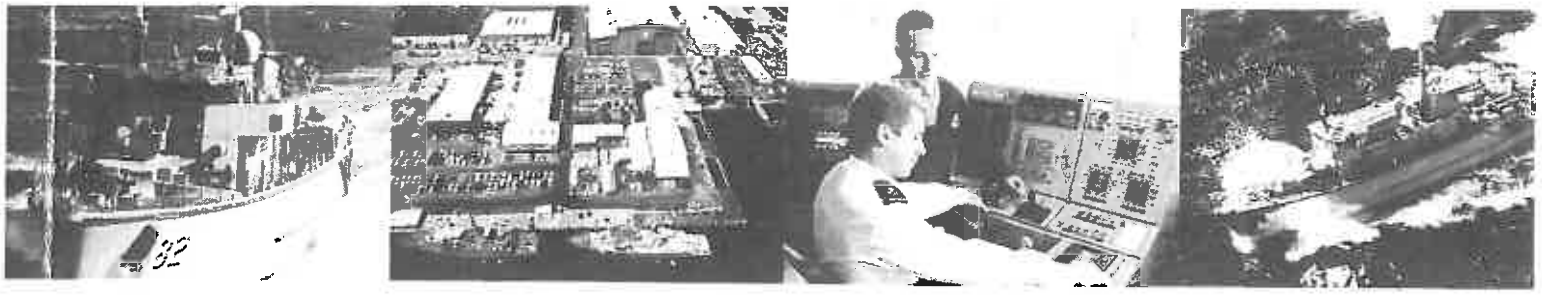

Tasman Economics

World Class Solutions for Business and Government

IMPACT OF MAJOR DEFENCE PROJECTS:
A CASE STUDY OF THE MINEHUNTER COASTAL PROJECT

FINAL REPORT

JANUARY 2002

PREPARED FOR THE AUSTRALIAN INDUSTRY GROUP DEFENCE COUNCIL

SPONSORED BY:

Department of State and Regional Development

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Mark Thomson

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MHC CASE STUDY — KEY FINDINGS

Defence's decision to source its new Minehunter Coastal capability from Australian industry rather than from overseas suppliers has been:

- a win for the economy and regional Australia;
- a win for Australian industry; and
- a win for Defence.

The Economy

Over the nine years of the construction phase, the Minehunter Coastal project will have:

- contributed up to $887 million to Gross Domestic Product;
- contributed up to $492 million to Consumption; and
- directly and indirectly generated (or sustained) an average of more than 1,800 full-time equivalent jobs each year.

As a comparison, the project's contribution to Gross Domestic Product is more than sufficient to fund the Federal Government's:

- National Action Plan to address salinity ($700 million); as well as
- recent initiatives to increase the number of nurses practicing in rural and regional Australia ($104 million) and improve Australian's access to after hours medical care ($43 million).

Regional Australia

The Minehunter Coastal Vessels are being constructed in Newcastle, New South Wales. The construction of the vessels has directly and indirectly (through flow on effects) generated economic activity and employment for the Newcastle region. For example, over the period of the construction phase the project will have created at least 3,180 jobs in the Newcastle region.

Industry and Defence

The opportunity to be involved in a major Defence project, such as the MHC project, has had positive long-term impacts. For example, many participating Australian businesses have:

- become more productive and competitive as a result of project-related technology transfers;
- adopted tools that have enhanced productivity and other aspects of performance in order to conform to Defence's stringent risk mitigating requirements; and
- acquired capabilities which enhance and extend Australian industry's integral role in the national defence effort.

Consultations with key stakeholders also indicate that, at this early stage, the involvement of Australian industry in the ship's in-service support is producing significant benefits including:

- savings in the amount of money and resources Defence needs to outlay on in-service support; and
- shorter repair turn around times, which in turn flows through to improved operational capability.

The importance of having a strong in-country industry capability to support Defence becomes particularly obvious in periods of international crisis, such as the current War on Terrorism.

SUMMARY

Debate about the merits of sourcing complex defence capabilities offshore or in Australia has been an issue for decades.

The MHC project case study is the second in a series of reports designed to shed light on this important issue.

This report on the Minehunter Coastal (MHC) project is the second in an Australian Industry Group Defence Council/Tasman Economics series of Defence industry case studies. These studies are designed to help shed light on the impact of Department of Defence decisions to acquire a major new Defence capability using Australian based suppliers. The first study in the series examined the economic impact of constructing the ANZAC frigates in Australia (Tasman 2000). This study builds on, and substantively adds to, the earlier study's positive findings. It puts forward new quantitative and qualitative data to give more rigour to the policy debate and provide a sound basis for future industry policy development.

Consistent with the earlier ANZAC frigate case study, the analysis for the MHC project case study is based on industry level analysis (using national input-output statistics and a general equilibrium model of the Australian economy) and firm level analysis (using a mail out survey questionnaire* and firm level interviews).

The Australian Industry Group Defence Council has initiated both case studies. However, support from other organisations, including the prime contractor (ADI Limited) and the Commonwealth Department of Defence has been crucial to the case study's success. Chapter 1 provides a full listing of the organisations that provided financial or other support for the project.

Ship 01 - HMAS HUON

The MHC project

In 1994, the Department of Defence awarded ADI Limited a contract to build six Italian designed minehunter vessels at a total contract value of $917 million — the contract value in 2001 dollars is over $1 billion.

Dubbed the 'Huon Class' in Australia, the ships are sometimes

* The survey response rate was 47.8 per cent, a very high rate for a privately conducted survey.

considered as an "off-the-shelf" purchase. However, ship modifications under the contract impacted on over 80 per cent of the original Italian design. This redesign work was done by ADI and in the process, established the company as the in-country design authority for the vessel.

To meet the RAN's requirements over 80 per cent of the original design was changed in some way.

The Australian Huon Class Minehunter, based on its original design and as modified for the RAN, is a unique vessel. For example:

- the composite hull design does not require ribs, frames or stiffeners, giving it unparalleled resistance to shock caused by sea mine explosions;
- the on-board equipment is specially isolated from the hull, further enhancing its shock resistant capabilities and lessening noise transmitted through the hull;
- the completed vessel has a lower magnetic signature than originally specified by the RAN;
- the purpose designed and built command and control system incorporates a state-of-the-art mine hunting sonar;
- the precision positioning system keeps the vessel on station above a fixed point on the sea bed while it hunts for mines;
- the ship is equipped with two Saab Double Eagle mine disposal vehicles, and
- the on-board recompression chamber has been designed and built to RAN specifications.

The Australian Huon Class Minehunter is a unique vessel.

Although based on a foreign ship design, ADI achieved a level of Australian Industry Involvement (AII) in excess of 68 per cent of the contract value. Achieving such a high level of AII was, in part, due to the involvement of the New South Wales Industrial Supplies Office (ISO).

Local involvement in the MHC project exceeds 68 per cent of the contract value.

The ISO, through its extensive network, had the ability to identify Australian businesses which could supply many of Minehunters' components and related products and services, often at a significant cost and/or quality advantage. In some cases, the ISO assisted the prime contractor to identify high quality substitutes for the foreign original equipment specified in the ship's Italian design.

The ISO played an important role in ADI achieving the high level of local content.

Small, medium and large businesses have been directly or indirectly involved in the MHC project

Many Australian business units are or have been directly or indirectly involved in the MHC project. Businesses from Australia's manufacturing and services sector played important roles in the MHC project. Even though the ANZAC and MHC projects were based in quite different geographic areas both had a high level of Small to Medium Enterprise (SME) involvement and a high level of first time participants in a defence contract.

The MHC case study's findings

The MHC case study demonstrates that the project has been:

- a win for the economy and regional Australia;
- a win for Australian industry; and
- a win for Defence.

A win for the economy

Defence's decision to construct the Minehunters in Australia rather than purchase similar vessels offshore has improved Australia's economic wellbeing.

Australia would have been worse off if Defence had sourced its minehunter capability requirements "off the shelf" from an overseas supplier rather than from Australian industry. Over the construction period and compared with the import replacement alternative, Australia had higher annual levels of Gross Domestic Product, consumption and employment.

The MHC project is a win for the economy on a number of fronts. First, the project generated demand for locally produced goods and services. Second, the project created opportunities for technology transfers and for participating businesses to improve many aspects of their export and overall performance.

The construction of the Minehunters in Australian has contributed positively to Australia's current levels of GDP, consumption and employment.

Over the nine years of the MHC construction phase, the project has:

- contributed up to $887 million to Gross Domestic Product;
- contributed up to $492 million to consumption; and
- directly and indirectly generated (or sustained) an average of more than 1,800 full-time equivalent jobs each year.

Looked at another way, each additional $100 million spend by the Australian Government on the MHC project will generate a

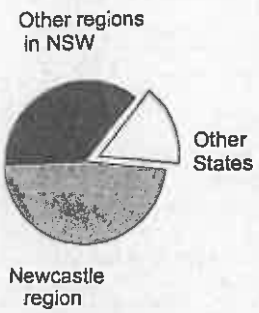
further $195.6 million increase in national output and 836 Australian jobs.

To help put these estimates in perspective, the MHC project's contribution to Gross Domestic Product is more than sufficient to fund the Federal Government's:

- National Action Plan to address salinity ($700 million); as well as
- recent initiatives to increase the number of nurses practicing in rural and regional Australia ($104 million) and improve Australian's access to after hours medical care ($43 million).

- **Regional benefits**

MHC suppliers by location



Most of the businesses participating in the MHC project are located in New South Wales. Many of these New South Wales subcontractors and suppliers are located in the Newcastle region, which is also the location of the prime contractor's MHC facilities.

The ANZAC ship case study also identified a similar link between the prime contractor's location and the location of its Australian suppliers. Together these case studies indicate that the State in which the prime contractor's work is carried out enjoys a significant proportion of the economic activity generated by the project.

The MHC directly generated 3,180 full-time equivalent jobs in the Newcastle region.

The benefits of the MHC project are particularly apparent in the Newcastle region of New South Wales. Input-output multiplier analysis indicates the MHC project would have generated (or sustained from year to year) at least 3,180 full-time equivalent jobs in this region. This contribution to the region's employment does not take into account the flow on employment effects that are associated with such a major project.

The Newcastle region suffers much higher rates of unemployment than the national average. In the absence of the MHC project the unemployment rate for the Newcastle region would have been even higher, putting further pressure

on the local community and the State and Federal Governments' budgets. For example, if the ships had been purchased overseas Federal Government outlays on the Newstart Allowance (or its equivalent) alone could have, in net present value terms, been around $21 million higher.

A fillip for Australian industry

The opportunity to be involved in a major Defence project such as the MHC project has had positive long-term impacts on many of the businesses participating in the project.

Respondents to the MHC survey indicated that their businesses association with the project had led to:

- technology transfers;
- the take-up of practices to enhance performance;
- enhanced exports or improved export potential; and
- higher productivity.

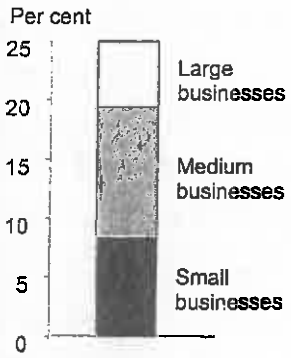
- **Many business obtained technology transfers**

Around 25 per cent of MHC businesses surveyed obtained a technology transfer as a result of being involved with the project. Once again these results had a high correlation rate with the ANZAC study. Small, medium and large firms were equally likely to obtain a transfer of technology.

Commercial partnerships and staff training and research and development were the most frequently reported means of obtaining the transfer.

Improved productivity was the most commonly reported benefit of the technology transfer. Other benefits gained from technology transfer included broadening of product range, increased sales to Defence, quality improvements and greater production flexibility.

MHC businesses obtaining technology



Technology transfers improved productivity, broadened Defence sales opportunities and improved product and service quality.

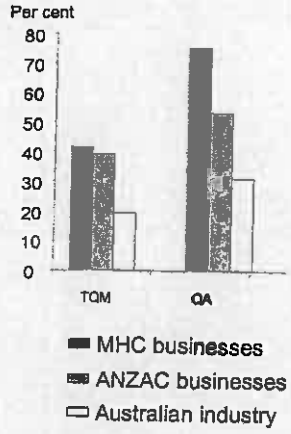
- **Take-up of performance enhancing practices**

As part of its approach to mitigating risk, Defence contracting stipulates that a range of leading edge standards and processes be adopted by its contractors.

Defence businesses are much more likely to use processes to enhance performance than their

non-Defence counterparts.

Manufacturing sector



Case study findings suggest that industry conformance to these Defence requirements has a 'pull' effect leading many businesses to adopt tools that enhance productivity and other aspects of performance.

A comparison of data from the MHC and the ANZAC frigate studies, against similar data collected by the Australian Bureau of Statistics, highlights that Defence businesses introduced processes to enhance performance such as total quality management and quality assurance programs at a consistently higher rate than the Australian industry average.

The most common benefits MHC survey respondents gained from implementing these practices were greater client satisfaction, the development of a culture of continuous improvement and increased opportunities for new business. A substantial number of businesses also reported their businesses achieved quality and productivity improvements as a result of the changed practices.

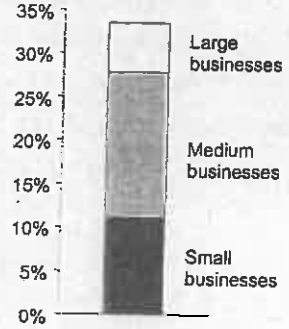
There is a strong link between Defence work and exporting.

- **Export potential enhanced**

Around 47 per cent of respondents to the MHC survey were involved in export activity. This high export propensity is consistent with the findings of the ANZAC study and contrasts markedly with an Australian industry average of 4 per cent and a manufacturing industry average of 13 per cent.

The higher export propensity of Defence industry firms suggests that businesses involved in Defence contracts may be characterised by a greater willingness to take risks for the sake of commercial gain than the industry population at large. It may also indicate that Defence work is an important export catalyst of itself.

MHC project improved export prospects



One-third of MHC businesses reported that involvement with the project had improved current or future export prospects. Survey findings also indicate that a business' ability to demonstrate it has successfully satisfied Defence's stringent conditions can lead to new defence business and non-defence related business in Australia and overseas. Small, medium

and large businesses were all equally likely to report this view.

- **Productivity improved**

Association with a major Defence project, such as the Minehunters, has a positive impact on the productivity of many businesses.

Around 35 per cent of responding businesses experienced an increase in their "overall" productivity as a consequence of being associated with the MHC project.

On average, these MHC businesses enjoyed a 2.24 per cent MHC project induced increase in the productivity of their entire operations. However, productivity increases varied and ranged from less than one per cent to around 10 per cent. As the increase in productivity applied to "overall" activity it can be expected to have a positive on-going benefit to Australia's economic wellbeing.

The ANZAC ship case study also identified a link between improved productivity and Defence work.

Improved Defence capability — a bonus for industry and Defence

As a result of their involvement in the MHC and other Defence projects, 80 per cent of survey respondents believed they were now better placed to undertake work on subsequent Defence projects.

Less than 30 per cent of respondents reported that defence work was crucial to the sustainability of their business. The majority considered that defence work either enhanced sustainability or was not crucial to sustainability. Most reported that involvement with the MHC project had contributed to net profit.

Australian industry is now able to provide the high quality, high technology equipment, training and support that Defence requires.

- **The Minehunters' in-service support**

Australian industry has

The involvement of Australian businesses in the MHC project has enhanced the capability of Australian industry to provide in-service support. Recognising this capability, the Department of Defence in 2000 awarded two Australian companies, ADI Limited and Thales Underwater Systems, in-service support contracts for the Minehunter Coastal Vessels.

the capability to support the Minehunters throughout their operational life.

Consultation with stakeholders indicates that the gap between the awarding of the construction and in-service support contacts created some problems for Defence and the prime contractor in the transition to in-service support. However, these risks have been managed and recent changes in Defence's contracting philosophy on through-life support, should enhance the transition and long-term support outcomes for future projects.

In-country through-life support is improving RAN's operational capability and is saving money and resources.

Consultations with key stakeholders also indicate that the Australian industry involvement in the ships' in-service support is producing significant benefits including:

- savings in the amount of money and resources Defence needs to outlay on in-service support; and
- shorter repair turn around times, which in turn flows through to improved operational capability.

Also, in-country through-life support creates opportunities for "value adding" which would be less likely to be obtained through an out-of-country arrangement.

The importance of having a strong in-country through-life support capability becomes particularly obvious in periods of international crisis, such as the Gulf War and the War on Terrorism.

PART A: BACKGROUND

This case study report on the impact of the Minehunter Coastal (MHC) project is presented in three parts.

Part A provides background to the study. Chapter 1 briefly describes the methodology used in the case study. Chapter 2 outlines the nature and scope of the MHC project and identifies the contribution played by the New South Wales Industrial Supplies Office (ISO) in its success.

Part B presents key findings from the MHC survey conducted by the Australian Industry Group Defence Council (Ai Group Defence Council) and Tasman Economics in June 2001. Issues covered in this part are:

- the extent of technology transfer associated with the MHC and its impact on individual businesses;
- the extent that MHC businesses compared with the wider business community have implemented programs and practices which have been linked to improved performance;
- the role of the MHC in improving participating businesses export performance; and
- the capability and sustainability of 'Defence industry' businesses.

Part C considers how a project such as the MHC project impacts on the economy. Chapter 8 considers how the improved ability of Australian industry to supply the Department of Defence and its contractors has impacted on through-life support for major acquisitions such as the MHC vessels. Finally, Chapter 9 examines how the decision to construct the vessels in Australia rather than purchase similar vessels overseas has impacted on national output, value added (GDP) and employment. The Chapter and its accompanying appendix also considers how the benefits gained from the MHC project by individual participating businesses have affected a regional centre and the economy as whole.

1. INTRODUCTION

Currently, there is very little information on the impact of sourcing major Defence acquisitions in Australia rather than from overseas. This report is the second in a series of case studies which aims to help fill this information gap.

In 1999, the Ai Group Defence Council commissioned Tasman to examine the economic impact of constructing the ANZAC frigates in Australia. This study into the Minehunter Coastal Project (MHC project) was designed to explore further the results of the first study and also provide more information about the impact on Australian industry of Defence related spending.

In addition to the Ai Group Defence Council, the MHC project case study has the support of a number of organisations. These are the MHC prime contractor ADI Limited (ADI), the Commonwealth Departments of Defence and Industry, Tourism and Resources, the New South Wales Department of State and Regional Development and the ISONET, assistance was also provided by the Commonwealth Department of Finance and Administration and the NSW Industrial Supplies Office.

1.2 METHODOLOGY

This report draws together the findings from a four-phase project.

In phase one, businesses associated with the MHC were surveyed to obtain information about the impact of their involvement on various aspects of their business environment.

In phase two, Tasman Economics developed an input-output database of the Australian economy, which separately identified the MHC. This database has been used to estimate the project's contributions to Australia's output, value added and employment.

In phase three, the survey information was used in conjunction with the input-output database and a general equilibrium model to examine some of the more dynamic impacts of Australian industry involvement with a major defence project.

The final phase of the study focused on the impact of Australian industry involvement on the through-life support of a major defence acquisition.

2. THE MINEHUNTER COASTAL PROJECT

In 1991, the Defence Force Structure Review recommended that the Department of Defence acquire new minehunter vessels as a matter of priority. These new vessels would need to operate in deeper and more exposed waters and remain on station longer than the Royal Australian Navy's (RAN's) inshore minehunters.

In August 1994, the Department of Defence awarded ADI Limited (ADI) a $917 million — more than $1 billion in 2001 dollars — contract for the supply of six high technology HUON Class Minehunter Coastal vessels and associated support to the Royal Australian Navy. By May 2001, ADI had delivered four ships on schedule and within budget. The construction program is on schedule for the delivery of the last ship in late 2002. In 1999, ADI and Thales Underwater Systems were awarded contracts for the in-service support of the ships and their platform and combat system elements.

2.1 THE DESIGN

Mine hunting is an inherently dangerous, highly specialised activity. Minehunters enter minefields and use high frequency sonar to search for, detect and classify mine-like objects. Remotely controlled disposal vehicles or navy divers are then used to identify and neutralise the mines. The dedicated vessels needed to carry out these tasks must have a very high resistance to shock and extremely accurate manoeuvring and positioning systems. Minehunters also need low magnetic and acoustic signatures so that operations can be carried out with confidence that mines are not detonated by accident. In the event of accidental detonation, the vessel design should ensure a high level of survivability for the ship and the crew. Minehunters also need effective air and surface surveillance systems and self-defence capabilities. All of these features had to be accommodated in ADI's proposed design.

As part of its recommendation to acquire new minehunters, the Defence Force Structure Review also stressed that the new vessels should be appropriate for Australian conditions and of proven design. To help meet Defence's tender requirements ADI formed a partnership with Intermarine, an Italian firm. Intermarine has an extensive background in designing minehunters and five navies have variants of its Lerici Class of minehunter vessels in service or on order.

While the MHC ships are based on a proven design they cannot be considered as being "off-the-shelf". Modifications to the Italian design undertaken by ADI in conjunction with its subcontractors include:

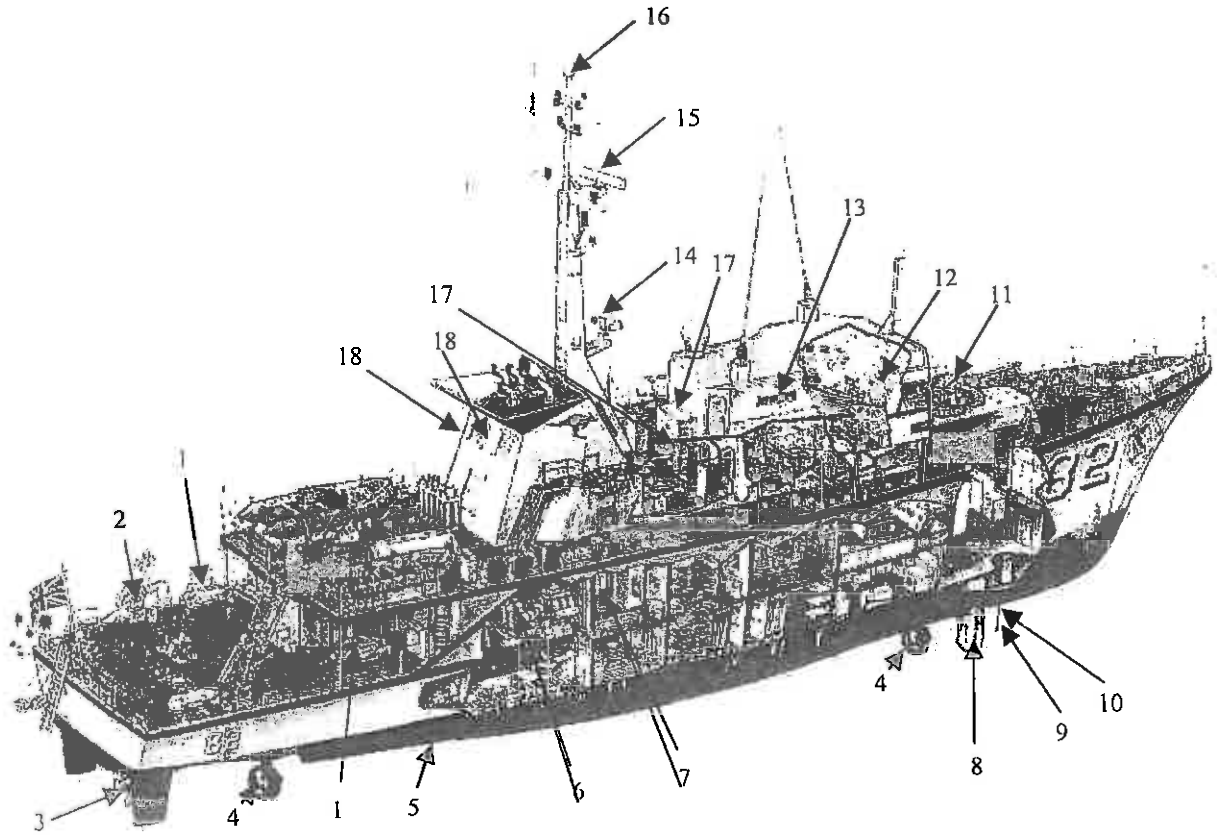
- the upgrading of the sonar;
- a new combat system;
- upgrading of the air conditioning system to improve operations in a tropical environment;
- improved accommodation; and
- extension of the upper deck to provide cover for the mine disposal vehicle and increased stowage for boats and a recompression chamber.

