life. Australian capabilities were ranked high for all four topic statements.

Marine Pollution Monitoring Systems

Respondents considered that the development of monitoring systems which would facilitate the enforcement of marine pollution regulations, for example, by satellite, would be in widespread use by year 2005. They considered that such systems would benefit Australian quality of life but have only a marginal impact on wealth creation. Australia was considered to be at the leading edge of development in respect of science and technology capability, innovation and production but lagging the rest of the world in respect of exploitation and commercialisation potential.
RECOMMENDATIONS

The Partnership made 18 recommendations in two sets.

A. Recommendation relating to the development of an Australian shipbuilding industry development program

The Partnership recommends that:
- the Australian Maritime Engineering Cooperative Research Centre's (AMCRC) participants lay the foundation for an Australian shipbuilding industry development program fostering innovation in shipbuilding and covering such elements as strategic marketing, design and production process improvement, collaboration and technology transfer.
- the Departments of Defence and Industry, Science and Tourism, in conjunction with Australian shipbuilders, develop and implement such a program.

Australia has no comparable program to the United States National Shipbuilding Research Program (NSRP) (discussed above) which provides an industry-driven collaborative forum for the discussion of ship-building technology and management issues affecting the industry.

The support provided by the US Department of Defence is a key factor in the organisational arrangements underpinning the NSRP. It provides funding of about $US 3–4 million per annum to the NSRP, which when combined with matching industry funding, makes the effective value of the program worth about $US 8–10 million per annum. In view of current discussions surrounding the eligibility of sectoral industry support under the OECD Agreement on shipbuilding subsidies, these US programs are of special interest.

The most important element for any Australian shipbuilding industry development program to succeed is the active participation of the Australian shipbuilding industry. As mentioned above, the NSRP is cost-shared between government and industry, it is directed by a learned society and the program is acknowledged to be industry-driven. Similarly, in Australia, it is essential that Australia's naval and commercial shipbuilders collaborate and participate in the program to ensure that the program is directed towards improving the industry's performance and competitiveness in international export markets.

The Shipping Partnership believes it is well-constituted to take on the role of an Industry-Government planning element for such a program.

B. Recommendations relating to the Priority Areas identified in the study.

The Partnership believes that the steps proposed in its list of recommendations, detailed in the action plan in the full report, will lay the foundation for an innovative Australian
RECOMMENDATIONS

shipping and shipbuilding industry for the future. It envisages a "partnership approach" to implementation which will require, inter alia, that:

**Industry**
- foster the creation of design and professional engineering expertise to avoid possible future increasing reliance on overseas design capability;
- support CRC collaboration on the integration of design and construction technology;
- develop and implement a national shipbuilding industry development program.

**The Cooperative Research Centres**
- lay the foundation for a national shipbuilding industry development program;
- give priority in their research programs to supporting imaginative and technologically intensive concepts to improve ship performance and construction efficiency;
- support research into technologies associated with port interface efficiencies in terms of both the physical aspects and the information interface.

**The Department of Defence**
- consider longer term contracts covering both build and through life support requirements;
- consider the use of ship design consultancies when developing conceptual designs for tendering processes;
- give consideration to industry needs in terms of skills retention and development when programming shipbuild, maintenance and repair requirements;
- investigate the feasibility for military operations of high-speed light-weight vessels.

**The Federal Government**
- support R&D and the maintenance of workforce skills;
- implement policies aimed at improving waterfront performance;
- promote a self reliant Australian industry warship design and build capability;
- support industry penetration of market opportunities in the region, for example through continued support for Austrade’s market intelligence activities;
- implement policies that encourage Australian shipowners to buy Australian-built fast ships for operation under the Australian flag;
- consider the establishment of a National Authority for EEZ resource assessment, management and sustainable development.
FURTHER ACTIONS
OF THE PARTNERSHIP

For its part, the Shipping Partnership intends to:

- disseminate information and encourage implementation of recommendations;
- consult and work with other bodies (eg AMISC, Government Oceans Policy Inter-Departmental Committee, AMSA);
- investigate ways of fostering an adequate Australian design and professional capability
- identify suitable set of benchmarking measures for the Australian shipbuilding industry

Consultations

The scope of the report overlaps work being undertaken by other bodies. The Partnership looks forward to a productive working relationship with them. These bodies include:

- Australian Marine Industries and Sciences Council;
- The Federal Government’s Inter-Departmental Committee on Oceans policy;
- The Australian Maritime Safety Authority (AMSA); and
- The ANZECC Maritime Accidents and Pollution Implementation Group.

8 The Partnership, as presently constituted, believes that it should continue to meet on a regular basis, initially for a further period of twelve months, in order to encourage the implementation of the recommendations in its Report and to undertake the tasks assigned to it in relation to the two recommendations above.

9 The Partnership considers that AMISC can play an important coordinating role. It has made a submission to the 1996 AMISC draft strategy, proposing enhanced strategy development and implementation arrangements.
APPENDIX A.
MEMBERS OF THE
AUSTRALIAN SCIENCE,
TECHNOLOGY AND
ENGINEERING COUNCIL.

Dr Don Williams AO FTSE
(Chairman)
Director
South Australian Ships Pty Ltd

Professor Ron Johnston FTSE
(Deputy Chairman)
Director
ACIIC
Faculty of Engineering
University of Sydney

Professor Lyn Beazley
Professor of Zoology
Department of Zoology
The University of Western Australia

Mr Donald Blesing
Agribusiness adviser

Professor William J Caelli
Head
School of Data Communications
Queensland University of Technology

Dr Doreen Clark FTSE
Managing Director
Analchem Bioassay Pty Ltd

Dr Elizabeth Heij
Chief
CSIRO Division of Horticulture

Professor John de Laeter AO FTSE
Department of Applied Physics
Curtin University of Technology

Professor Helene Marsh
Head of Department
Department of Tropical Environment Studies and Geography
James Cook University of North Queensland

Dr Carolyn Mountford
Executive Director
The Institute for Magnetic Resonance Research
University of Sydney

Mr John D Vines
Executive Director
The Association of Professional Engineers, Scientists and Managers of Australia