The MHC project is the first major Australian sourced naval defence project where the prime contractor was given design authority. As a consequence, most of the detailed design work for the MHC was carried out in Australia and by Australians. ADI advised the consultant that this detailed design work accounted for 80 per cent of the total ship design and included design definition, integration, installation and testing requirements.

Figure 1 presents a schematic diagram of ship 01 HMAS Huon. Key design features of the HUON class vessels include:

- the unique composite structure hull, which achieves a high level of shock resistance. In order to avoid local stress points (which could separate under shock conditions) the hull has been designed with no ribs, frames or stiffeners (see Figure 2);
- the mounting of sensitive equipment and machinery on cradles suspended from bulkheads and deckheads and the mounting of fuel and water tanks between watertight bulkheads, clear of the hull. When the ship's hull flexes under shock the equipment and tanks remain clear and unaffected. The machinery cradles also act to minimise the overall underwater radiated noise generated by the ship;
- the extremely low magnetic signature of the hull and equipment. The Royal Australian Navy measured the magnetic signature of the first ship and found that it was better than that required under the contract;
- a new command system, which integrates the tactical data system with the major platform and operational systems. This highly integrated system ensures that all operation and control equipment can be operated in a coordinated manner;
- a variable depth Thales Underwater Systems (TUS) mine hunting sonar, which has a dual frequency search and classification capability and is capable of deploying below any thermal layers in water. The sonar is also designed to perform in the extreme environments found in the northern and southern waters around Australia;

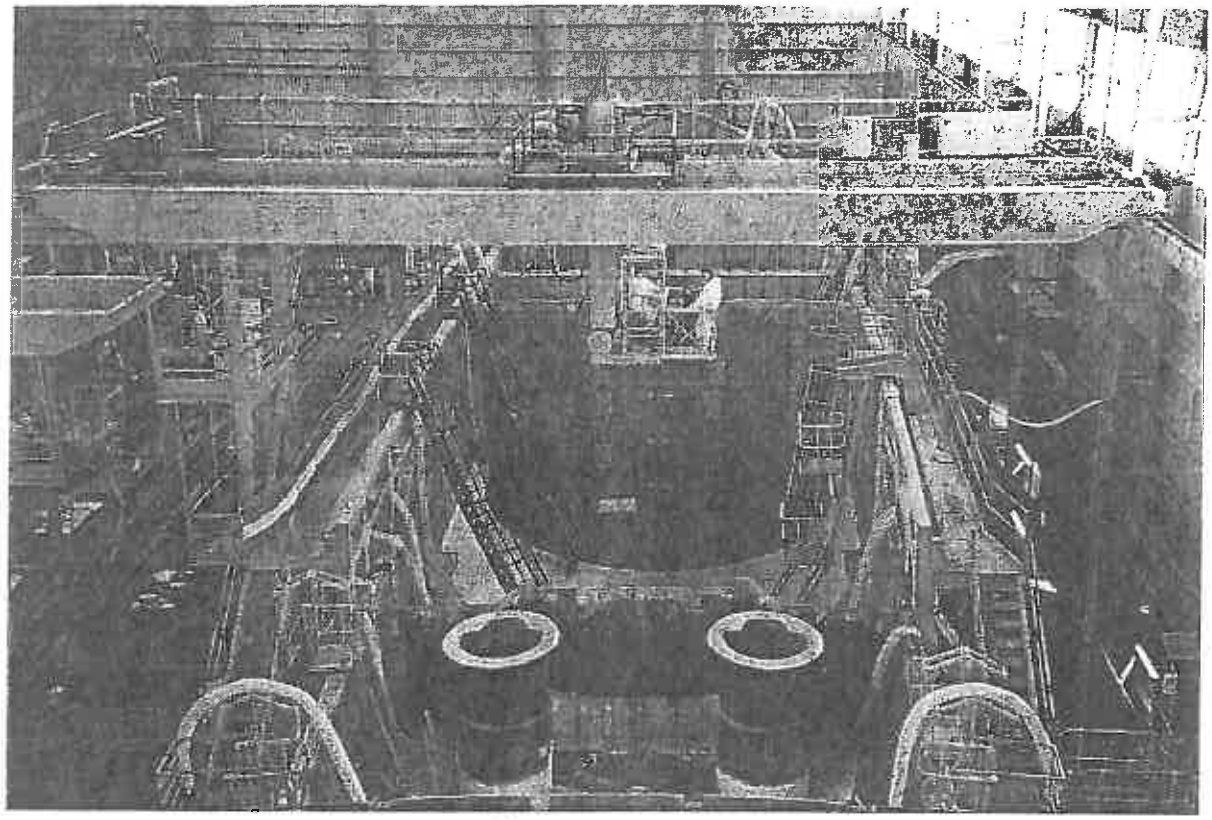
Figure 1: Key features of the Huon Class design



1. 2 x Saab Double Eagle Mine Disposal Vehicles
2. ADI Mine Sweeping System
3. acb Lips Controllable Pitch Propeller
4. 3 x 124kW Calzoni Auxiliary Propulsion Units
5. 1 x 1460kW Fincantieri GMT Diesel Engine
6. 3 x 350kW Isotta Fraschini Generating Sets
7. SEPA Control & Monitoring System
8. TUS Type 2093 (Aust) Sonar
9. TUS 2093 Monitor Transducer
10. Nautronix Acoustic Tracking System
11. MSI DS30B 30mm Gun
12. BAE SYSTEMS Nautis - IIM (Aust) Tactical Data System
13. CEA Integrated Internal/External Communications System
14. RADAMEC Electro Optical Surveillance System
15. Kelvin Hughes 1007 Radar
16. BAE SYSTEMS Prism III Electronic Support Measures
17. FRL Super Barricade Electronic Counter Measures
18. SITEP Closed Circuit Television System (4 Cameras)

- three retractable auxiliary propulsion units which assist in the critical manoeuvring and precise positioning of the ship in order to maintain safe hovering positions while mine identification is made and destruction measures are implemented; and
- two electrically powered Saab Underwater Systems Double Eagle mine disposal vehicles which can be deployed at distances of more than 500 metres from the ship. A fibre optic link between the vehicle and the ship is used to control the vehicle and is also used to relay images for display on the ships' multi-function consoles.

Figure 2: Construction of the composite structure hull



2.1.1 Construction innovations

ADI introduced a number of innovations in the construction of the MHCs that are not used in the Italian built vessels. The company introduced a Product Work Breakdown Structure (PWBS) to plan and control production tasks. The use of a PWBS allowed ADI to introduce modern shipbuilding methods which included:

- construction by stage;
- block outfitting; and
- zone outfitting.

IMPACT OF MAJOR DEFENCE PROJECTS: MINEHUNTER COASTAL CASE STUDY

These methods allow hull construction and outfitting tasks to be carried out in parallel, which significantly reduces the risk of falling behind the construction schedule. These methods also simplify tasks such as the laying of the ship's 63,000 metres of cables.

The construction strategy has been refined as the multiple build program has proceeded. One important development in the parallel hull construction and outfitting process was the block pre-outfittng of the engine room. This development resulted in significant improvements in the efficiency of the engine room outfit and in the quality of the workmanship.

2.2 PROJECT CHALLENGES

2.2.1 *A tight delivery schedule*

The contract schedule called for a very short period between the signing of the contract and the delivery of the first Minehunter Coastal Vessel. To meet this schedule ADI undertook a concurrent design and build program.

To start up the MHC Project, ADI had to: develop an understanding of the unique mine warfare needs of the customer; establish a design office, systems integration, and project management capability; and construct a purpose built construction facility. This facility is on a greenfield site at Carrington, a suburb of Newcastle, New South Wales. At the same time, ADI had to construct the first of this new class of warships, develop training facilities, train the crew and, finally, put the first vessel through a nine-month program of performance trials.

To meet the tight schedule ADI had the first composite hull manufactured in Italy, all subsequent hulls we constructed on site using an Australian made mould. The delivery of this first hull coincided with the effective completion of the new Carrington facility and construction and outfitting of ship 01 commenced.

ADI delivered the first vessel, HMAS Huon, on time and on budget in March 1999, four and a half years after signing the contract.

- **Quality management**

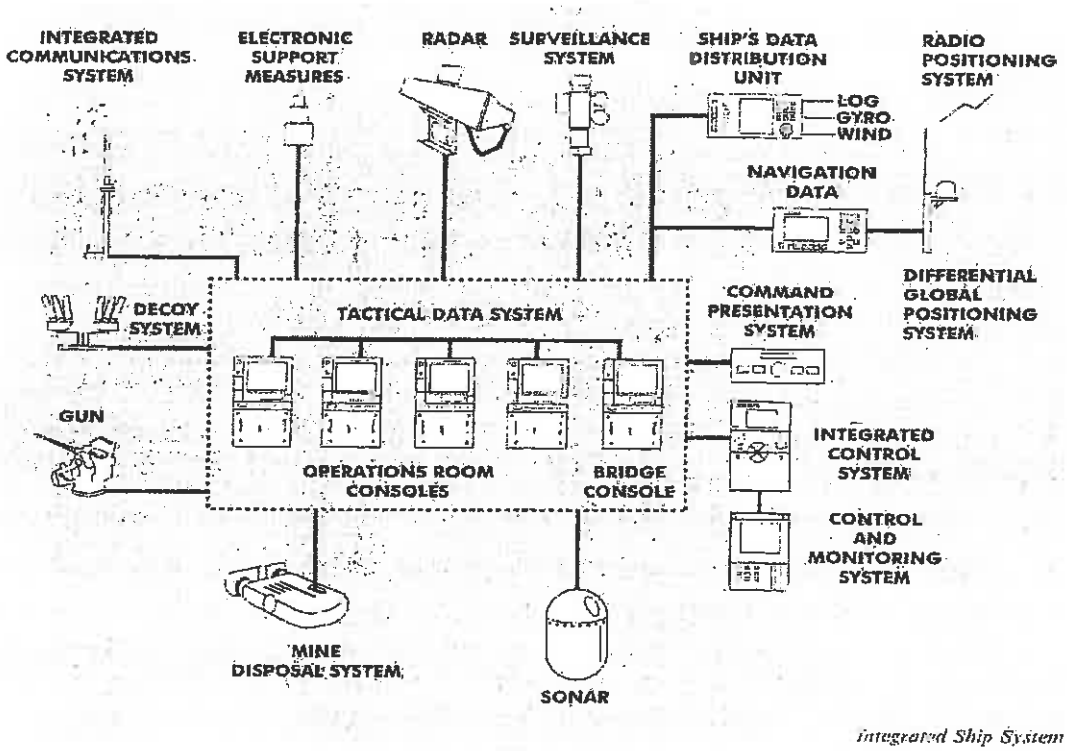
The Australian Department of Defence demands a high standard of quality from its prime contractors and subcontractors. The prime contractor is well aware of these requirements and has strict quality management systems in place. However, as the prime contractor was undertaking the MHC project's whole ship design and build program for the first time and on a greenfield site, an entirely new set of management processes and systems had to be

developed. Within six months of commencing the development of procedures ADI's quality management system was certified as complying with AS/NZS ISO 9001.

2.2.2 The new combat system

An array of complex electronic equipment and software intensive information processing systems had to be brought together for the first time in the MHC's new integrated combat system (see Figure 3). To help mitigate the risks associated with such a major integration project ADI invested in a shore-based integration facility at its Carrington site. The facility was able to make extensive use of simulation and simulation technology to replicate the environment that a vessel, undertaking minehunting activities, could be expected to experience.

Figure 3: The integration of the combat system



Source: ADI Limited.

The shore integration facility was initially used to simulate the combat system in order to establish and verify installation issues, interfaces, and data exchange protocols. The facility was also used to test the complex software functionality and integration.

ADI's decision to use a shore-based facility for the integration of the first combat system minimised the risk associated with this complex task and enabled the conduct of the first-of-class trials to be undertaken within a tight contract schedule.

In addition to these important roles, the facility is also used to support the training component of the MHC contract.

2.2.3 *Australian Industry Involvement - a contractual requirement*

Access to the industry capabilities needed to support and enhance Australia's Defence Force is a key policy objective of the Government. This policy objective was set out in the 1998 *Defence and Industry Strategic Policy Statement* and enunciated again in the recent *Defence 2000* White Paper (Commonwealth of Australia 2000). The White Paper stated:

> .... we want a sustainable and competitive defence industry base, able to support a technologically-advanced ADF. This calls for efficient, innovative and durable industries - and a close partnership between Defence and those industries (Commonwealth of Australia (2000) p.99).

The Australian Industry Involvement (AII) Program is the key tool for developing strategically important capabilities in Australian industry and for ensuring that in-country capacity exists to provide through-life support to Defence's capabilities. The *Australian Industry Involvement Manual* (DoD 2001, p. 2-1) states that:

> The goal of the AII program is to involve Australian industry in Defence's equipment acquisition projects so as to:
>
> a. develop a capability in Australian industry to support the equipment;
> b. sustain and develop strategically important capabilities in Australian industry that are identified in *Defence Needs of Australian Industry*;
> c. enhance the capability of defence-related industrial infrastructure to further develop Australia's defence self-reliance; and
> d. maximise the amount of involvement where this is cost effective.

Local content which sustains or enhances Australian industry's capability is an important focus of the AII program. Local content is defined as that part of the supply of major defence projects which is value-added by Australian and/or New Zealand industry. Imported content in items supplied locally is not treated as local content.

High local content (or value added) is significant for a number of reasons. First, it extends or enhances industry capability, which has positive flow on effects for effective in-country through-life support. Second, it assists Australian industry obtain a better understanding of the new equipment.

An Australian Industry Involvement plan formed a part of ADI's MHC contract. Under the terms of the MHC contract 68.4 per cent of the contract value must be local content. As a consequence of the re-design work required by the RAN, ADI had a high degree of flexibility in achieving this high level of local content. Ultimately ADI achieved a level of AII in excess of its target of 68.4 per cent. Part of this success was due to the assistance of the ISO and

its ability to source Australian suppliers for many products and services and, in some cases, substitute products for foreign original equipment at a significant cost and/or quality advantage.

2.3 THE ISO'S ROLE

ADI's close association with the ISO assisted the company in achieving this high level of local content. A consultant from the ISO worked closely with ADI from the tender period and in an on-going role for five years. The ISO helped ADI to identify local Hunter, New South Wales and Australian businesses which had the capability to supply ADI or its subcontractors with goods or services which would other wise have been sourced from overseas. ADI commented that:

> The NSWISO consultant made an important contribution to the Minehunter Coastal project's import replacement program. As a direct result of the combined efforts of NSWISO and ADI staff, at least $55 million of the initially proposed imports were replaced with products manufactured by local industry. The NSWISO performed an invaluable service that ADI was not resourced to do. Their assistance was a win for ADI, a win for Australian industry and a win for Defence in the short and long term.

More than 20 per cent of MHC survey respondents reporting an involvement with the MHC project indicated that the ISO had played a role in their company becoming involved in the project. In the majority of cases these businesses believed that the ISO's role was a major one. As outlined in Box 1, the ISO played an important role in recognising the Defence capabilities of Australian businesses and in creating links between individual businesses and the prime contractor.

Box 1: Some businesses experiences and perspectives on the ISO's role

Transform Composites, a Newcastle company, specialises in the design and manufacture of glass reinforced plastic (GRP) products. The company's main area of work focuses on the design and construction of components for passenger railway carriages. However, in 1993 the ISO approached the company's management and drew their attention to the GRP requirements of the MHC project. Transform Composites was subsequently awarded a contract to design and construct the minehunters' water and gas tight GRP doors and hatches. The company also constructed air conditioning ducting for the minehunters. The company's management considers the ISO, by first recognising their capability and then liaising between the MHC prime contractor and themselves, played a major role in the company winning its first defence project.

(continued)

Box 1: Some businesses experiences and perspectives on the ISO's role (continued)

Novamarine, a Newcastle firm whose primary activity pre-MHC was the supply and service of commercial marine equipment, was introduced to the MHC prime contractor by the ISO. Novamarine's CEO said that the ISO played a very important role in the company's involvement with the MHC project:

> *'Novamarine's capabilities could have been overlooked if the ISO had not made the initial introductions to ADI. The ISO opened the door, it was then up to Novamarine to prove themselves as being capable of undertaking Defence work. The company's work on the minehunters has created opportunities for it to work on other Defence projects. This would not have occurred without the ISO's initial involvement.'*

Baker and Provan, a mechanical engineering business in St Mary's New South Wales, reported that the Industrial Supplies Office played a major role in the company becoming a supplier for the MHC project. The ISO contribution was particularly important in the early stages of the project, the company's management said, "the ISO's assistance in the tender's preparation was invaluable".

Maxwell Engineering, a medium sized company operating in the Newcastle region, and **Spunaloy Castings** a small company in Ourimbah, New South Wales, were approached by the ISO in 1994. The ISO believed that together the companies had the capability to manufacture 30,000 copper nickel flanges from cast rather than the more usual wrought bar. Both companies agreed to be involved in a test run with Spunaloy producing the alloy in a variety of sizes and shapes and Maxwell Engineering using the alloy to manufacture the flanges to an Italian design. Tests of the alloy and the original batch of flanges indicated that not only could the imported components be replaced by this substitute Australian product but that the quality of the Australian product would meet all technical requirements including its magnetic signature.

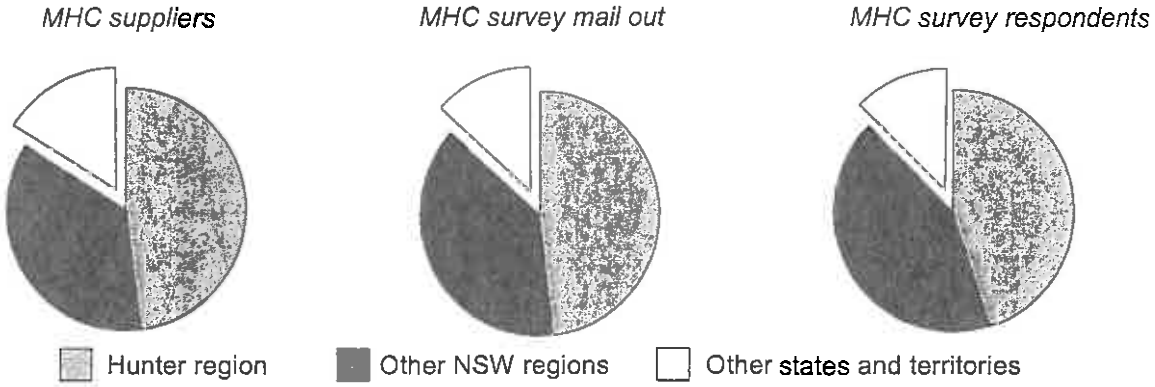
After the success of the tests full-scale production commenced. However, difficulties arose with subsequent deliveries of flanges, a major problem being cracking when the flanges were welded. Both Maxwell Engineering and Spunaloy advised the prime contractor that procedures used to produce subsequent batches were identical to the test run. After extensive investigations metallurgists identified a minute amount of impurity in the alloy, which was associated with the "wash" process used to clean the crucible. Once identified, the problem was resolved relatively simply by using a dedicated crucible for the manufacture of the minehunters' copper nickel castings. Maxwell Engineering and Spunaloy Casting's management consider that the ISO officer assigned to the MHC project put in an enormous amount of time and effort to help all parties resolve the problem.

2.4 SUPPLIERS AND SUBCONTRACTORS

Many Australian business units are or have been directly or indirectly involved in the MHC project. While businesses from all Australian states and territories are involved the majority are located in New South Wales (Figure 4). ADI's database of suppliers indicates that nearly 85 per cent of businesses supplying the MHC project are located in New South Wales — more than half of these are located in the Newcastle/Hunter Valley region of New South

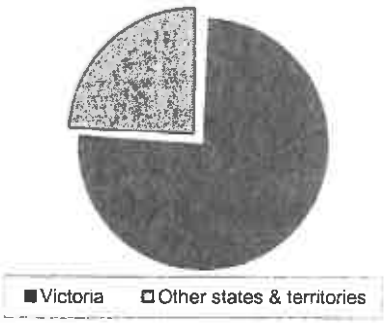
Wales. The location of MHC project survey respondents was also broadly consistent with the composition of MHC project suppliers and the MHC survey mail out (Figure 4).

Figure 4: Location of MHC Australian suppliers



The predominance of New South Wales businesses in the list of Australian MHC project suppliers is in large part explained by the location of the MHC prime contractor in Newcastle, New South Wales. A similar link between the prime contractor location and Australian suppliers was identified in the ANZAC ship case study. In that instance, approximately 75 per cent of Australian subcontractor businesses were located in Victoria where the vessels were constructed (Figure 5).

Figure 5: ANZAC ship Australian subcontractors



Source: Tasman (2000).

Australian MHC project suppliers come from a diverse range of industries including the:

- Plastic Product Rigid Fibre Reinforced Manufacturing Industry;
- Non-Metallic Mineral Product Manufacturing Industry;
- Non-Ferrous Basic Metal Product Manufacturing Industry;
- Structural Metal Product Manufacturing Industry;
- Sheet Metal Product Manufacturing Industry;
- Fabricated Metal Product Manufacturing Industry;
- Photographic and Scientific Equipment Manufacturing Industry;
- Electronic Equipment Manufacturing Industry;
- Electrical Equipment and Appliance Manufacturing Industry;
- Industrial Machinery and Equipment Manufacturing Industry;
- Furniture Manufacturing Industry;
- Building Construction Industry;
- Computer Services Industry;

- Machinery and Equipment Hiring and Leasing Industry; and
- Marketing and Business Management Services Industry.

Activities undertaken by MHC project suppliers are also diverse as the responses to the survey question, reported in Box 2, illustrate.

Box 2: Primary activities undertaken by MHC survey respondents

Participants in the MHC survey were asked to describe the main activity undertaken by their business. The following is a listing of the responses to this question.

- Integrated logistic support;
- Systems management and integration of communications equipment;
- Manufacturing engineered textiles and agency importers;
- Ship repair and refit;
- Manufacture of fire detection and suppression products;
- Mechanical engineering;
- Manufacturing and servicing of recompression chambers and hyperbaric equipment;
- Drafting and technical services;
- Manufacturing and support of complex large equipment;
- Manufacturing of wires cables and electrical interconnect components;
- Supply of marine equipment;
- Design and manufacturing of specialist glass reinforced plastic products;
- Design and manufacturing of galley equipment;
- Engineering and IT services;
- Supply of industrial products;
- Design and manufacturing of large diesel gas turbine exhaust systems, acoustic design and installation, thermal insulation exhaust gas purification equipment;
- Stainless steel fabrication;
- Metal fabrication;
- Supply of industrial fasteners;
- Manufacturing machined or fabricated metal products;
- Manufacturing air systems;
- Design and manufacturing hydraulic cylinders and associated equipment;
- Recruitment of permanent and temporary staff;
- Softwear and support;
- Manufacturing stainless steel pipe, fitting, flanges etc;
- Manufacturing hoses and assemblies;
- Manufacturing and supply of industrial safety equipment including breathing apparatus;
- Engineering technology solutions and services - CAD/CAM;
- Supply of industrial insulation, sheet-metal and marine preservation;
- Manufacturing high pressure gas/liquid systems and equipment;

(Continued)

Box 2: Primary activities undertaken by MHC survey respondents (continued)

- Design, manufacture and supply of hot water systems and associated vessels and equipment;
- Engineering;
- Consulting, supply and servicing of specialised equipment;
- Building and civil engineering construction;
- International freight forwarding customs clearance;
- Computer programming and task analysis;
- Sonar design and manufacturing;
- Supplying building materials;
- Manufacturing communications equipment;
- Precision machining of components;
- Sales and service of diesel engines;
- Sales and service of filtration and separation solutions products;
- Project management;
- Security services;
- Payroll software and support;
- Supply stainless steel;
- Crane hire;
- Manufacturing sealing products;
- Manufacturing and supply of waste-water treatment plants;
- Mechanical engineering and engine reconditioning;
- Sales and manufacturing of hydraulic and pneumatic hoses;
- Management consulting services;
- Supply and service of electronic equipment;
- Manufacturing marine safety goods;
- Manufacturing engineering equipment;
- Supply of catering and other on-site amenities services;
- Testing of materials;
- Supply and installation of floor coverings;
- Supplying purchasing services;
- Manufacturing rubber fendering;
- Supplying protective coatings/paint;
- Manufacturing polyester resin;
- Manufacturing and supply of navigation and infra-red systems;
- Manufacturing of training and simulation products;
- Manufacturing and supply of filters and pumps;
- Manufacturing fibre reinforced plastic products;
- Manufacturing, supply and service of underwater equipment;
- Manufacturing of joinery items — ships furniture;
- Computer software development; and
- Project management and technical support services.

2.5 A SUCCESSFUL PROJECT

The success of the MHC project has been acknowledged by the prime contractor's industry peers, the Government and its client the Department of Defence.

Peer recognition includes:

- a 1999 Engineering Excellence Award, from the Institution of Engineers, Australia Newcastle Division; and
- a 1999 National Engineering Excellence award from the Institution of Engineers, Australia.

The following comments by the (then) Minister for Defence, John Moore at the launch of the fifth ship HMAS DIAMANTINA in December 2000 are an example of the Federal Government's recognition of the project's success. The Minister said:

> The Minehunter Coastal Project is delivering world-class capability to Navy and the Australian Defence Force, ...
>
> Managed by the Defence Material Organisation in partnership with ADI, this project has, been very successful, drawing on the best skills and technologies Australia has to offer. .....
>
> This positive partnership between Defence and industry demonstrates that, with responsible project management, Defence capability can be delivered on time and on budget (The Hon. John Moore 2000).

The Department of Defence's Inspector General Division in a recent audit of the Department's MHC project office and the MHC prime contractor has favourably reported on key performance measures for the project. Key audit findings were:

- since inception, the Project has been well managed;
- at this time, assessed against the conventional measures of project performance, (Cost, Schedule and Performance) the project appears highly successful;
- the major risks appear to have been identified by the Project and are being vigorously managed;
- both the sponsor (Capability Division) and the client (Maritime Command) expressed a high level of satisfaction with the Mine Hunter Coastal platform and its transition into service; and
- once the platform is accepted into service it should provide the ADF with a significant 'cutting edge' capability in the maritime operational environment (DoD 2001, p. 4).

On the release of the audit report Mr Jim Clough, a Director from the Inspector General's Management Audit Branch, said:

> The audit found that the MHC project is well managed and is achieving good results. It is better than some similar projects in terms of risk, cost and performance outcomes. It shows good signs of fulfilling the performance requirements stipulated. It's a credit to both the ship building industry and to the DMO [Defence Materiel Organisation] (On Target, 2001, p.3).

PART B: FIRM LEVEL IMPACTS OF THE MINEHUNTER PROJECT

Many Australian businesses have directly or indirectly been involved with the MHC project. This part of the MHC project case study examines how participation in the project has impacted on individual businesses' operations. A survey questionnaire and firm level interviews were important sources of information for this analysis.

THE MHC SURVEY

The MHC survey follows on from a previous survey of businesses involved in the ANZAC Ship Project (Tasman 2000). Like the previous survey the MHC survey questionnaire, was designed to help identify any dynamic or spin off impacts of major Defence projects on individual business. The questionnaire explored the impact of the MHC project on technology transfer, uptake of business practices, exports, productivity and defence capability. Tasman Economics developed the survey questionnaire with the assistance of the Ai Group Defence Council and a number of key supporters of the project including the MHC prime contractor, ADI Limited, and the Commonwealth Departments of Defence, Industry Science and Resources and Finance and Administration. The survey questionnaire is reproduced in Appendix 1.

Where possible the MHC survey findings have been compared with outcomes in the wider business population through firm level information collected in the Australian Bureau of Statistics Business Longitudinal Surveys that were undertaken in 1995-96 and 1997-98 (the last year of the survey).

Survey Respondents

The MHC survey questionnaire was dispatched to 179 Australian businesses identified in the prime contractor's database as having an involvement in the MHC. The businesses included in the survey mail out accounted for around 95 per cent of the total value of supplies to ADI's Minehunter operations in Carrington, NSW. The extent of individual businesses involvement in the MHC project varied significantly with contract values (in $A1993) ranging from just over $150,000 to more than $200 million.

Eighty businesses responded to the survey questionnaire. This number of responses (after adjusting the survey population to take account of businesses that had merged or were no longer operating at the address in the prime contractor's database) represents a response rate of 47.8 per cent. This is an excellent response rate for a privately conducted survey. The New South Wales Industrial Supplies Office's role in contacting non-respondents and

urging them to respond was an important factor in achieving this high response rate. Seventy-two respondents indicated that their business had been involved in the MHC project. The small disparity between survey respondents and the number reporting involvement in the MHC project can be explained by a number of factors. For example, some businesses involved in the early stages of the project may have lost corporate memory through staff turnover. Also some businesses may have not been aware of their involvement in the project because the involvement was indirect, in the sense that some businesses contacted had been contractors to a MHC project sub-contractor.

Respondents reporting an involvement with the MHC project were from the Manufacturing sector (40 respondents — 55.5 per cent) and from the Services sector (32 respondents). Breakdowns of the businesses reporting an involvement in the project by employment size (72 businesses) and by annual turnover (71 businesses) are outlined below:

Employment

- 9 micro businesses (less than 5 employees) – 12.5 per cent;
- 22 small businesses (5 to less than 20 employees) – 30.5 per cent;
- 31 medium businesses (20 to less than 200 employees) – 43 per cent; and
- 10 large businesses (200 or more employees) – 14 per cent.

Annual turnover

- No more than $5 million - 29 businesses;
- More than $5 million but no more than $10 million – 15 businesses;
- More than $10 million but no more than $50 million – 14 businesses;
- More than $50 million but no more than $100 million – 9 businesses;
- More than $100 million but no more than $200 million – 2 businesses;
- More than $200 million but no more than $500 million – 1 business; and
- More than $1,000 million – 1 business.

Interestingly the size composition of survey respondents was very similar to the size composition of the responses to ANZAC ship case study survey.

Seventeen of the 72 respondents reporting an involvement with the MHC project indicated that the project was their business' first defence-related contract. Eight of these first time defence suppliers were from the manufacturing sector.

The five Chapters in this part present key survey findings covering:

- Technology transfer (Chapter 3);
- Business programs and practices (Chapter 4);
- Exports (Chapter 5);
- Industry — Defence Relationships (Chapter 6); and
- Businesses MHC project related changes in productivity (Chapter 7).

Appendix 3 presents survey findings for the 31 respondent businesses located in the Newcastle and Hunter Valley region.

Non-response bias survey

A short telephone non-response bias survey was also undertaken to help assess whether the respondents answers to the MHC survey questionnaire were representative of the wider ASP business population. The businesses contacted in this telephone survey were randomly selected from the non-respondents. Significance testing was then used to compare the responses from this telephone survey with the responses from the main survey, in only one instance, which related to MHC project-related improvements in exports, was there a statistically significant difference between the findings of the two surveys. This finding gives us some confidence that the survey results are not biased due to businesses choosing not to respond to the mail out survey. Appendix 2 presents the findings of the non-response bias survey and the significance testing.

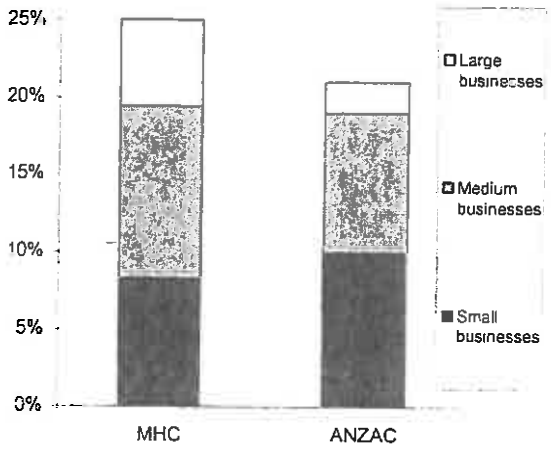
3. TECHNOLOGY TRANSFER

Although the Minehunter Coastal Vessels are based on a proven design they are by no means "off-the-shelf". As outlined in Chapter 2, the high level of Australian content and the design improvements required by the Department of Defence meant that many aspects of the design, including the design of the combat system, had to be reworked. While the MHC project imposed challenges for the prime contractor and its subcontractors it also presented opportunities for technology transfers.

3.1 MANY FIRMS OBTAINED TECHNOLOGY TRANSFERS

Defence projects such as the MHC project provide an excellent opportunity for participating firms to obtain a technology transfer. The MHC survey results indicate that 25 per cent of businesses involved in the project obtained a technology transfer as a result of the involvement. This level of technology transfer is similar to the level achieved by businesses involved in the ANZAC frigate project (Figure 6).

Figure 6: Technology transfer (per cent of businesses)



Source MHC survey and Tasman (2000).

Respondents from large (businesses employing 200 or more employees) and medium (businesses employing 20 to 199 employees) sized businesses were more likely to report a technology transfer than were smaller businesses. However, significance testing indicates that we cannot be confident that the lower level of technology transfer reported by smaller businesses actually reflects a lower level of technology transfer obtained by the wider population of participating small businesses (see Appendix 2).

MHC respondents from the manufacturing sector and services sector businesses were equally likely to report obtaining a technology transfer.

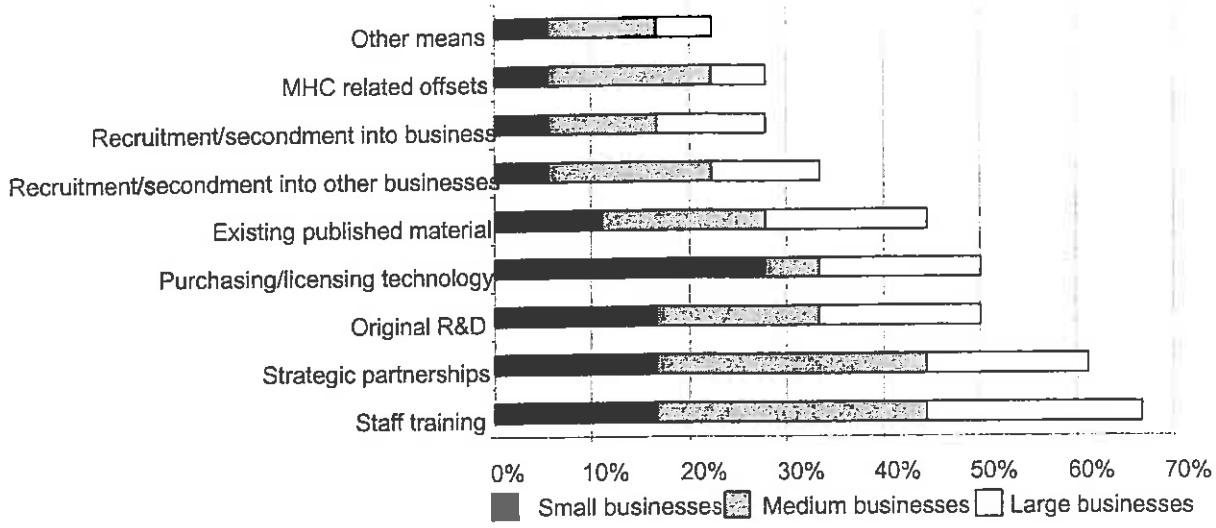
Around 27 per cent of respondents with previous Defence experience obtained a technology transfer from involvement with the MHC project. On the other hand only 18 per cent of first time Defence businesses reported obtaining a technology transfer from involvement with the MHC project. However, significance testing of these two proportions indicates that we can

not be certain that this lower proportion actually represents a real difference in the uptake of technology by the two groups.

In most instances businesses used a combination of measures to obtain the technology transfer. Overall, staff training and strategic partnerships with other organisations were the most frequently reported methods. However, a significant number of businesses also reported the purchasing or licensing of technology, original research and development and existing published material as sources of the transfer (see Figure 7).

Interestingly, respondents from smaller businesses were more likely to report that their business obtained the transfer by purchasing or licensing the technology, while larger businesses were more likely to report that staff training was a means of obtaining the technology transfer.

Figure 7: Sources of technology transfer, by firm size
(proportion of all businesses that obtained technology)



Source: MHC survey.

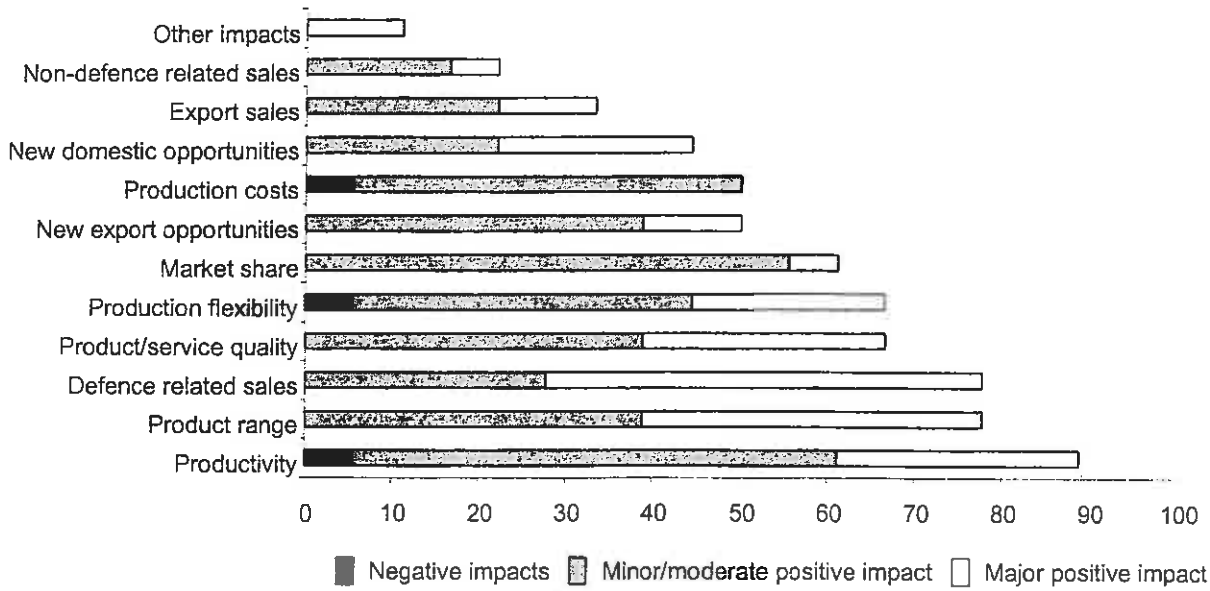
The sources of the technology transfers obtained by firms participating in the MHC project were similar to those reported by businesses responding to the earlier ANZAC frigate survey. However, there was some difference in the ranking of sources. For example, existing published material followed by staff training were the most commonly reported sources of the transfer among ANZAC frigate businesses. Strategic partnerships were much less likely to have been a source of the transfer for business associated with the ANZAC frigate project — less than 30 per cent of ANZAC frigate business which obtained a technology transfer reported that a strategic partnership was a source of the transfer.

3.2 TECHNOLOGY TRANSFER OUTCOMES

Survey responses indicate that the technology transfers obtained by most businesses participating in the MHC project were beneficial for performance and growth (Figure 8). Only one firm reporting a technology transfer indicated any negative impacts from the transfer. However, as outlined in Box 3 these negative effects were of a short-term nature. In the longer term, the company's involvement with the MHC project led to improvements in quality and productivity.

Improved productivity was an important outcome of the technology transfer (see Figure 8). Just under 30 per cent of businesses obtaining a transfer reported it had a major positive impact on productivity. A further 55 per cent considered the transfer produced minor to moderate improvements in productivity.

Figure 8: Impact of technology transfer
(proportion of all businesses reporting a technology transfer)



Source: MHC survey.

Technology transfer can impact on productivity in a number of indirect ways. For example, new technology can allow a business to produce new or improved products or services. New technology can also provide opportunities for a business to produce its outputs at a lower cost. Not surprisingly the businesses enjoying a technology transfer driven increase in productivity also experienced improvements in their:

- product range; and/or
- production costs; and/or
- product or service quality; and/or
- production flexibility.

Other important impacts of the technology transfer included increased sales, and improved market share.

Box 3: The negative productivity cloud had a silver lining

Transfield Reinforced Plastics/Composites (Transfield RP/C) is a division of the Transfield Group. Transfield RP/C manufactures fibre reinforced plastic products. Although Transfield RP/C had undertaken many complex projects its work on the Collins Class submarines and the Minehunter Coastal Vessels was, at that time, the most challenging encountered.

Transfield RP/C's work for both the Collins Class submarines project and the MHC project involved technology transfers. These transfers were obtained through strategic partnerships with overseas original equipment suppliers. In the case of the submarines the technology transfer lead to positive spinoffs for the company, in terms of additional business. However, the outcomes from the company's involvement with the MHC project were not all positive.

Transfield RP/C was awarded the contract to manufacture fibreglass tankage for the Minehunters. Given the short lead times for the project Transfield elected to manufacture the tankage to the original Italian design — this required Transfield to enter into a strategic partnership under a once-off licensee agreement with an Italian company Selip, Fontanellato. As part of this licensing arrangement Transfield obtained manufacturing technology from Selip, to enable it to manufacture tankage in Australia.

Unfortunately differences in manufacturing equipment in the Australian and Italian plants led to a number of problems. Some of these problems were overcome by fine tuning the design to suit the equipment. However others, while addressed, resulted in a decline in productivity and a loss making venture for Transfield RP/C.

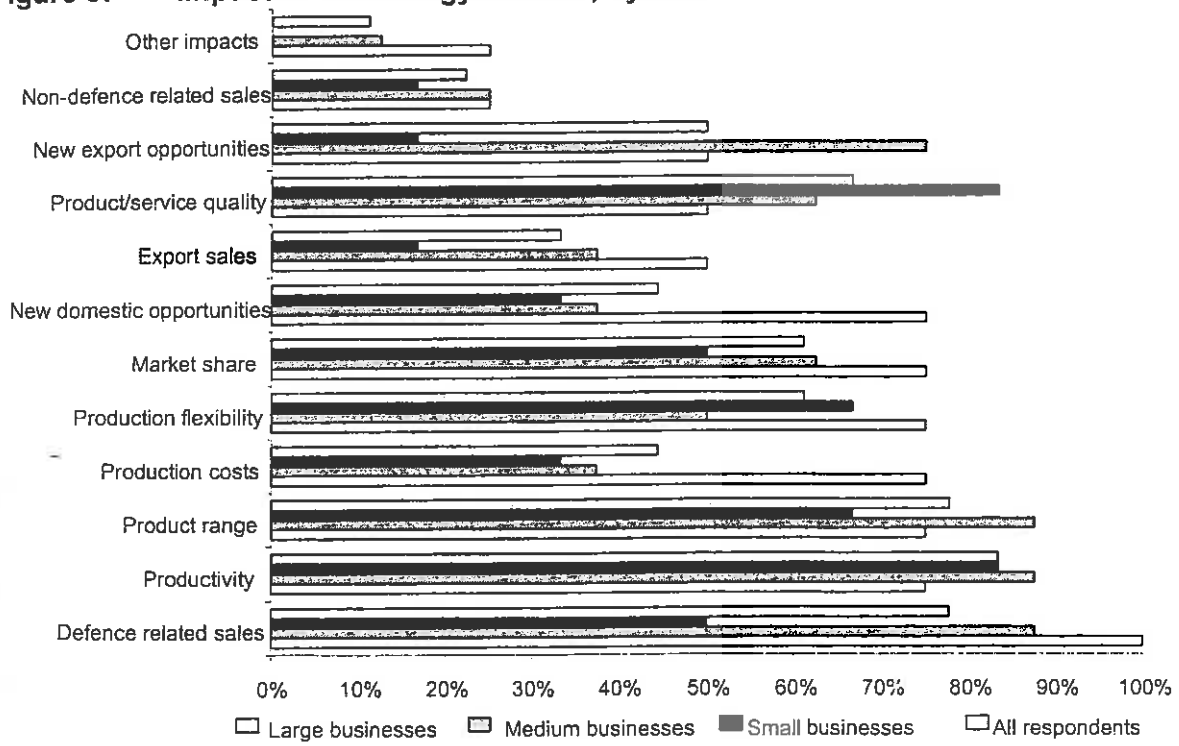
Transfield RP/C's management reports that a number of factors contributed to this outcome. One related to the nature of the technology transfer. Another related to Transfield RP/C's own quality assurance and internal inspection practices. Transfield RP/C became aware that the level of quality assurance it had in place for its industrial reinforced plastics/composites work, whilst an ISO 9002 endorsed system, needed to be upgraded to deal with the Minehunter contracts complex and stringent requirements. The company accordingly increased the level of its quality assurance standards and methods. These new standards are now applied to all Transfield RP/C's Defence and general manufacturing work.

Transfield RP/C's management considers that early negative impacts of the company's involvement with the Minehunter project have in the long run produced dividends. Management said:

> *The Minehunters involved a learning experience that has paid off. Our experience with the Minehunters and the Collins class submarines has forced us to develop higher level quality assurance processes which has helped Transfield obtain new business both onshore and offshore.*

The nature of technology transfer impacts varied to some extent by firm size (Figure 9). All of the large businesses that obtained a technology transfer from involvement with the MHC project reported that the transfer had positively impacted on the level of defence-related sales. However, only half of the small businesses that obtained a technology transfer reported this impact. Significance testing indicates that, with at least 95 per cent confidence, the difference between these two proportions reflects a real difference in the impact of the technology transfers on the two size groups. New export business opportunities was the only other statistically significant difference in technology transfer impacts by business size. In this case, medium sized businesses that had obtained a technology transfer were statistically more likely than small businesses to have experienced improved export opportunities as a result of the transfer.

Figure 9: Impact of technology transfer, by size of business



Source: MHC survey.

Box 4 presents some examples of how the MHC related technology transfers have positively impacted on individual businesses.

Box 4: Examples of MHC related technology transfers and innovations and their impacts

MCM Manufacturing Pty Ltd is a medium sized engineering business situated in Cardiff, New South Wales. The company is building stainless steel rudders for the MHC project. The project was the company's first major defence contract.

Like other Minehunter Coastal Vessel components, it is important that the rudders have a very low magnetic signature. Normal stainless steel welding technology was unsuitable for the rudders manufacture, as it would increase rather than decrease the magnetic field. The company undertook extensive research and development and purchased new computer controlled welding technology in order to resolve some of these magnetic field issues. Management reports that the new technology has "taken the company to a new level of performance in terms of productivity, quality and production flexibility".

MCM Manufacturing's involvement with the MHC project has also had positive demonstration effects, which generated work using its new technology in the private sector. The company's success with the MHC project contract has also led to further defence-related work — the company is currently manufacturing steering components for the ANZAC frigates.

Transform Composites, a Newcastle company, which was initially contracted to construct the MHC's water and gas tight doors and hatches from glass reinforced plastic (GRP). GRP has been used extensively in the MHC project because the material has a very low magnetic signature, which helps to minimise risks of the ships accidentally detonating mines. Other key uses of GRP in the MHC project include the hull and numerous components such the tankage. However, in the original Intermarine design for the minehunters, aluminium was the material specified for the air conditioning ducting. With the intention of further reducing the ships' magnetic signature ADI approached Transform composites to manufacture the ducting from GRP. Although Transform composites had a long history in the production of specialised GRP products, the company did not have the technology to manufacture GRP ducting. After assessing likely possibilities Transform Composites devised a special GRP ducting manufacturing technology. This technology was successfully used to produce the vessels' air conditioning ducting.

In addition to supplying the ducting within the original ducting budget the GRP substitute has the advantage of being equally efficient but much lighter than the original equipment. This innovation in the design of the Huon class Minehunter will consequently produce fuel saving benefits for the Royal Australian Navy. The innovation has also assisted Transform Composites' management to develop new areas of work in the company's private sector lines of business.

Transform Composites' management reports that the company's overall productivity has increased slightly as a result of its involvement with the MHC project. Management said that the ducting contract required Transform Composites to develop procedures to allow them to efficiently produce the 600 different ducting components in a semi-production line environment. The lessons learned from this have been applied across the company's other non-defence GRP projects and have resulted in a long-term increase in productivity for the business.

(continued)

Box 4: Examples of MHC related technology transfers and innovations and their impacts (continued)

Baker and Provan is a medium-sized mechanical engineering business in St Marys, New South Wales. The MHC project gave the company an opportunity to obtain the technology and know how to design defence equipment. Baker and Provan, in a strategic partnership with an Italian business, were contracted to design and manufacture the multipurpose cranes for the vessels. This contractual arrangement provided Baker and Provan with opportunities to observe the Italian company's design process in operation, the insights obtained led to major advances in the company's design, which in turn has increased the company's ability to supply the Department of Defence and its prime contractors.

Baker and Provan's management reports that the company's involvement in the MHC project has had a slight but significant impact on its manufacturing business' productivity. Further, the company is now better able to manage complex projects and the skill base of management and staff has been extended and improved.

Marine Plant Systems, prior to its involvement with the MHC project, was a micro business operated by a husband and wife team in Western Australia. The company currently employs three full-time employees, three contract engineers and one contract designer and its prospects for future growth are excellent. This growth is largely due to the MHC project.

Prior to its involvement with the project, Marine Plant Systems operated as an importer of marine equipment for a number of European manufacturers. Through these contacts Marine Plant Systems became the agent for the MHC project's supplier of sewage treatment plants and chlorinators. This strategic partnership with the original equipment supplier has opened the door to a number of new opportunities for the company.

For example, Marine Plant Systems will shortly commence manufacturing sewage treatment plants and chlorinators in Australia under licence. The company obtained the technology to undertake this major step from the original equipment supplier. The technology transfer came through a range of mechanisms including training and the transfer of the necessary technical information by way of CAD and electrical drawings, classification and certification.

The company has also expanded its operations into Asia and New Zealand. The company's Managing Director said:

> *As a result of our involvement with the Minehunter Coastal project Marine Plant Systems has gone from strength to strength. The company is now recognised as leaders in Sewage Waste Systems in Australia and New Zealand.*

4. DEFENCE PROJECTS AND BEST PRACTICE

Numerous national and international studies have found a strong link between the adoption of best practice business programs and practices and improvements in firm performance. For example, the United States National Institute of Standards and Technology has found through numerous case studies and other analysis that:

> investing in quality principles and performance excellence pays off in increased productivity, satisfied employees and customers, and improved profitability — both for customers and investors (NIST 2001).

The NIST website presents numerous case studies of businesses which have embraced the United States Government's national quality program and experienced substantial increases in productivity, turnover and profits as well as higher retention rates for employees and customers.

Australian studies have also identified positive impacts from implementing best practice programs and practices such as quality assurance and benchmarking. For example,

- the Australian Manufacturing Council (AMC 1994) found a link between the adoption of best practice programs and superior export growth;
- Harrison and Samson (1997), in a Commonwealth government sponsored study found a positive correlation between organisational culture and the use of management tools such as total quality management; and
- Hausner (1999), in a study of 22 manufacturing businesses found a strong link between achieving high scores in the Australian Quality Awards for business excellence and improvements in a range of performance variables including productivity improvements, increased sales and profit, improved employee satisfaction and reduced defect and injury rates.

Despite this important link, Australian Bureau of Statistics data indicates that relatively few Australian businesses have implemented best practice business programs and practices such as benchmarking and quality assurance (DEWR&SB (1998) and ABS unpublished data).

4.1 IMPLEMENTATION OF BEST PRACTICE BY DEFENCE BUSINESSES

The high standards demanded by the Department of Defence from its contractors could be expected to increase participation in best practice programs such as quality assurance and total quality management by defence businesses. Indeed, the ANZAC ship case study

(Tasman 2000) found that businesses associated with the project were much more likely than the wider business community to have implemented a range of programs and practices commonly associated with best practice. The ANZAC ship case study found that participation in Defence work was a major factor in a business' decision to implement these programs and practices.

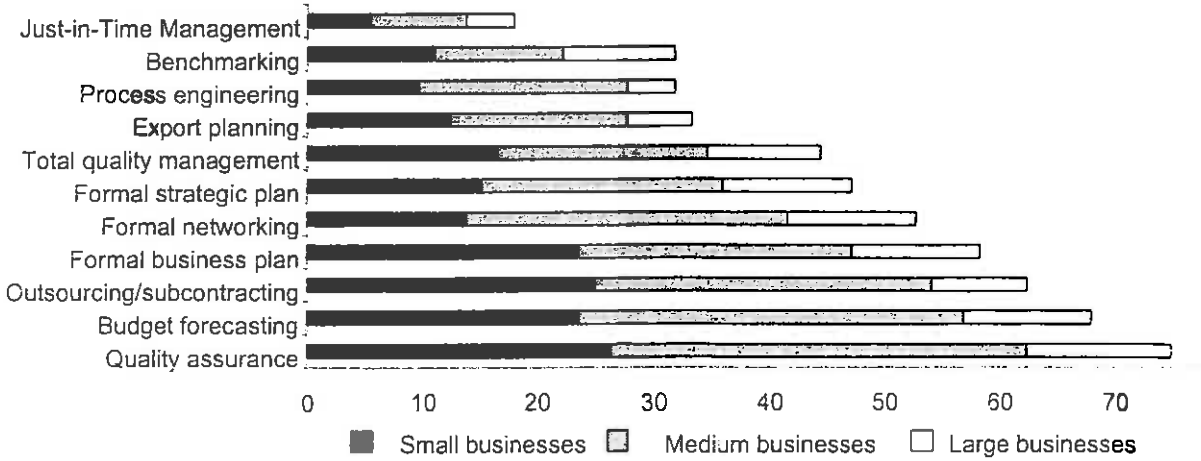
To further advance these results MHC survey respondents were asked to indicate if they had implemented any of the following business programs or practices:

- Total Quality Management;
- Quality assurance;
- Just-in-Time Management;
- Process Engineering;
- Formal strategic plan;
- Formal business plan;
- Budget forecasting;
- Formal networking with other businesses;
- Comparison of performance with other businesses (benchmarking);
- Export market planning; and
- Outsourcing/subcontracting.

Sixty-four MHC businesses indicated that they had implemented one or more of these programs and practices. As might be expected smaller businesses were less likely to have implemented these practices than larger businesses — one hundred per cent of large businesses compared to 86 per cent of small businesses indicated they had implemented one or more programs and practices.

Quality assurance and budget forecasting were the most commonly implemented of the programs and practices examined — with 75 per cent and more than 65 per cent, respectively, of MHC respondents indicating that these programs had been introduced into their business. Just-in-time management, benchmarking and process engineering were the programs and practices least likely to have been implemented by MHC project respondent business (Figure 10).

Figure 10: Business programs and practices implemented by MHC businesses
(proportion of all businesses reporting a technology transfer)



Source: MHC survey.

Large MHC project businesses were more likely to have implemented each of the eleven programs and practices than medium sized businesses. Similarly, medium sized MHC businesses were more likely to have implemented a particular program or practice than smaller sized businesses.

In most instances, the implementation of the various programs and practices occurred more than six years ago.

4.1.1 Comparisions with the wider business community

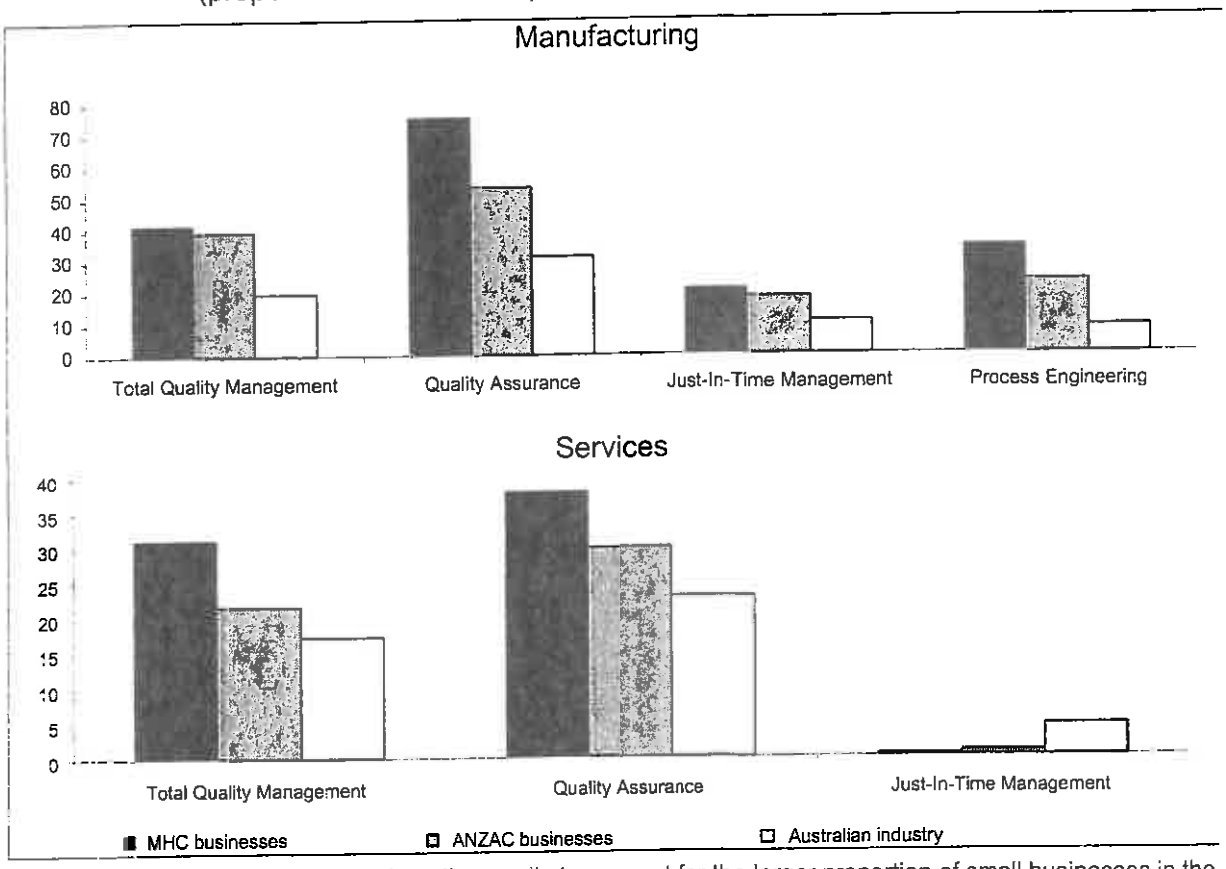
Surveys undertaken by the Australian Bureau of Statistics in 1996 and 1998 on the uptake of certain business programs and practices by industry have been used to benchmark the uptake of business programs and practices by MHC businesses (Australian Bureau of Statistics (1998) and (1999). In the majority of cases businesses participating in the MHC project and the ANZAC ship project were more likely than the wider population to have implemented those programs and practices which are commonly associated with improvements in productivity and performance.

In the case of business programs MHC manufacturing firms were more likely to have implemented total quality management, quality assurance, just-in-time management and process engineering than businesses in the manufacturing sector as a whole. For example, by June 1996 more than 75 per cent of MHC manufacturing businesses had implemented quality assurance programs where as only 31 per cent of businesses in the wider manufacturing sector had implemented such programs (Figure 11).

In most instances MHC services businesses were also more likely to have implemented these programs and practices than their counterparts, the one exception being just-in-time management.[1] However, in this instance the implementation rate for just-in-time management was very low for all industry groups.

[1] Process engineering data was not collected by the ABS for services sector businesses.

Figure 11: Businesses' implementation of best practice programs by June 1996
(proportion of businesses)



Note: Adjustments have been made to the results to account for the larger proportion of small businesses in the ABS survey sample. In this analysis MHC and ANZAC ship services businesses have been benchmarked against implementation rates in the Business services industry.

Source: MHC survey, ANZAC ship survey and ABS survey results reported in DEWR&SB (1998).

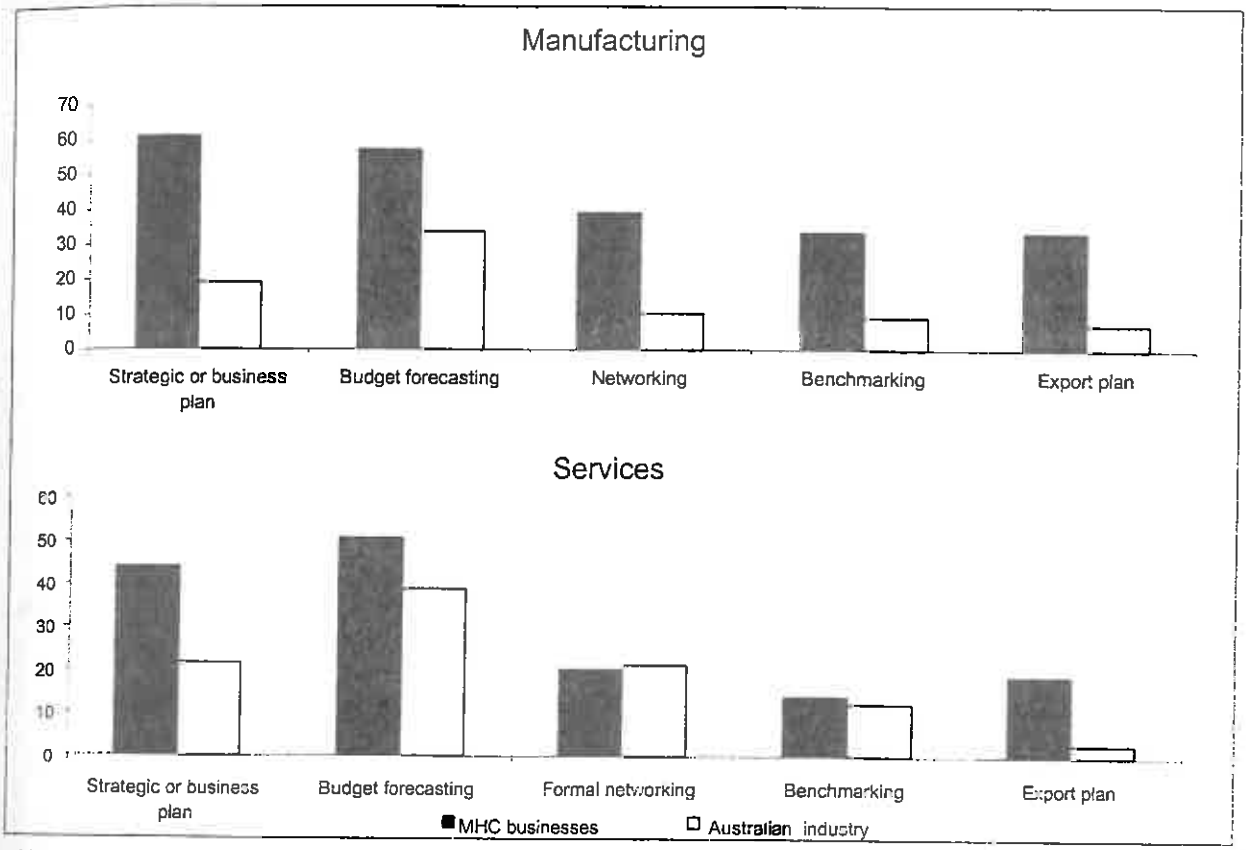
More recent results on the implementation of business practices collected in the 1998 ABS Business Growth and Performance Survey also confirm that businesses associated with Defence work are more likely to have implemented a range of best practice techniques associated with improved performance and productivity (Figure 12).[2]

Figure 12 highlights that MHC businesses in both the manufacturing and services sector were much more likely to have in place strategic or business plans. They are also more likely to undertake budget forecasting than their counterparts in the wider business community. Respondents from MHC manufacturing firms were also much more likely to report that their business used networking and benchmarking techniques in their business

[2] The 1996 ABS survey is the latest available data on the implementation of best practice programs by the wider business community and the 1998 ABS survey is the latest available data on the uptake of best practice techniques by the wider business community.

Both MHC manufacturing and services businesses were more likely than industry as a whole to use an export plan to help manage their business.

Figure 12: Implementation of best practice techniques by June 1998
(proportion of businesses)



Note: Adjustments have been made to the results to account for the larger proportion of small businesses in the ABS survey sample. In this analysis MHC and ANZAC ship services businesses have been benchmarked against implementation rates in the Business services industry.

Source: MHC survey and unpublished data from Australian Bureau of Statistics (1999).

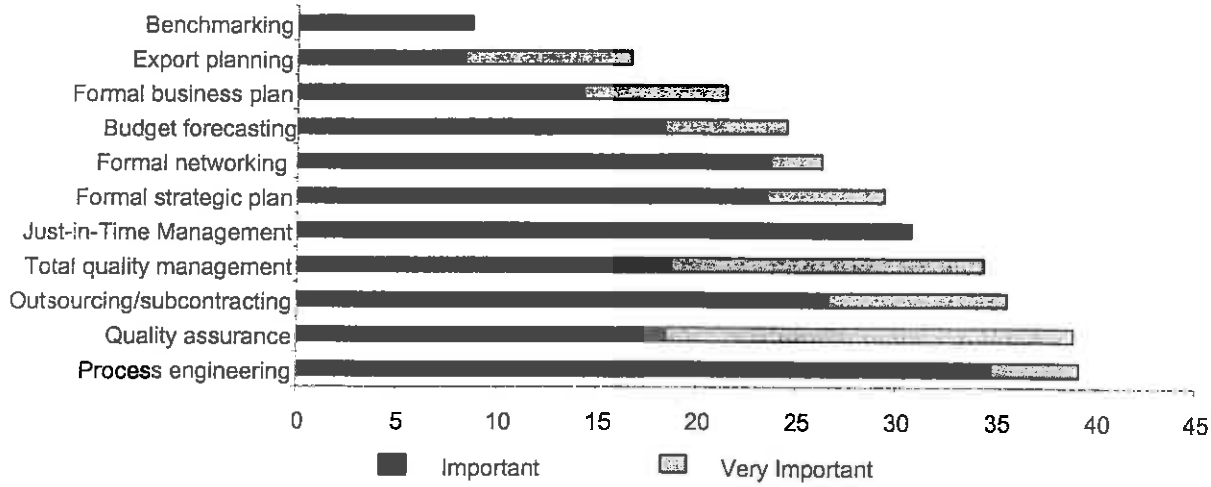
4.1.2 *The role of Defence work in the implementation decision*

By insisting on high quality standards from its contractors, Defence has played a lead role in many businesses decisions to implement performance improving programs and practices. The MHC and ANZAC ship survey findings support this hypothesis. More than two-thirds of the MHC businesses that had implemented these programs and practices reported that the involvement with defence-related projects had been important in the implementation decision.

Given that a large number of responding firms had previously been involved with other Defence work, it is not surprising that the importance of the MHC project in the implementation decision was less pronounced than the importance of Defence projects as a whole. Nonetheless a significant number of businesses indicated that the MHC project had

played a role, and in many instances a very important role in the implementation decision (Figure 13). For example, nearly 40 per cent of respondents with process engineering and quality assurance programs and practices in place in their business indicated that the MHC project had been an important factor in the implementation decision. In the case of quality assurance around half of these respondents reported that the MHC was very important in the implementation decision.

Figure 13: Role of the MHC project in decision to implement programs and practices
(proportion of businesses reporting program or practice implemented)



Source: MHC survey.

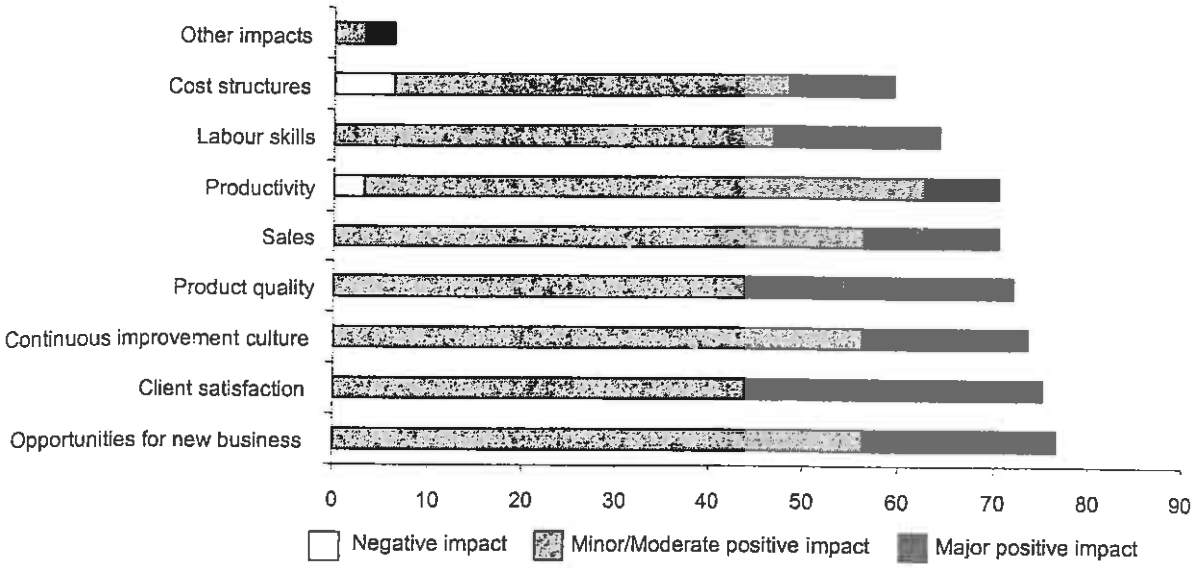
4.2 IMPLEMENTATION OF PROGRAMS AND PRACTICES LINKED TO IMPROVED OUTCOMES

The majority of business that had implemented all or some of these programs and practices reported that they have, as a consequence, experienced a variety of improvements in the business environment. The most commonly reported positive impacts were related to:

- opportunities for new business;
- client satisfaction;
- the ability to implement a culture of continuous improvement;
- product quality;
- sales; and
- productivity (Figure 14).

Box 5 presents some insights into the benefits MHC businesses have obtained from implementing these business programs and practices.

Figure 14: Impact of business programs and practices
(proportion of businesses reporting one or more program implemented)



Source: MHC survey.

Box 5: Implementation of business programs and practices — Some outcomes

Colpro Engineering is a medium sized business in Pendle Hill, New South Wales. The company currently employs 30 people. Prior to its involvement with defence-related projects the company employed 11 people. The MHC project was the company's second Defence project; the company had previously been awarded a contract to undertake work for the ANZAC Ship Project. The company is quality assured. It was taking steps toward quality assurance before its ANZAC ship contract was awarded. However, accreditation became imperative for its work on both the ANZAC Ship Project and the MHC project because accreditation was, in both cases, a contract requirement. Company management believes that quality assurance has had a major impact on the business. In addition to improvements in product quality, the quality assurance process has improved Colpro Engineering's labour skill base and has opened up many new business opportunities.

Colpro's management points out that quality assurance is not a costless process. However, over the longer run it brings rewards, which more than compensate for these costs. Indirectly quality assurance has improved productivity, for example, through less waste, less duplication of work and a more skilled workforce. Company management said that "Defence work has shown the company the benefits that quality assurance can bring".

CompAir (Australasia) Limited is a compressed air specialist. The company's head office is in Mount Waverly Victoria, with branches in all states. CompAir has a long tradition of working with Australia's Defence Forces. The company was an early supplier of compressors to Cockatoo Dockyard in Sydney and Williamstown Naval Dockyard in Melbourne. More recently the company has supplied compressed air systems for the ANZAC class frigates, the Collins Class Submarines and the Huon Class Minehunters.

(Continued)

Box 5: Implementation of business programs and practices — Some outcomes (continued)

CompAir is quality assured to ISO 9001 and JAZ-ANZ ISO 9002. CompAir management considers that the company's quality assurance practices have enabled it to supply a world standard quality product in front of its competitors. The need to meet Defence's stringent standards was an important factor in the company's decision to obtain quality accreditation.

CompAir management reports that the implementation of quality assurance processes and practices has done much more than improve the quality of the company's products, the company has also been able to improve its productivity and its over all performance. CompAir management reports that:

> *Quality assurance means that we now implement processes and practices that in the past would have, at best, been done on an ad hoc basis. Factory test performance of new equipment is a case in point. In the old days we would have simply installed the equipment and started manufacturing. As a consequence of this quality assurance driven procedure we now have less down time, fewer faults and we are less likely to be called out to correct errors that should not have occurred in the first place. Thus we are now producing a higher quality product which in turn improves our productivity and overall performance.*
>
> *Quality assurance practices have helped make CompAir Australasia's compressors the best in the world. Our credibility in overseas and Australian markets has increased, we are now known for the quality product and service that we provide.*

Cowan Manufacturing is a medium sized company operating from Warners Bay in New South Wales. The company commenced operations around 30 years ago as a sheet metal, general fabrication business. The company now specialises in stainless steel and aluminium fabrication and has particular expertise in the design and construction of recompression chambers, hyperbaric medical chambers and underground pressure vessels and mine survival units.

In the mid to late 1980s Cowan Manufacturing, well ahead of its time, decided to implement quality assurance practices. Cowan Manufacturing now is accredited to the highest international quality standards and is an accredited supplier to both the United States and Australian Departments of Defence.

In addition to becoming quality assured in the late 1980's Cowan Manufacturing's management decided to expand their businesses horizons and commenced designing and constructing transportable recompression chambers. After many years of satisfying the United States Department of Defense of its credibility as a high quality supplier Cowan Manufacturing was awarded a contract to supply the Cowan transportable recompression chamber system. This relationship with the United States Department of Defense continues today. At this stage the company has supplied the US Navy with over 90 transportable recompression chamber systems. Cowan Manufacturing has subsequently been contracted to supply the Australian Department of Defence with 16 transportable recompression chambers and six twin lock recompression chambers for the MHC project.

While the majority of businesses reported positive impacts, a small number reported som negative impact of the programs and practices on productivity (3 per cent of respondents and cost structures (6 per cent of respondents). Implementation dates help explain thes negative outcomes for at least one of these businesses. In the early years of implementin programs such as total quality management and quality assurance businesses som

businesses may perceive that the costs outweigh the benefits. However, once processes are fully understood and fully implemented benefits become more obvious as a culture of continuous improvement becomes the norm. This continuous improvement culture will in turn flow through to improved productivity, product quality and greater client satisfaction.

Interestingly, not one of the respondents reporting negative impacts on cost structures and/or productivity considered that their business' overall productivity had declined as a result of being involved with the MHC project. Indeed some of these respondents indicated that the business' overall productivity had actually increased as a result of being involved with the MHC project. The experience of one of these companies, MCM Manufacturing Pty Ltd is reported in Box 6 below.

Box 6: Short-term pain for long-term gain

MCM Manufacturing Pty Ltd, a medium sized engineering business in Cardiff, New Scuth Wales. The company implemented total quality management, quality assurance and just-in-time management business practices to help meet the high quality standards of its large private sector clients, such as BHP. These practices also played an important role in the company being able to meet the high quality standards required by Minehunter Coastal project's prime contractor for the manufacture of the vessels' rudders.

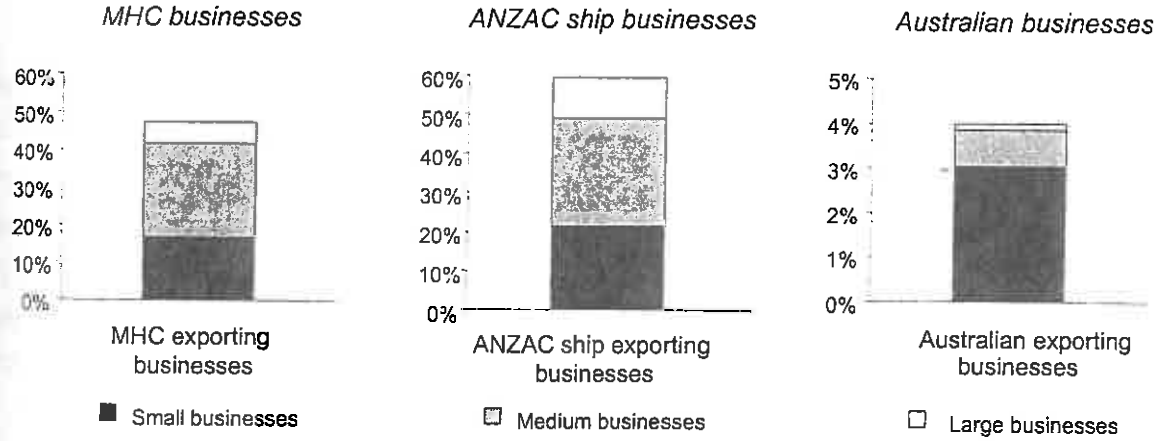
MCM's management reported in its response to the MHC survey that the use of these practices for its Minehunter Coastal work led to a reduction in productivity. However, consultation with management has clarified that the very slight reduction in productivity referred to in their response had more to do the company's access to magnetic signature testing equipment, which was an important component in the project's quality assurance arrangements, rather than the business practices themselves. This lack of access to the testing equipment meant that work on the project had to periodically stop until testing equipment became available. This had a short-term negative impact on productivity. However, management reports that, from a company wide perspective, involvement with the MHC project and the implementation of business practices such as quality assurance has had a long-term positive impact on productivity and overall performance.

5. EXPORTS

Exports are an important source of income for many Australian businesses. In addition, our export trade increases Australia's standard of living by allowing us to take advantage of the gains from trading with other countries. In the context of Australia's relatively small defence industry, exports also create an opportunity for businesses to diversify their activities and clients. This diversification can in turn help improve defence businesses long-term viability and capability to supply the Department of Defence or its prime contractors.

Responses from the MHC survey indicate that just under half (47 per cent) of the MHC survey respondents currently export. The majority of these exporting businesses were small and medium businesses. This result is consistent with the earlier ANZAC ship case study, (Figure 15 and Tasman 2000). By way of comparison the ABS found that only 4 per cent of Australian businesses surveyed are exporters (Figure 15). Thus it appears that firms associated with major defence projects have a much higher propensity to export than Australian businesses as a group.

Figure 15: Percentage of exporting businesses



Source: MHC survey, Tasman (2000) and ABS (2000).

As might be expected the proportion of exporters varies by sector. MHC survey results indicate that around 60 per cent of MHC manufacturing businesses and around 30 per cent of MHC services businesses were in the export business. These proportions are much higher than in the wider economy. For example, the ABS reports that around 13 per cent of manufacturing businesses and around 4 per cent of businesses in the Property and business services industry were exporters.

5.1 INCREASED EXPORT ORIENTATION - THE MHC'S ROLE

A range of factors may contribute to the 'defence industry' having a higher propensity to export than other Australian businesses. It may be that defence businesses and export businesses have similar characteristics. For example, their managers may be more prepared than the wider business population to undertake the often time consuming preparatory work necessary to develop new international markets or meet the Department of Defence's stringent requirements for quality and documentation. Another explanation may be that the defence work of itself is an export catalyst. The MHC survey, like the ANZAC ship survey was designed to find out if businesses participating in these major defence projects experience any positive spin offs which could improve their export performance.

Survey results suggest that there is an important link between defence work and exports. One-third of MHC businesses reported that involvement with the project had improved current or future export prospects. Small, medium and large businesses were all equally likely to report this view.

Respondents from just over 35 per cent of exporting businesses reported that exports had increased since the business' involvement with the MHC project had commenced; no exporters reported a decline in exports. All of the businesses reporting an increase in exports were in the small and medium sized employment size categories.

Many the factors that contributed to MHC businesses increase in exports were directly or indirectly related to the MHC project or Defence projects more generally (Figure 16). For example, the implementation of best practice programs and practices was considered as an important contributor to the increase by around half of those businesses with increased exports (Figure 16). Interestingly, the ABS has also recently identified a correlation between the use of business practices and exporting (ABS 2000). In around 30 per cent of cases exporters reported that MHC related productivity improvements, technology transfers and business links contributed to the export increase (Figure 16).

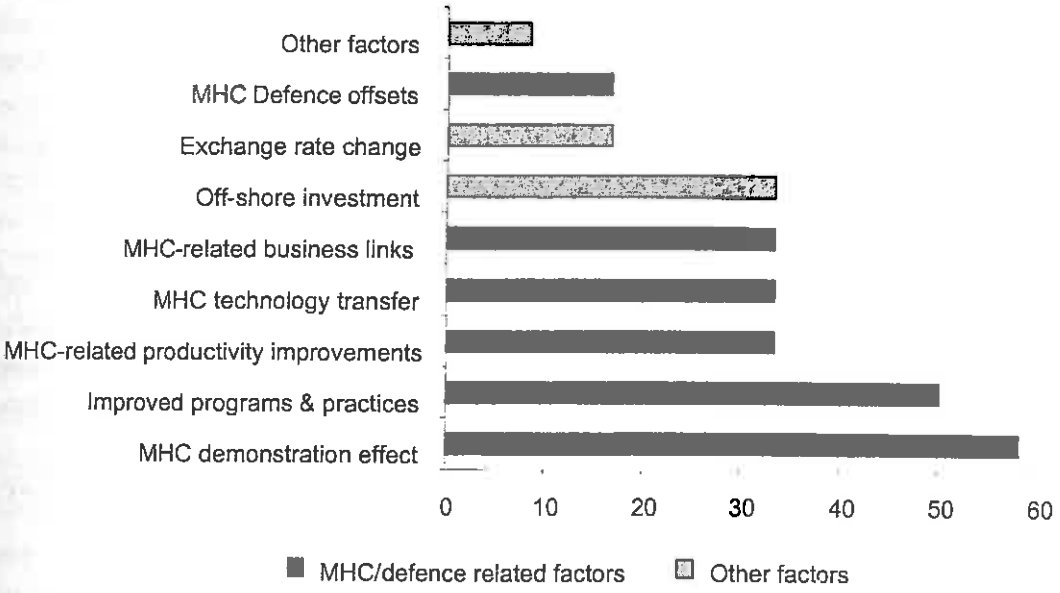
However, the most commonly reported contributor to the increase in exports was the MHC demonstration effect. Nearly 60 per cent of MHC respondents with increased exports reported that their business was able to increase exports because of their business' proven track record on the MHC project (Figure 16). The demonstration effect was also identified as being important among exporters involved in the ANZAC ship project (Tasman 2000).

This MHC demonstration effect has, amongst other things, created opportunities for Australian industry to work with Intermarine, the Italian designer of the Lerici Class minehunter, to supply minehunters for the Royal Thai Navy. The New South Wales Industrial Supplies Office Deputy Director points out that:

Intermarine, through their experience with the MHC project, had an opportunity to see Australian industry's capability first hand. Intermarine is very impressed with our industry's capability, its level of innovation and the quality of its work. When Intermarine decided to tender to supply minehunters to the Royal Thai Navy they naturally considered Australian input.

The ISO worked with Intermarine to identify opportunities for Australian businesses in Intermarine's bid. The ISO on behalf of Intermarine contacted approximately thirty Australian manufacturers. The ISO reports that Australian industry was successful in eight tender packages, worth approximately $2.6 million in Australian export revenue.

Figure 16: Factors contributing to increased exports among MHC project businesses
(proportion of businesses with increased exports)



Source: MHC survey.

Box 7 presents some firm level examples of how individual businesses success in contributing to the MHC project has improved the export potential of Australian industry.

Box 7: The MHC projects role in increasing exports

CompAir (Australasia) Limited supplied the MHC project with medium and high pressure compressors. The company has also supplied compressors and associated equipment for the Collins Class submarines, the ANZAC frigates and more recently the Hydrographic ship project. Company management considers that its involvement with these defence projects has had an important demonstration effect and has led to the company supplying Defence equipment in the Asia and Pacific regions. For example, the company's track record in supplying the MHC project has led to Intermarine contracting with CompAir Australasia to supply compressors for Lerici Class minehunters Intermarine sold to the Royal Thai Navy.

(Continued)

Box 7: The MHC projects role in increasing exports (continued)

Colpro Engineering's involvement in the MHC project has had an important demonstration effect. Company management said that its Defence work has allowed it to prove to other clients that it is a credible company that can build quality equipment. The company has subsequently been involved in Defence's hydrographic ship project and is now supplying equipment for a company manufacturing ferries in Tasmania. Colpro Engineering is also exporting defence-related equipment to Hong Kong and New Zealand as a consequence of its involvement with Australian Defence projects such as the MHC project.

Cowan Manufacturing's involvement with the MHC project commenced at the bidding stage. The company has formed a close association with the prime contractor ADI Limited and has supplied numerous stainless steel components for the Minehunters Coastal Vessels. However, its major MHC project was the design and manufacture of six stainless steel four-man twin lock recompression chambers. These chambers are designed to meet strict shock and vibration tests and have a low magnetic signature.

Cowan Manufacturing's management considers that the MHC project has had important flow on effects for the company. The company, as a result of the MHC project, has a higher profile both nationally and internationally. One important spin off was the opportunity to demonstrate its capabilities to Intermarine. This led to Cowan Manufacturing's recompression chambers being included in Intermarine's bid to supply its Lerici Class minehunters to the Thai Government. The success of this bid has created a stepping stone to other Thai work including the construction of a Cowan designed recompression chamber for a Phuket hospital. The company is also exporting recompression chambers and other equipment to Malaysia, the Philippines and Hong Kong.

6. INDUSTRY — DEFENCE RELATIONSHIPS

Australian industry through its direct contribution to the development and acquisition of new capability and through its contribution to Defence's national support base plays a key role in Australia's defence capability. Industry's role is important in times of peace but is crucial in wartime. Major Defence contracts such as the MHC project provide Australian industry with an opportunity to build on and improve their defence capability.

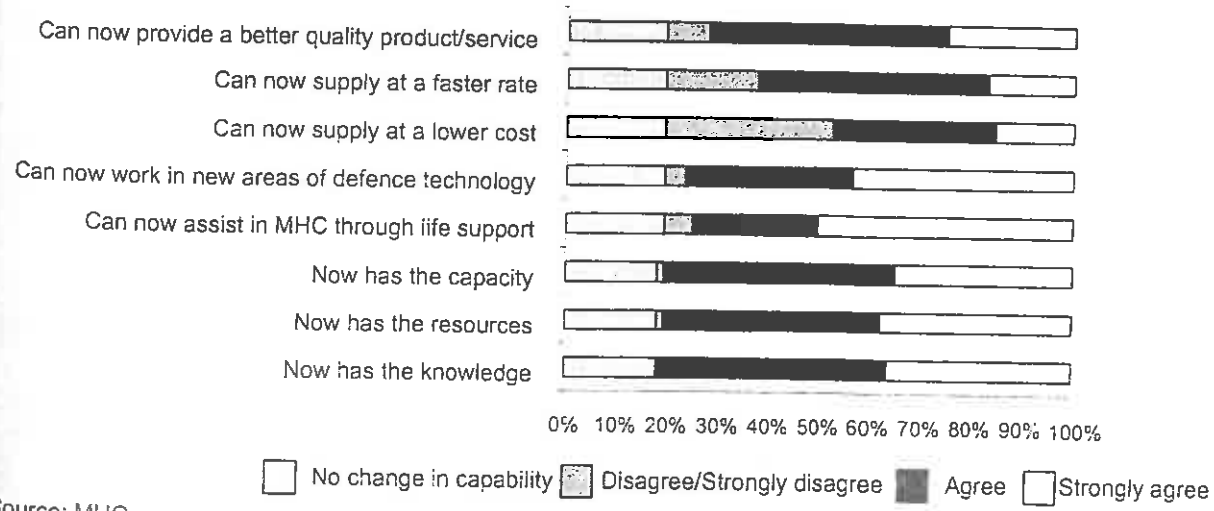
6.1 DEFENCE CAPABILITY

Previous chapters have outlined how Australian businesses participation in the MHC has positively impacted on business through a range of mechanisms and instruments including:

- technology transfer; and
- usage of performance improving programs and practices.

The firm level benefits arising from industry involvement in major Defence projects are, in turn, acting to improve Australia's defence capability. Over 80 per cent of MHC businesses report that they have improved capability to supply the Department of Defence or its contractors as a result of involvement in the MHC build program and/or other Defence contracts. Manufacturing and service sector businesses were both equally likely to have improved capability. As a result of this improved capability, the majority of these businesses have the resources, the knowledge and the capacity to supply the Department of Defence and its contractors. The majority of businesses with improved capability can also now work in new areas of defence technology (Figure 17).

Figure 17: Participating MHC businesses change in defence capability



Source: MHC survey.

Another important survey finding is that 75 per cent of businesses participating in the MHC assessed that as a result of involvement with the MHC and other defence contracts they now have the capability to assist in the through-life support of the Minehunter Coastal Vessels (Figure 17). These through-life support capabilities are considered in more detail in Chapter 8.

Many respondents also report that their businesses are now better able to supply a higher quality product at a faster rate and at a lower cost. While there was some level of disagreement in most of the areas of capability considered, the following two areas had relatively high levels of disagreement about the capability change:

- 33 per cent of respondents disagreed with the statement that 'As a result of improved capability they can supply defence equipment or services at a lower cost than previously'; and
- 18 per cent of respondents disagreed with the statement that 'As a result of improved capability they can supply the Department of Defence or its contracts at a faster rate than previously' (Figure 17).

Box 8 presents some examples of how participating businesses' defence capability has improved. A feature common to many of the businesses is that defence capability is often built up and enhanced through involvement in a range of defence projects.

Box 8: Examples of changes in defence capability

Cowan Manufacturing is a medium sized company operating from Warners Bay, New South Wales. The company's association with Defence work commenced over 20 years ago when the company constructed stainless steel galleys for HMAS Tobruk. The company also played a key role in the construction of the inshore minehunters. The company is now involved in the design of recompression systems, their manufacture and maintenance and the provision of training for their use. Cowan Manufacturing is accredited to the highest international quality standards and is an accredited supplier to both the United States and Australian Departments of Defence. Cowan Manufacturing is also accredited as a Hyperbaric Repair Facility for the Australian Department of Defence and is contracted to undertake maintenance of the RAN's recompression chambers. The company has also recently branched out into providing training operations and daily maintenance of its recompression chambers and is recognised for its capacity to clean oxygen systems to international standards.

The MHC project has had a positive impact on the company's overall productivity. To a large extent the improvement in productivity was linked to the highly specialised requirements of the MHC project. Management said that:

> *In many respects our work on the Huon class project was more intense than much of our other Defence work. To achieve the high standards required we had to lift our skills base and this has flowed through to improvements in productivity.*

(Continued)

Box 8: Examples of changes in defence capability (continued)

Transfield Reinforced Plastics/Composites (Transfield RP/C) manufactures fibre reinforced plastic products. The company considers that its work on the Collins Class submarines and the MHC project was, at that time, the most challenging encountered. Management also points out that Transfield's defence capability in Reinforced Plastics/Composites has substantially improved through its experience with the MHC and the Collins class submarine projects. As a result of its involvement in these projects Transfield RP/C also has the knowledge, the resources and the capacity to assist in the through-life support of the Minehunter Coastal Vessels. Another result of this improved capability in fibre reinforced plastic products is that Transfield/ADI is now the Royal Australian Air Force's authorised contractor for the repair and maintenance of radomes and sonar shields.

Colpro Engineering is a medium-sized business operating in Pendle Hill, New South Wales. The company, among other things, designs and manufactures large diesel and gas turbine exhaust systems. The manufacture of exhaust systems for the ANZAC ships was the company's first Defence project. This project was important for the company as it helped prove that it could manufacture equipment to the strict specifications required by the Department of Defence and its prime contractors. However, the company's management said:

> *The Minehunter Coastal project was crucial for Colpro as it gave us the opportunity to prove our capabilities not only in manufacturing but, importantly, also in design.*

Colpro Engineering designed and manufactured the exhausts for the Minehunter Coastal Vessels' engines and silencers for the pumps. All designs had to meet stringent noise and shock resistant criteria. The stainless steel exhausts also had to be designed to operate with a low magnetic signature. Colpro's team was confident they had the skills and capabilities to meet these design challenges and their involvement with the MHC project allowed them to prove their capability to the Department of Defence but also to private sector clients. Colpro's manager said:

> *We knew we had the design ability, but the Minehunter Coastal project gave us the opportunity to pull it all together and prove our capability.*

Baker and Provan has supplied the Department of Defence and its contractors with slewing arm davits (boat cranes) for over 12 years. The company's capability in supplying the Department of Defence and its contractors has progressively increased over this period. Initially, the company's defence capabilities centered on mechanical engineering such as the machining and fabrication of equipment to a design specified by the Department of Defence. This situation changed with the Minehunter Coastal project.

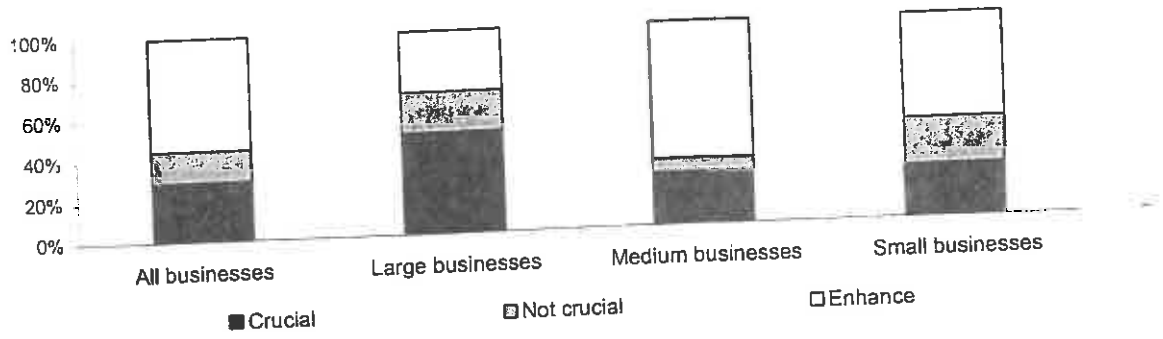
The insights into design technology obtained through Baker and Provan's involvement in the project led to major advances in the company's design capability, which ultimately led to improved defence capability. As a consequence of this improved capability the company successfully tendered to design and manufacture boat cranes for the ANZAC frigates.

6.2 SUSTAINABILITY

Given the importance of Australian industry to our defence capability it is crucial that our in-country defence industry is viable over the long term. More than 90 per cent of the MHC businesses surveyed report that their involvement with the project contributed to net profit. However, the majority of MHC businesses considered that defence-related contracts are not crucial or, alternatively, enhance their business's viability. Just under 30 per cent of respondents maintained that defence-related contracts were crucial to their business viability.

Larger MHC project businesses are more concerned about obtaining defence-related contracts for future viability than smaller businesses. Figure 18 shows that 50 per cent of large businesses (businesses employing 200 or more) considered that defence-related contracts were crucial to business viability, whereas only 25 per cent of small and medium sized businesses had similar views.

Figure 18: Importance of defence contracts to MHC businesses' viability



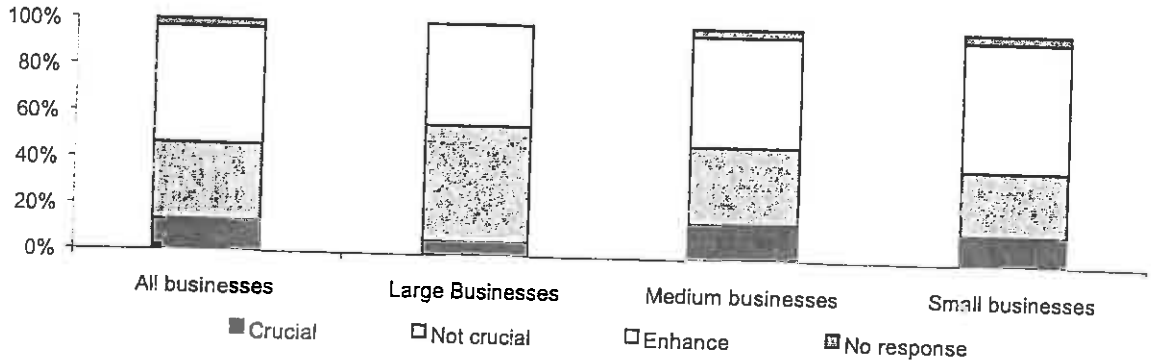
Source: MHC survey.

A different picture emerged in the ANZAC ship case study (Figure 19 and Tasman 2000). Only 13 per cent of respondents to the ANZAC ship survey reported that defence work was crucial to their business' viability. Further, medium and small businesses were more likely to report that defence work was crucial than larger businesses.

ANZAC ship respondents were more likely to report that defence work was crucial to their viability if the ANZAC ship project accounted for more than 10 per cent of their business' turnover. To minimise respondent burden a question on the importance of the MHC project to businesses turnover was not included in the MHC survey questionnaire. However, given the number of respondents reporting Defence work was crucial a number of MHC respondents were followed up by telephone on this issue. Many of the businesses contacted reported that the MHC or other defence work accounted for between 10 per cent and 30 per

be the important factor in respondents' decision to report that defence work is crucial to their business' viability.

Figure 19: Importance of defence contracts to ANZAC ship businesses' viability



6.2.1 The Defence export nexus

As outlined in Chapter 5, businesses participating in the MHC and ANZAC ship projects have a much high propensity to export than industry as a whole. This higher export propensity enhances 'defence industry' sustainability by making businesses less reliant on Defence work. Importantly, Chapter 5 also identified that involvement in Defence work enhances these businesses ability to export. Thus the benefits of the relationship flow in both directions and, in turn, act to further strengthen industry's sustainability and Defence's capability.

7. IMPROVED BUSINESS PERFORMANCE — AN IMPORTANT OUTCOME

The technology transfers achieved through Defence projects such as the MHC and the high level of usage of best practice programs and practices by defence industry businesses has positive implications for industry's ability to support Australia's Defence capability. Industry, as a result of its involvement with major defence projects, is now better able to provide the high quality, high technology equipment, training and support that Defence requires.

While the importance of this improved capability should not be discounted, it is only a part of the overall impact of Australian industry participation in major Defence projects. As outlined in earlier chapters a substantial number of firms participating in the MHC project reported that their involvement in the project has had positive spinoffs for productivity as well as other aspects of performance including improved quality and increased exports.

7.1 PRODUCTIVITY GROWTH

Productivity growth is central to improving Australia's competitiveness and its citizens' standard of living. For example, the Industry Commission (IC 1997, p. xxi) notes:

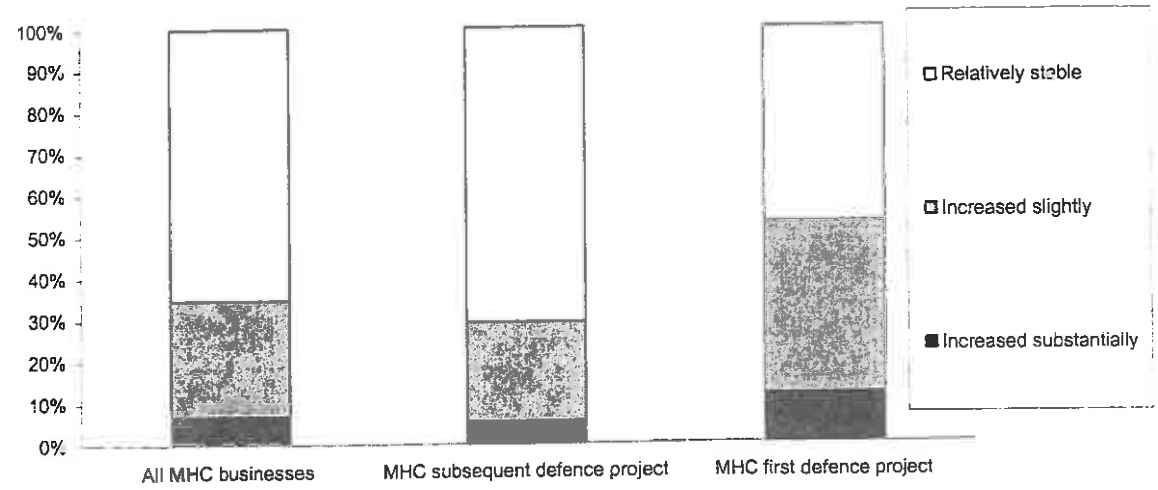
> Raising and sustaining productivity growth should continue to be a high priority for policy. The evidence is that strong and sustained productivity growth is essential if Australians are to purchase more, save more, enjoy more leisure, and increase their capacity to meet community objectives and protect the environment.

MHC survey respondents were asked to indicate both qualitatively and quantitatively how their overall business productivity was effected by involvement with the MHC project. No business reported a decrease in its overall productivity/efficiency as a consequence of its involvement with the MHC project. While the majority of businesses considered that productivity had remained relatively stable, 35 per cent reported that involvement with the MHC had led to an increase in productivity (Figure 20).

The proportion of businesses reporting a productivity increase did not vary significantly by business size. However, respondents reporting that the MHC was their business' first time defence-related project were more likely to experience an increase in productivity as a result of their involvement with the MHC project than businesses with more experience in defence work (Figure 20). Nevertheless, a significant number of respondents from businesses with a long record of working on defence projects considered that involvement in the MHC project was important in improving overall productivity performance. The positive productivity experiences of Cowan Manufacturing, a company which has supplied the Australian and

United States Departments of Defence for more than two decades, is a case in point (see Box 8).

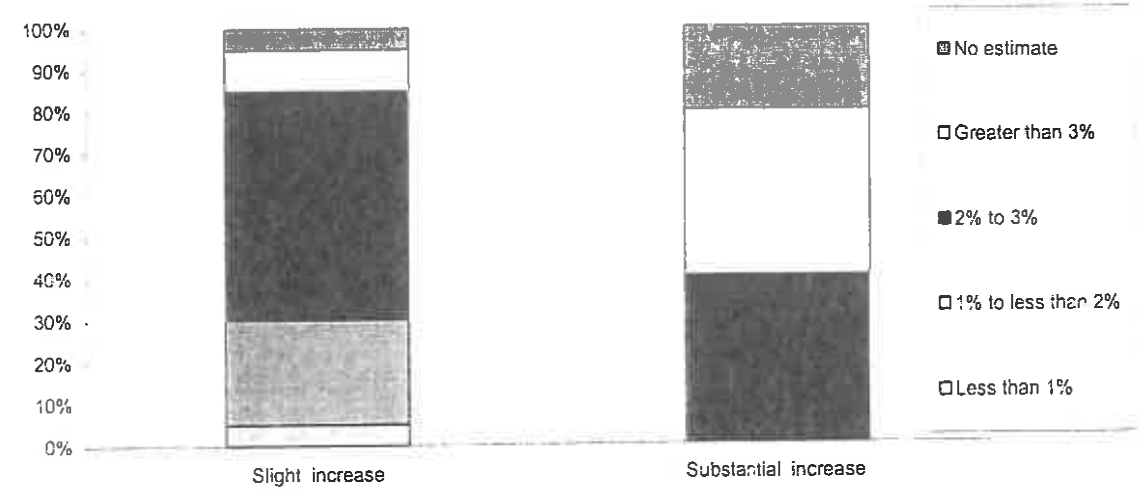
Figure 20: Respondents qualitative estimate of the change in productivity



Source: MHC survey.

In the majority of instances the productivity increase qualitatively reported by firms was assessed to be "slight". However differences in perceptions about the relative magnitude of the increase become apparent when firms quantified the increase. For example, more than half of the businesses reporting a slight increase in productivity estimated that the increase was between 2 per cent and 3 per cent. Forty per cent of businesses reporting a substantial increase also estimated that the increase was in the 2 per cent to 3 per cent range (Figure 21).

Figure 21: Quantitative estimates of MHC related increase in productivity
(per cent of firms reporting a productivity increase)



Source: MHC survey.

Businesses reporting a productivity increase of greater than 3 per cent were given the opportunity to estimate the actual increase, these estimates ranged from 5 per cent to 10 per cent. The average change in productivity generated as a result of these businesses involvement with the MHC project was 2.24 per cent.[3]

The productivity increases generated by Australian industry's participation in the MHC project can be expected to have had positive impacts on Australia's economic wellbeing. Part C considers the impact of this productivity improvement on the Australian economy as a whole.

[3] This average productivity increase was estimated by assigning the midpoint of the productivity increase option chosen by each business reporting an increase in productivity. This estimate was then assigned a weight, which was based on the businesses' reported annual turnover. These increases in productivity were then summed to derive an average increase in productivity.

PART C: THE MHC PROJECT'S ECONOMY WIDE IMPACTS

In addition to being a catalyst for technology transfer, improved defence capability and a driver of improved performance for many businesses, Defence projects can have positive impacts on the economy as a whole. This can occur in a variety of ways.

First, the increased capability of Australian businesses to work with the Department of Defence or its prime contractors can have positive implications for the through-life-support of major naval acquisitions, such as the MHC vessels. The benefits of Australian industry involvement in the support of the Minehunter Coastal Vessels include:

- savings in the amount of money and resources Defence needs to outlay on in-service support; and
- shorter repair turn around times which, in turn flows, through to improved operational capability.

These impacts are considered in greater detail in Chapter 8.

Second, the decision to construct the vessels in Australia rather than import similar vessels from overseas has implications for national output, Gross Domestic Product, Australian's consumption and employment. [4]

Finally, the increase in the productivity experienced by many businesses associated with a Defence project, such as the MHC project, has an additional positive impact on the economy. General equilibrium analysis indicates that the stimulus created by the construction of the Minehunter Coastal Vessels in conjunction with the productivity improvement experienced by its subcontractors will have, in net present value terms, contributed up to $887 million in Gross Domestic Product over the nine year construction phase. While the construction stimulus has a relatively short time frame of nine years the benefits of the MHC-induced productivity improvement will continue long after the project has been completed. These economy wide impacts are considered in greater detail in Chapter 9.

[4] This report refers to the MHC project's contribution to a number of national aggregates, such as GDP. The definition of these aggregates can be found in Appendix 4.

The analysis presented in this part of the report demonstrates that if the MHC project had not gone ahead and similar ships had been sourced from overseas the Australian economy would have been worse-off in terms of both national income and consumption.

8. THROUGH-LIFE SUPPORT

The Minehunter Coastal Vessels' in-service support contract reflects a change in the RAN's approach to through-life support. This new approach, which was first initiated for the Collins Class Submarine project, relies on a close collaboration between the RAN and Australian industry. In this instance it sees industry, as much as possible taking responsibility for the logistic support of the MHC capability from the RAN. By contrast, in-service support for acquisitions purchased prior to this change in policy required the RAN to undertake all management aspects and arrange for in-service support to be provided through a series of individual contracts. In many cases in-service support services were provided by the overseas original equipment suppliers and foreign navies.

As per Defence contracting guidance at the time of the acquisition, the through-life support contracts for the Minehunter Coastal Vessels were negotiated separately from the acquisition contract. After completion of a tendering process in 2000, Defence awarded ADI Limited the Minehunter Coastal Vessels' in-service support contracts for the platform systems and combat system and Thales Underwater Systems (TUS) was awarded the in-service support contract for the ship' sonar system.

Both ADI's and TUS's through-life support contracts run for a five-year period. Both contracts include an option to extend for a further period. The contracts cover routine and ad hoc in-service support services. The routine in-service support components of the contracts are valued at $41 million and $19 million, respectively. ADI estimates that over the first five years the ad hoc component could run to three or four times the value of the routine in-service support component.

A wide range of tasks and services are covered by the contracts. Tasks covered by the ADI routine contract include:

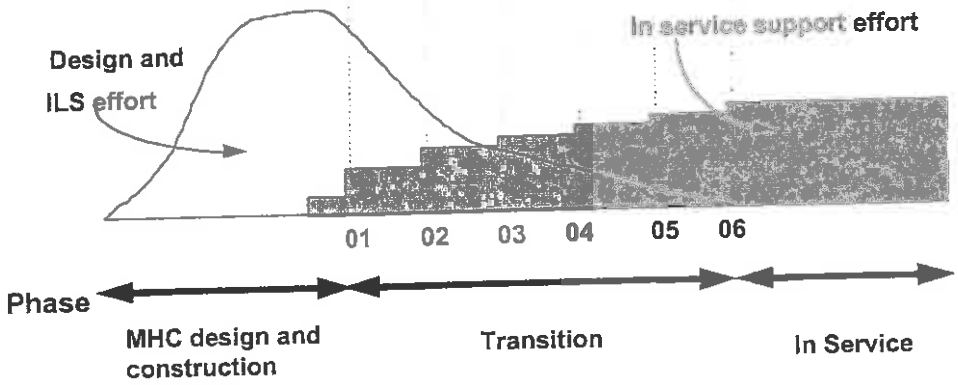
- Program management;
- System engineering and configuration management — including, design change management and implementation, supportability analysis, technical investigations and provision of technical advice to Minehunter Coastal Vessels' personnel and obsolescence management;
- Platform and combat system maintenance, management and planning;
- Inventory management — including warehousing, procurement and distribution of spares; and
- Planning and scheduling technical training of crews and other personnel as required — under the contract, the conduct of training is treated as an ad hoc service.

In regards to Sonar training for the RAN's Minehunter Coastal Vessel crews, TUS reports that its contract was the first in-service support contract where training for a system was contracted to the Original Equipment Manufacturer (OEM) for both training development and implementation. To deliver this training TUS maintains a RAN Training System qualified external training group.

Even though through-life support technically commences on the delivery of the first ship, work must commence much earlier. The through-life support period can be conceptualised as involving the following three distinct phases:

- Design and construction;
- Transition; and
- In service support (Figure 22).

Figure 22: Phases in the provision of through-life support



Thus, the process of developing a through-life support plan commenced in the design phase of the acquisition contract, well before Defence awarded the in-service support contracts. As part of this first phase of in-service support, the prime contractor put in place a comprehensive Integrated Logistics Support (ILS) program. The ILS flow chart (see Figure 23) highlights the interdependencies between the design, construction, training and in-service support activities.

The Minehunter Coastal Vessels' through-life support effort is currently in the transition phase. Four vessels have been delivered to the RAN and the remaining two are nearing completion. As Figure 22 demonstrates, the scale of the through-life support workload progressively increases as each vessel comes into service.

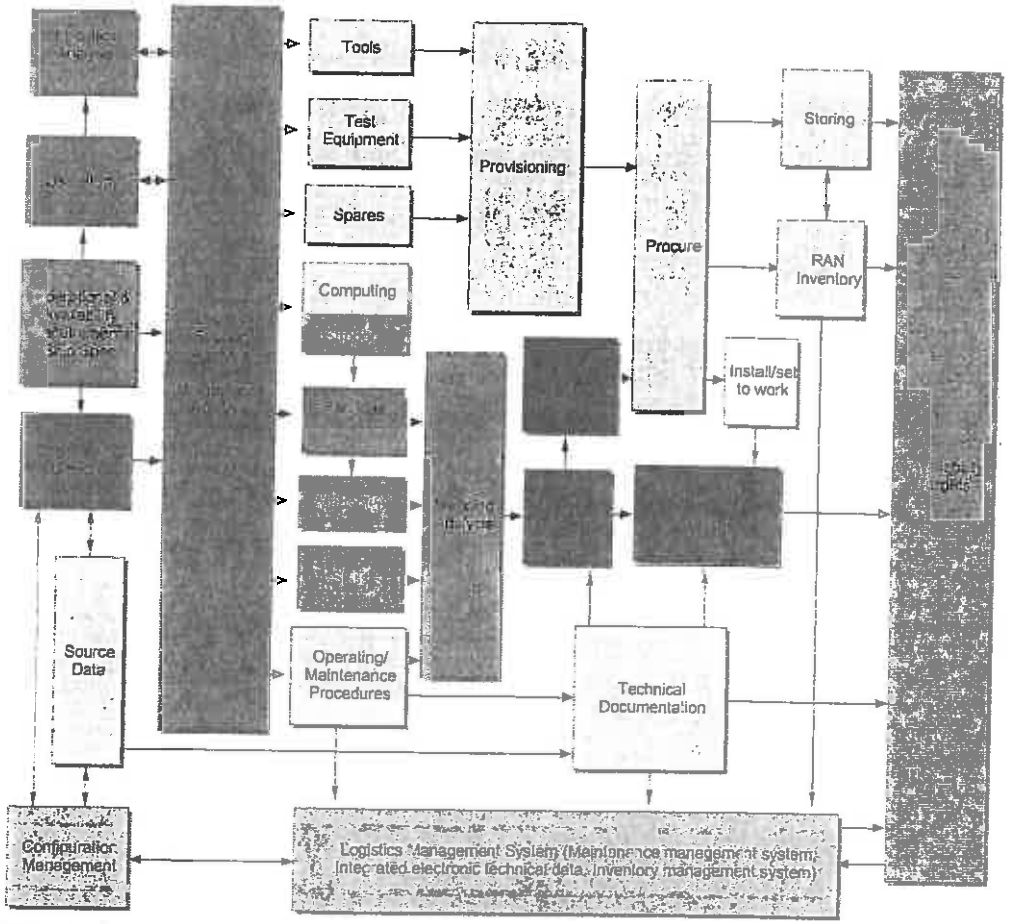
The Transition phase is a high-risk period in the through-life support of a new class such as the Minehunter Coastal Vessels. This is because:

- training of crews and support staff is under way;
- even fully trained crews and support staff have relatively limited experience in operating and supporting the ships;

- design changes which arise from early operating experience and First of Class trials must be managed;
- the industry skills, capabilities and knowledge built up by firms and individuals in the construction phase may be lost as businesses move to other work or staff are redeployed. Restoring capabilities to the level required can be time consuming and expensive;
- the data, documentation and materiel deliverables to be supplied to the RAN and the MHC project office are still incomplete and in various stages of delivery; and
- the construction schedules of the remaining vessels must be maintained.

In the process of managing these risks, the transition phase provides opportunities for the RAN, ADI and TUS to identify where the vessels' logistics support package may need to be refined or reviewed. Once all of the vessels have been delivered, in-service support enters into a steady state.

Figure 23: The Minehunter Coastal Vessels' Integrated Logistics Support Process



Source: ADI Limited.

8.1 EXPERIENCE TO DATE

During the study, representatives from the Department of Defence, ADI and TUS were contacted to assess the scope and significance of in-country through-life support plans. These discussions and other feedback which are reported below, indicate that the MHC Project is demonstrating to Defence and Australian industry the positive impacts of being both a prime, a design authority, and an original equipment manufacturer, not only during production, but also in the emerging through-life support phase.

8.1.1 Defence's perspective

The Project's Director, is clearly of the view that the RAN, as the customer, will achieve an enhanced through-life outcome because the MHC's in-service support is being provided by local industry. The strong local industry involvement program that was achieved during the acquisition of the vessel further enhances this long-term support outcome.

From the RAN's perspective an in-country through-life support capability has had a positive impact on operational capability. For example, under the contract repair turn around times (RTAT) are required to be in the range of 90 to 180 days. Defence advised that in some instances RTAT of up to a year, or even longer, could be expected when a capability is sourced and serviced from overseas suppliers. Furthermore, in periods of international crisis, such as in the Gulf War or the current War on Terrorism, there is the potential for RTAT to blow out to years as overseas suppliers are under pressure to give the priorities of their own defence organisations the highest weight.

While these benefits are significant, the Project Director also pointed out that the in-service support contracting arrangements present lessons for future acquisition contracts. As noted above, Defence contracting guidance at the time of the MHC's acquisition contract was that through-life support contracts should be negotiated separately from acquisition. The Project Director believes that this has caused some problems not only for Defence but also for the prime contractor. A particular concern is maintaining the specific MHC project-related skills and capabilities developed in Australian industry under the industry involvement program, which would enhance the support outcome, prior to the start of through-life support activity. Unless there is other, similar work being carried out by the company, there is significant potential to lose staff and their skills and knowledge during this period.

Consequently, the Project Director is of the view that the current Defence contracting philosophy, which emphasises the need to put in place arrangements for through-life support when negotiating major acquisition contracts, has significant potential to lead to an enhanced transition and long-term support outcome. He is of the view that a number of the

problems faced during the transition period would not have appeared if the acquisition and support contracts had been negotiated at the same time.

8.1.2 Industry's perspective

Both ADI and TUS consider that Australian industry's involvement in the MHC project has provided Defence with an excellent (best practice) indigenous capability to support the ships' throughout their operational lives. That said, the gap between awarding the acquisition contract and the in-service support contract has presented some complications to the provision of the Minehunter Coastal Vessels' in-service support. For example:

- since the acquisition contract was awarded a number of Defence companies in Australia and offshore have been the subject of mergers and acquisitions as the global defence industry adjusts to changing demands. Such structural change occurs from time to time in all industry sectors and the defence sector is no exception. However, these mergers and acquisitions have to some extent complicated the negotiations for the provision of through-life support. The contractual responsibilities of all parties would have been much clearer if the through-life support contract had been agreed to at the same time as the acquisition contract;
- because through-life support was not a requirement of the acquisition contract ADI could not give its subcontractors a guarantee that they would have work in the through-life support phase. As a result of this uncertainty some subcontractors were reluctant to undertake the necessary steps in the acquisition phase to prepare and invest for through-life support. In this period of transition to through-life support, invaluable expertise can be lost. For example, some subcontractors' staff, uncertain of their future, moved on to other projects or to other employers. ADI reports that in some areas, the uncertainty created by the through-life support contracting philosophy led to a loss of through-life support capability in the short term; and
- the segmentation of acquisition and through-life support contracting arrangements means that the prime contractor must negotiate with two Defence customers (acquisition and support) in order to resolve issues that transcend both contracts. There can be no guarantee that these two clients have the same views on the most appropriate approach to the resolution of a particular issue. This can result in trade-offs, which may not necessarily be ideal from a through-life support perspective. For example, opportunities for design changes that would realise through-life benefits have not been pursued in the interests of complying with the acquisition contract's cost and schedule constraints.

While these issues and problems have been managed, they have increased the risks associated with the transition phase of the Minehunter Coastal Vessels' in-service support. Notwithstanding this, ADI's Minehunter In-Service Support Manager, points out that:

> The transition challenges have been addressed. It is clear that the Minehunter Coastal project has built up Australian industry's in-service support for Defence capability. And, as a consequence, Defence is achieving savings, in terms of lower procurement and maintenance costs and increased operational availability.
>
> Furthermore recent changes in Defence's through-life support contracting philosophy should lead to even higher savings for capability acquired under the new arrangements.

As outlined below, savings have been achieved through the management of inventories, repairs and maintenance and through low RTAT.

- **Inventories**

A range of inventory management techniques in conjunction with short turn around times and the valuable input of staff who have a high level of knowledge about all aspects of the equipment, have reduced Defence's capital procurement costs. For example, in relation to the platform and combat systems in-service support contract, ADI estimates that:

- the inventory savings achieved to date through alternate sourcing would be in the order of $6 million to $8 million over the vessels' 20 year life;
- improved repair turn around times are resulting in inventory holding savings in the order of $7 million to $8 million over the vessels' 20 year life; and
- savings achieved through inventory distribution and collection procedures are in the order of $300,000 per annum.

- **Repairs and maintenance**

As part of the in-service support function, both ADI and TUS have each set up a multi-functional service team. These two teams have enabled ADI and TUS to provide the RAN with a unique service. The teams comprise people who have experience in systems engineering, test and trials, logistics analysis and training. With their overall multi-system knowledge, the teams can provide advice and instruction over the telephone to the ships' crews. If the team's attendance at a ship is required this can be arranged seven days a week.

ADI points out that its Routine Services Team can often diagnose problems that transcend a number of systems. In addition to providing a speedier solution to such problems the Routine Services Team is also a cost effective alternative to involving individual equipment suppliers (at high hourly rates) who cannot have the overall knowledge necessary to resolve system integration or whole of ship type problems.

TUS reports that in addition to providing a speedier solution to problems its In Service Support Team has been providing valuable assistance to the RAN during the conduct of ship trials.

Examples of TUS's speedy response to urgent MHC repairs include:

- notification of a fault in the Sonar system on a ship in Darwin was received at 1200 hours on a Saturday. By 2200 hours a member of the company's In-service Support team in Sydney was in attendance at the ship; and
- a ship on exercise north of Sydney reported a sonar problem and was going to terminate its participation. The ship called into TUS's Technical inquiry service, the defect was investigated with the use of a system in TUS's facility, a work around was discussed and agreed with the ship and the ship successfully completed the exercise.

Examples of ADI's speedy response to urgent MHC repairs include:

- notification of a fault in the communications system on a ship in Cairns was received at 1200 hours. By 2300 hours the same day an ADI person (from Sydney) was in attendance at the ship;
- a ship transiting north from Sydney reported a defect on a main engine. The ship called into ADI's Minehunter facility in Newcastle at 1800 hours. The defect was repaired and a trial conducted, at midnight the ship continued its passage north.

This type of industry interaction with the RAN and the establishment of the multi-functional system team approach to in-service support, requires a deep-seated system knowledge of a capability. Australian industry can only obtain this knowledge, and thus provide this type of in-service support, by having a major involvement in the acquisition phase. The MHC Project has been important to Defence and Australian industry in demonstrating the positive impacts of being both a prime and a design authority, not only during production, but now in the emerging through-life support phase.

- **Preventive Maintenance and training**

Preventative maintenance is a key component of effective through-life support. For example, as at October 2001, the ADI and TUS teams planned and managed 23 Funded Maintenance Availabilities (FAMPs). FAMPs are typically of two weeks duration and occur at approximately three-monthly intervals, depending upon the ship's program. They are used to conduct the preventive maintenance, which is beyond the capacity of ship's staff, as well as to carry out repairs (or corrective maintenance) of a non-urgent nature. The ability to plan and provide for a regular cycle of preventive and corrective maintenance requires a degree of communication, flexibility and responsiveness that is made much easier by having a highly skilled in-country team. The concept of transitioning this type of maintenance from

RAN crews to industry, without having an adverse impact on operational requirements, requires the closest of working relationships that will need to endure for the lifetime of the vessel.

TUS reports that, at the RAN's request, the company has on several occasions, provided experienced staff to work on board ships during major exercises. TUS reports that this on board support has been beneficial to the crew who gained valuable operational training. This "on-tap" support can also enhance the ship's performance during an exercise. It is unlikely that this support would be available from an offshore original equipment supplier.

- **Turn around times**

Over the period since the first ship was delivered in early 1999 to October 2001 ADI received around 700 notifications of requests for assistance and/or repair action from the in-service vessels. Over the same period TUS received 50 notifications of requests for assistance with the Sonar system. [5]

These requests are given a priority rating. Under the in-service support contracts, requests rated as Priority 1 require an immediate (or as soon as practicable) response. Priority 2 requests, which form the majority of requests received by ADI, have a longer response time frame. ADI and TUS advise that on all occasions their multi-functional service teams have provided the customer with a rectification plan within the response time frame specified in the in-service support contract. ADI reports that in its case over 300 of its notifications were cleared in less than 30 days and 27 were cleared before an official notification and request for assistance had been received.

ADI and TUS are both working to, wherever possible, further reduce the ships repair turn around times. RTAT has been improved over past projects by:

- utilising a rigorous approach to establishing Australian depot level repair requirements through techniques such as repair analysis and industry support plans;
- utilising ADI's Routine Services Team and TUS's In-service Support team and local industry capability, rather than a foreign original equipment manufacturer, to find faults and repair capability;
- working to maintain good direct relationships with ADI's original equipment manufacturers;

[5] Taken in isolation, the number of notifications cannot provide an accurate representation of ship reliability or availability. Nonetheless, the response times to these notifications provides a useful measure of the responsiveness of contractor (and RAN) support infrastructure and a measure of the robustness of the in-service support philosophy and its implementation.

- identifying problems in items to be repaired prior to despatching to a repair agent and encouraging repairers not to operate a 'first-in, first-out' regime or queuing system; and
- streamlining the administration process and fast tracking acceptance or rejection of quotations.

Some examples of local industry arrangements that have reduced repair turnaround times or have matched the RAN's in-house repair capability are listed below:

- gyros are repaired through an arrangement between ADI Services and Sagem in Australia. These items would previously have been repaired by Sagem in France which could result in a RTAT of months rather than weeks;
- the use of a local company in the acquisition phase for the build of the mine disposal vehicles has helped facilitate the vehicles' Swedish original equipment manufacture awarding an Australia company a licence to conduct in-country repair and service. This licence has given ADI and its subcontractors the ability to comply with a subsequent in-service support contract requirement that the RTAT for the vessels' mine disposal vehicles should be no longer than two weeks;
- BAE SYSTEMS has developed a test rig and methodology to test electro luminescent panels in-country. Prior to developing this in-country capability items needing repair had to be to be returned to the UK at a cost of $9000 and RTAT of 12 weeks. Utilising the new test rig, a similar repair was conducted locally in 1 hour at a cost of $200;
- communication system equipment repairs on headsets and the like are undertaken in-country and are available for use within hours rather than weeks; and
- repairs to valves are undertaken by a local engineering company and, in some circumstances, are back with the RAN on the same day a fault is identified. This RTAT is equivalent to the standard of service achieved by the RAN's in-house repair capability.

8.1.3: In-country through-life support — a win-win strategy

The discussion above highlights that the benefits to Defence of a major in-country acquisition such as the MHC project extend past the construction phase. The Australian industry involvement in the MHC project has developed or enhanced the capability of Australian industry to provide in-service support. Many Australian businesses are currently working with the Australian prime contractor providing in-country through-life support for the ships. The in-service support benefits of Australian industry involvement are many and include:

- savings in the amount of money and resources Defence needs to outlay on in-service support;

- shorter repair turn around times, which in turn flows through to improved operational capability; and
- increased effectiveness during operations through the provision of 24 hour technical inquiry services.

In-country through-life support also creates opportunities for "value adding" which would be less likely to be obtained through an out-of-country arrangement. The multi-functional system team approach used by ADI and TUS to support the Minehunter Coastal Vessels is an example of these "value adding" opportunities. This approach can only be contemplated when Australian industry has a deep-seated system knowledge of a capability. This can only be gained through either the experience of being the prime, or by achieving design authority status.

The importance of having a strong in-country through-life support capability becomes particularly obvious in periods of international crisis, such as the current War on Terrorism. Past experience indicates that in times of international crisis out-of-country through-life support repair turn around times can blow out because overseas suppliers are under pressure to give the priorities of their own organisations the highest weight. An in-country capability means that Australia's Department of Defence requirements are treated as 'priority number one'.

While the experience to date with the Minehunter Coastal Vessels' transition into in-service support has been positive there are nonetheless lessons for future Defence contracting. The MHC Project Director in Defence and the ships' In-service Support Managers in ADI and TUS consider that the management of the risks associated with the transition phase of in-service support have been complicated by the through-life support contracts being negotiated some considerable time after the acquisition contract. However, they are all of the view that recent changes in Defence's contracting philosophy on through-life support should enhance the transition and long-term support outcomes, which can only increase the benefits to be gained from in-country through-life support arrangements.

9. THE MHC PROJECT'S IMPACT ON NATIONAL AGGREGATES

Since 1994 the MHC project has generated output, employment and Gross Domestic Product (value added) for the Australian economy. This Chapter focuses on the MHC's contributions to these economic variables.

9.1 THE MHC INPUT-OUTPUT DATABASE

The actual quantum of the economic effects of the MHC project is not just related to the direct employment and increased demand in Australia that the project has created. This is because these initial impacts have flow on effects, which should also be included in the analysis. Input-output activity multipliers, which are derived from an input-output database, are an established method for estimating these flow-on effects. To help estimate these direct and indirect effects Tasman Economics has developed an input-output database, which separately identifies the MHC project.

In a project such as the MHC it is difficult to identify a year which could be considered as "typical". For this reason the MHC input-output database developed for this study is based on the latest available Australian Bureau of Statistics input-output table of the Australian economy. This database, which represents the economy's inputs and outputs for the year 1996–97, contains 106 highly aggregated Australian primary, manufacturing and service sector industries (see ABS 1999). The high level of aggregation in the Australian Bureau of Statistics input-output table means that the inputs and outputs of projects such as the MHC project cannot be readily identified. However, with the assistance of the prime contractor's financial records and extensive supplier database, Tasman Economics has been able to estimate and separately identify the MHC project inputs and outputs for 1996-97. These data were extracted from the relevant industry in the input-output table and then aggregated into two input-output industries — the MHC prime contractor industry (comprising the activities of ADI's Minehunter facilities in Newcastle) and the MHC subcontractor industry.

The new MHC input-output database identifies the linkages in 1996-97 between the MHC prime contractor, its suppliers and the rest of the economy and, through imports, the rest of the world. Consistent with the ABS input-output methodology, New Zealand content in the MHC project has been treated as imports. However, under the Australian Industry Involvement program local content in major Defence projects includes value added from New Zealand as well as Australian industry. Figure 24 sets out the key milestones in the MHC to date to highlight the activity in the selected year 1996-97.

Figure 24: MHC project production - key milestones, to date

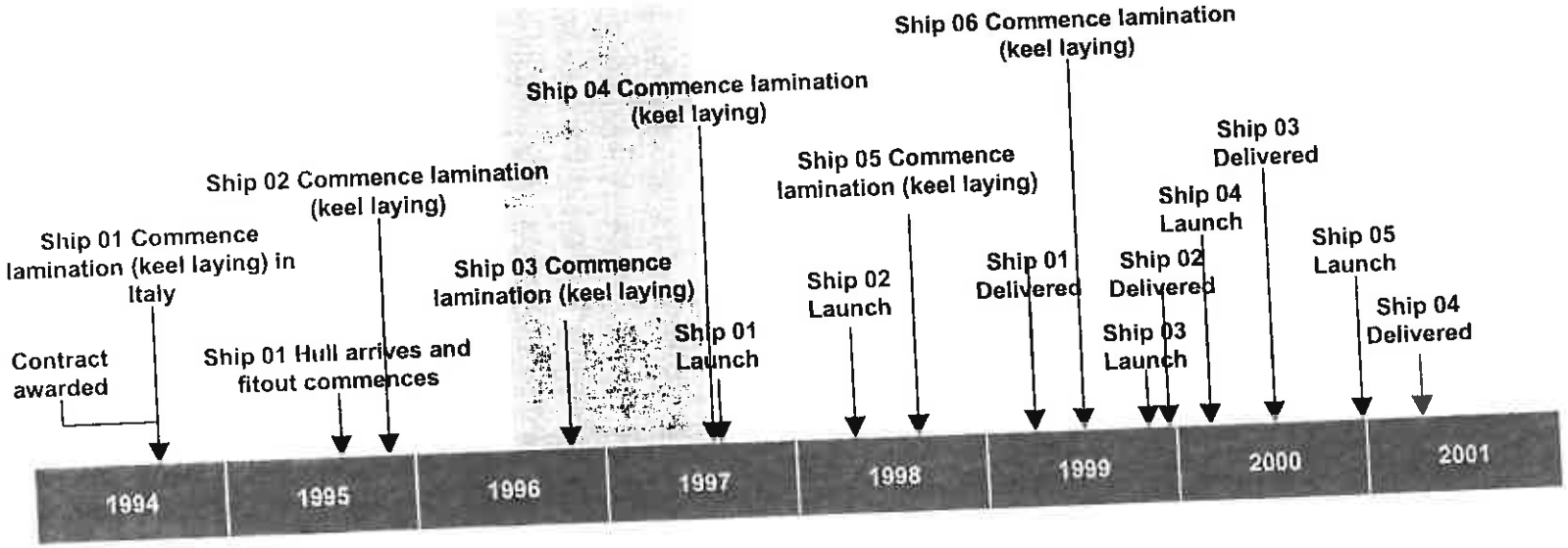


Figure 24 illustrates that a range of activities were under way in 1996-97 including:

- fitting out of ship 01:
- fitting out of ship 02; and
- keel laying and lamination of ship 03.

The current planned dates for major future milestones are:

- Ship 06 to be launched - January 2002;
- Ship 05 to be delivered - January 2002; and
- Ship 06 to be delivered - September 2002;

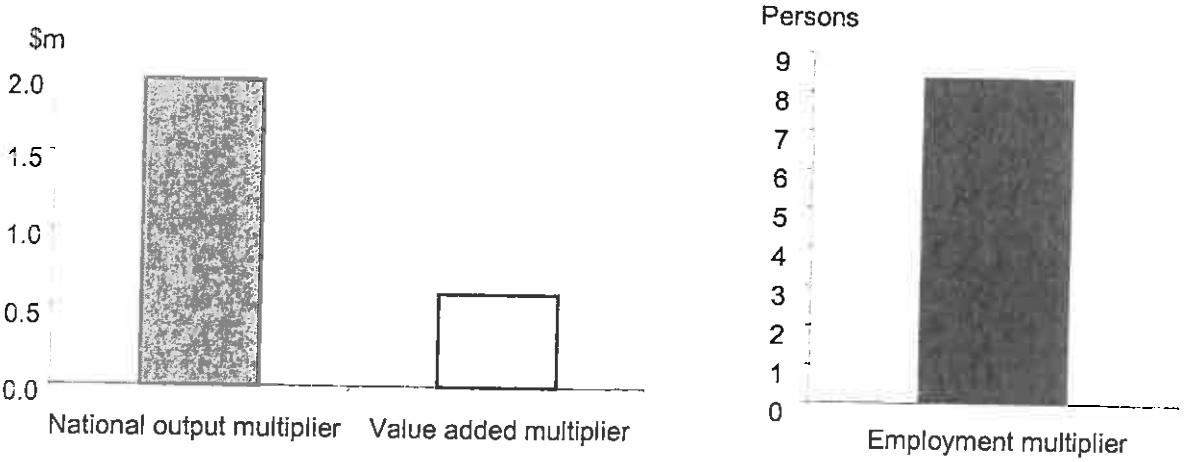
The construction contract is expected to be competed in March 2003.

The MHC input-output database separately identifies the MHC project and its linkages to the Australian economy. It has been used to calculate output, employment and value added multipliers. These multipliers represent a well-established analytical approach for assessing the extent of the direct and indirect linkages between an industry and the rest of the economy. Appendix 4 outlines some of the key assumptions underlying multiplier analysis and presents more detail on the MHC multipliers, which are summarised below.

Multiplier analysis indicates that for every dollar of MHC output there will be a significantly larger increase in national output, value added (or Gross Domestic Product) and employment in Australia (Figure 25).

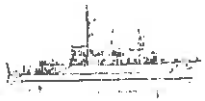
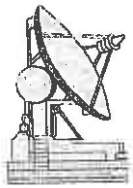
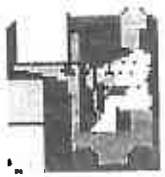
As explained in Box 9 this multiplier effect is due to the linkages between the MHC project and the rest of the economy. In the following section these multipliers have been applied to the outputs of the MHC project to help assess the wider impact of the project on the economy.

Figure 25: MHC project input-output multipliers
(economic activity generated by a $1 million increase in MHC project output)



Source: Tasman economics estimates.

Box 9: MHC project input-output multipliers for Australian output, value added and employment

		Australian production ($ million)	*Australian value added* ($ million)	*Employment* (Full-time equivalent jobs)
$100 million increase in demand for Minehunter Coastal Vessels →	**Total multiplier effect** →	**195.6**	**59.3**	**836.0**
	Which includes the:			
	Initial effect — Prime contractor to satisfy additional demand requires extra labour and supplies →	100.0	21.3	175.0
	Plus			
	First round effect — In order to supply the prime contractor's increase in demand, sub-contactors also increase demand for labour & inputs →	52.2	20.0	405.0
	Plus			
	Industrial support effect — Demand for the goods and services produced by the sub-contractor's suppliers will in turn increase demand for labour and inputs. This cycle continues until all increases in demand are satisfied. →	43.4	18.0	256.0

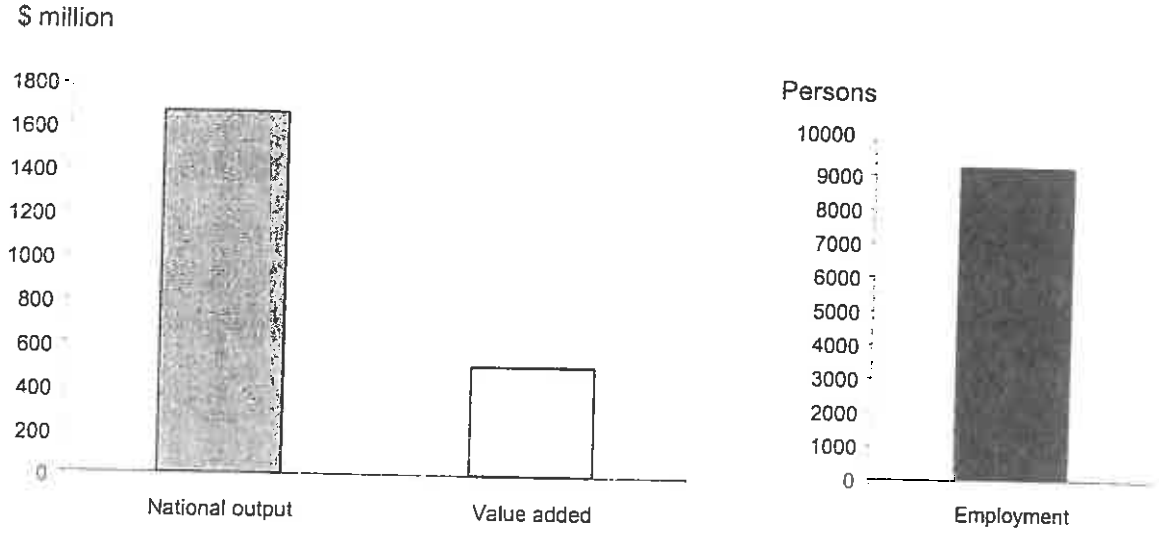
9.2 CONTRIBUTION TO NATIONAL ECONOMIC ACTIVITY

The construction of the Minehunter Coastal Vessels spans a period of around nine years. Over this period the MHC prime contractor will deliver vessels with a contract value of just under $917 million in 1993 dollars, or more than $1 billion in 2001 dollars. The contract directly contributes to the total value of national output, value added and employment. However, because of the linkages between the prime contractor, its subcontractors and the wider economy, the project's contribution to national aggregates is greater than the contract value might suggest. Applying the input-output multipliers reported above to the contract value indicates that over its nine year life the MHC project will, in net present value (NPV) terms:

- contribute $1,665 million (2001 dollars) to national output; and
- contribute $505 million (2001 dollars) to national value added (Figure 26).

In addition, over the nine year construction period MHC project directly and indirectly generated (or sustained from year to year) around 9,250 full-time equivalent jobs (Figure 26).

Figure 26: Impact of the nine year MHC project on national aggregates

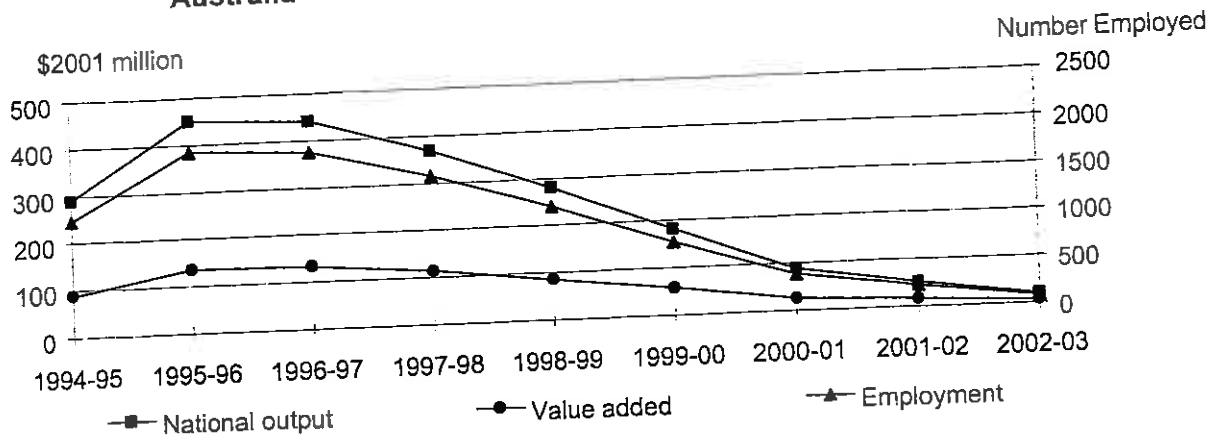


Note: Australian production and value added estimates are reported in terms of their net present values.
Source: Tasman Economics estimates.

As might be expected the annual value of output, value added and employment generated by the construction of the Minehunter Coastal Vessels in Australia was at its peak in the early years of the project's life. For example, in 1995-96 the project directly and indirectly generated more than 1,900 jobs and around $135 million in value added (2001 dollars). Even in the project's later years its contribution to the economy is still substantial. For

example, input-output multipliers indicate that the project in 2000-01 generated around 370 jobs and $26 million of value added for the economy (Figure 27).

Figure 27: Annual impact of constructing the Minehunter Coastal Vessels in Australia



Source: Tasman Economics estimates.

Given the large involvement of New South Wales businesses in the MHC project, a substantial proportion of this employment and value added will have been generated in the State. The Newcastle region of New South Wales, the construction site for the ships, will have enjoyed a significant proportion of this activity. Analysis presented in Appendix 3 indicates that the MHC project will have generated (or sustained from year to year) at least 3,180 full-time equivalent jobs in the Newcastle region. This contribution to employment in the Newcastle region does not take into account the flow on employment effects that are associated with such a major project.

Throughout the vessels' construction the Newcastle region has had consistently higher rates of unemployment than the national average (see figure in Box 10). In the absence of the MHC project the unemployment rate for the Newcastle region would have been even higher, putting further pressure on the local community and the State and Federal Governments' budgets. For example, if the ships had been purchased overseas Federal Government outlays on the Newstart Allowance (or its equivalent) alone would have, in net present value terms, been at least $21 million higher.

9.3 DYNAMIC IMPACTS OF THE MHC PROJECT

The multiplier analysis reported above focuses on the impact of the increase in demand for goods and services generated by the construction of the Minehunter Coastal Vessels in Australia. However, the analysis does not take into account the more dynamic impacts of the project, such as technology transfers, which have improved participating businesses' productivity and performance. As outlined in Part B, around 35 per cent of survey

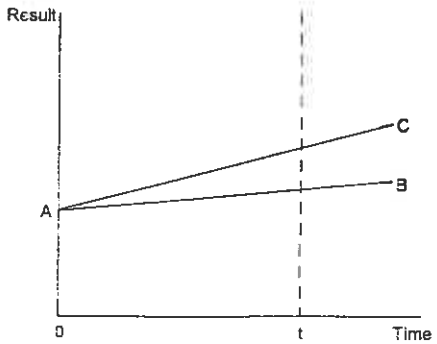
respondents reported obtaining MHC project-related improvements in their businesses overall productivity. A general equilibrium model, such as the STATE model, can help shed some light on these dynamic effects.[6]

Tasman Economics has used the STATE general equilibrium model of the Australian economy to help identify how the MHC project and the related productivity improvements have impacted on national consumption and Gross Domestic Product. Box 10 provides some information on general equilibrium models and their results. Appendix 5 presents more detail on the STATE model and the results reported in this section.

Box 10: Understanding the results of a general equilibrium model

General equilibrium models mimic the workings of the economy through a system of interdependent behavioural and accounting equations. These models initially assume that the economy is in equilibrium. The implications of a particular policy or change in demand or supply can be examined by "shocking" the model from this equilibrium position. Unlike input-output multiplier analysis general equilibrium models take into account constraints on the supply of labour, capital and other inputs that will apply in an economy like Australia. Because of these constraints the results from a general equilibrium model tend to be more conservative than those derived from an analysis based on input-output multipliers.

The STATE model has been used in this study. The STATE model is a comparative static model. As the figure below demonstrates, the STATE model's results allow comparison of the steady state and shocked environments at the same point in time. For example, assume path AB in the figure below shows the underlying time path of a particular variable, say Gross Domestic Product. Suppose that at time 0 a MHC project induced change in productivity occurs, this higher productivity flows through to higher wages and returns to capital and thus higher Gross Domestic Product. The result of this change is that Gross Domestic Product grows at a rate represented by the line AC. In the absence of the productivity change output would have grown at a rate represented by the line AB. A comparative static analysis involves comparing the size of the gap at point in time *t*.



(continued)

[6] General equilibrium models, unlike input-output multipliers, include a series of parameters that help explain the responsiveness of industries, consumers and the government to a change in economic conditions. For these reasons these models tend to produce more conservative results than those derived from multiplier analysis.

Box 10: Understanding the results of a general equilibrium model (continued)

Short run vs long run results

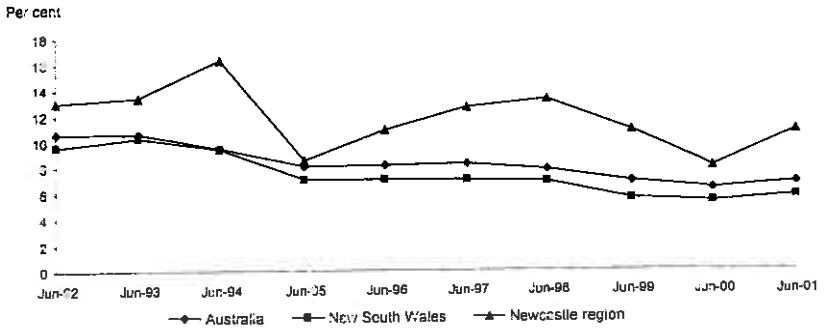
The STATE general equilibrium model provides short run and long run estimates of the impact of a "shock".

For the short run analysis nominal wage rates in the model are fixed and the rate of unemployment adjusts to reflect changes in the demand for labour. Short run results are often used to reflect a situation when the economy is not in a period of full employment. The results of a short run model closure can be considered as reflecting the situation around two or three years after the "shock" occurred.

To derive the long run results all markets, including markets for labour, in the STATE model clear — that is supply in each market equals demand for its goods or services. Thus in the long run closure of the model any increase in unemployment associated with the removal of demand for locally manufactured Minehunter Coastal Vessels is addressed by changes in prices, including real wage rates. For example, if there is disequilibrium in the labour market the change in wage rates could continue until the demand for labour is equal to the supply of labour. For this to occur wages rates need to be flexible downwards and upwards and labour needs to be prepared to move from region to region within Australia to obtain work. The results from the long run closure of the model are generally considered as reflecting the situation when the economy returns to an equilibrium position, which could be at a time some ten years or more after the "shock" occurred.

Given the high levels of unemployment experienced in Australia and particularly in the Newcastle region for much of the MHC projects life, the short run closure may be a better reflection of the MHC project's impact on the economy, particularly over the nine year construction period (see figure below). For this reason the general equilibrium results reported in this study are based on the short run closure of the STATE model.

Unemployment rates (June 1992 to June 2001)



To help assess the MHC project's wider effects on the Australian economy the STATE model, which separately identifies the MHC prime contractor industry and the MHC sub-contractor industry, was given the following "shock":

- rather than constructing the Minehunter Coastal Vessels in Australia with a high level of Australian industry involvement the Department of Defence purchased similar valued ships from overseas.[7] The construction of these imported ships required no Australian industry involvement. Under this scenario the MHC project prime contractor industry and the MHC project subcontractor industry disappear; and
- because the minehunters were imported Australian industry's productivity declines. This occurs for two reasons. First, Australian businesses no longer have the opportunity to obtain MHC related technology transfers (see Chapter 3). Second in the absence of the MHC project, fewer Australian businesses would have implemented performance enhancing programs and practices such as quality assurance (see Chapter 4). Reflecting the survey findings on productivity reported in chapter 4, this negative impact on productivity has been modelled as a 2.24 per cent decline in the productivity of 35 per cent of MHC project subcontractors "non-Defence" work.

The results

Australia would have been worse off if Defence had sourced its minehunter capability requirements offshore rather than from Australian industry. Compared with the import replacement alternative, Australia over the construction period had higher annual levels of Gross Domestic Product and consumption. Importantly, more Australians had employment than would have otherwise been the case. For example, around three years after the commencement of the MHC project, the decision to construct the ships in Australia rather than purchase them from an offshore supplier increased:

- Gross Domestic Product by $234 million ($2001 dollars);
- Consumption by $130 million ($2001 dollars); and
- employment by more than 3,000 full-time equivalent jobs.

These contributions are particularly important when it is remembered that Australia experienced high levels of unemployment for much of the 1990s. Further the Newcastle

[7] This analysis assumes that there was no strategic cost associated with Defence's decision to invest in a minehunter capability rather than some other non-minehunter capability. As outlined in Chapter 2, the acquisition of new minehunter vessels by the Department of Defence had been considered a matter of priority by the 1991 Defence Force Structure Review. Further, representatives from the Department of Defence contacted in the course of this study did not indicate that the Department paid a premium for the new Australian sourced minehunter capability.

region of New South Wales, which is the construction site for the ships, has higher unemployment rates than the national average. For example, in June 1996-97 the national unemployment rate was 8.3 per cent, whereas the unemployment rate in the Newcastle region was 12.6 per cent (see Box 10).

Extrapolating these short run results across the MHC project's construction phase provides an indication of the project's value to the economy. Over the nine years of the MHC construction phase the project, through the construction stimulus and the projects positive impact on participating businesses performance, would have (in net present value terms) contributed up to:

- $887 million to Australia's Gross Domestic Product; and
- $491 million in higher consumption levels for Australian households.

The project's contribution to annual employment will have varied over the life of the MHC project. However, on average, the project during the construction phase will have directly or indirectly contributed 1,860 full-time equivalent jobs each year.

These contributions to economic activity and employment are due to the demand associated with the construction of the Minehunter Coastal Vessels as well as the improved productivity of many businesses participating in MHC project.

To help put these estimates in perspective, the MHC project's contribution to Gross Domestic Product is more than sufficient to fund the Federal Government's:

- National Action Plan to address salinity ($700 million); as well as
- recent initiatives to increase the number of nurses practicing in rural and regional Australia ($104 million) and improve Australian's access to after hours medical care ($43 million).

Appendix 5 presents more detail on the general equilibrium estimates reported in this section.

9.4 CONCLUDING COMMENTS

This MHC case study builds on, and substantively adds to, the earlier ANZAC Ship project case study's positive findings. This case study demonstrates that the MHC project has been:

- a win for the economy and regional Australia;
- a win for Australian industry; and
- a win for Defence.

Australia would have been worse off if Defence had sourced its new minehunter capability requirements "off the shelf" from an overseas supplier rather than from Australian industry. Over the nine years of the MHC construction phase the project, through the construction

stimulus and the projects positive impact on participating businesses performance, would have (in net present value terms) contributed up to:

- $887 million to Australia's GDP; and
- $491 million in higher consumption levels for Australian Households.

The project has also contributed to employment. The project during the construction phase will have directly or indirectly contributed an average of 1,860 full-time equivalent jobs each year. A significant number of these jobs will have been in the relatively depressed economy of the Newcastle/Hunter region.

The opportunity to be involved in a major Defence project such as the MHC project has had positive long-term impacts on many of the businesses participating in the project.

Respondents to the MHC survey indicated that their businesses association with the project had led to:

- technology transfers;
- the take-up of practices to enhance performance;
- enhanced exports or improved export potential; and
- higher productivity.

Australian businesses' involvement in the MHC project has enhanced the capability of Australian industry to supply the Department of Defence. Consultations with key stakeholders indicates that the Australian industry involvement in the Minehunter Coastal Vessels' in-service support is producing significant benefits including:

- savings in the amount of money and resources Defence needs to outlay on in-service support; and
- shorter repair turn around times, which in turn flows through to improved operational capability.

APPENDIX 1: THE SURVEY QUESTIONNAIRE

Australian Industry Group

DEFENCE COUNCIL

Tasman Economics

World Class Solutions for Business and Government

THE IMPACT OF THE MINEHUNTER COASTAL SHIP PROJECT ON PARTICIPATING FIRMS

↓ In correspondence, please quote this number.

Please complete this survey for the Australian-based activities of the business shown on this label. ←

About this survey

Currently, there is very little information on the impact of sourcing major Defence acquisitions in Australia rather than from overseas. Tasman Economics, on behalf of the Australian Industry Group is helping to fill this information gap. In 1999 the two organisations conducted a survey into the economic impact of the ANZAC Ship Project. This survey into the Minehunter Coastal Project (MHC) aims to validate the results of the first survey and provide more information about the impact on Australian industry of defence-related spending.

Your completion of this survey will provide hard evidence for Government and industry as to the benefits Australian companies can obtain through their participation in major defence contracts. Your involvement in the survey will also help facilitate high levels of Australian industry involvement in future Defence work.

The survey has the support of a number of organisations including the MHC prime contractor ADI Limited (ADI). ADI has assisted in the development of the survey and provided the address list for MHC firms. Other key supporters of the survey are the Commonwealth Departments of Defence, Industry, Science and Resources and Finance and Administration, the New South Wales Department of State and Regional Development, the ISONET and the NSW Industrial Supplies Office.

The Ai Group, along with the survey sponsors, requests that you allocate some of your valuable time to complete this questionnaire. A high response rate will be important to the success of this study.

The Ai Group guarantees that the Ai Group and the survey consultant, Tasman Economics, will treat your firm's individual responses to this questionnaire as **Commercial-in-Confidence**.

Due date

Please complete and return the completed questionnaire by as soon as possible by facsimile to (02) 6247 0876 of by mail to the **Minehunter Coastal Study, Australian Industry Group, GPO Box 817, Canberra ACT 2601.**

Help is available

If you have any problems or queries or feel you may have difficulty meeting the due date, please contact Denise Ironfield, Senior Consultant, Tasman Economics on (02) 6247 0866 or dironfield@tasman.com.au or Ainslie Barron, Executive Officer, Ai Group Defence Council on (02) 6217 9188 or ainslieb@aigact.aigroup.asn.au

Part 1 Background Information

Please indicate the person we should contact regarding this form.

Name	

Telephone number	( )	Facsimile number	( )

1. **Does this business have an involvement in the Minehunter Coastal Ship Project (MHC)?**

Note: Involvement may be direct or indirect. For example your business may be a subcontractor or may supply a subcontractor or may have involvement through a Defence offsets agreement.

Yes ..... ☐

No..... ☐ **Thank you for completing this survey please return it in the envelope supplied.**

2. **This business commenced its involvement with the MHC in.....** 19 - -

3. **Was the MHC the first Australian defence related contract for this business?**

Yes ..... ☐

No..... ☐

4. **Did the Industrial Supplies Office play a role in this business becoming involved in the MHC?**

Yes a minor role..... ☐

Yes a major role..... ☐

No ..... ☐

5. **What is this business' <u>main</u> activity?**

Please tick one Box

The manufacture of goods or products..... ☐

The provision of services..... ☐

6. **Please briefly describe the main activity undertaken by this business.**

Note: For example, your business' main activity may be manufacturing paint or supplying accounting services.

This business' main activity is .....

Part 2 Technology

7. Did this business obtain a technology transfer as a result of its involvement with the MHC?

Yes ..... ☐

No..... ☐ **Go to question 10**

8. This technology was obtained via:

Please tick one Box per row	No	Yes
Existing published material	☐	☐
Original research and development	☐	☐
Recruitment or secondment into this business	☐	☐
Secondment of this business' staff to other organisations	☐	☐
Staff training	☐	☐
Purchasing or licensing of technology	☐	☐
Strategic partnership(s) with other organisation(s)	☐	☐
MHC related Defence offsets agreement	☐	☐

Other means (please specify below)

9. How did this technology transfer impact on this business':

Please tick one Box per row	Negative impact	No impact	Minor to Moderate positive impact	Major positive impact
Productivity	☐	☐	☐	☐
Product range	☐	☐	☐	☐
Level of defence related sales	☐	☐	☐	☐
Level of non-defence related sales	☐	☐	☐	☐
Level of export sales	☐	☐	☐	☐
Production costs	☐	☐	☐	☐
Product/service quality	☐	☐	☐	☐
Production flexibility	☐	☐	☐	☐
Market share	☐	☐	☐	☐
Opportunities for new domestic business	☐	☐	☐	☐
Opportunities for new export business	☐	☐	☐	☐
Other impacts (please specify below)	☐	☐	☐	☐

Part 3 Business operations

10. Does this business use <u>any</u> of the following business programs and practices?

- **Total Quality Management;**
- **Quality assurance;**
- **Just-in-Time Management;**
- **Process Engineering;**
- **Formal strategic plan;**
- **Formal business plan;**
- **Budget forecasting;**
- **Formal networking with other businesses;**
- **Comparison of performance with other businesses (benchmarking); and/or**
- **Export market planning;**
- **Outsourcing/subcontracting.**

Yes ..... ☐

No..... ☐ **Go to question 15**

11. When were these business programs and practices first implemented?

Please tick one Box per row	Not applicable	Prior to 1 July **1996**	After 30 June **1996** and Prior to 1 July **1998**	Since 30 June **1998**
Total Quality Management.....	☐	☐	☐	☐
Quality Assurance.....	☐	☐	☐	☐
Just-in-Time Management.....	☐	☐	☐	☐
Process Engineering.....	☐	☐	☐	☐
Formal strategic plan.....	☐	☐	☐	☐
Formal business plan.....	☐	☐	☐	☐
Budget forecasting.....	☐	☐	☐	☐
Formal networking with other businesses	☐	☐	☐	☐
Comparison of performance with other Businesses (benchmarking).....	☐	☐	☐	☐
Export market planning.....	☐	☐	☐	☐
Outsourcing/subcontracting.....	☐	☐	☐	☐

12. Was this business' involvement with <u>Defence</u> related projects important in the decision to implement any of the above business programs or practices:

Please tick one Box

Yes some..... ☐

Yes all..... ☐

No none..... ☐

13. How important was this business' involvement in the MHC in the decision to implement these business programs and practices?

Please tick one Box per row	Not applicable	Not important	Important	Very important
Total Quality Management	☐	☐	☐	☐
Quality Assurance	☐	☐	☐	☐
Just-in-Time Management	☐	☐	☐	☐
Process Engineering	☐	☐	☐	☐
Formal strategic plan	☐	☐	☐	☐
Formal business plan	☐	☐	☐	☐
Budget forecasting	☐	☐	☐	☐
Formal networking with other businesses	☐	☐	☐	☐
Comparison of performance with other Businesses (benchmarking)	☐	☐	☐	☐
Export market planning	☐	☐	☐	☐
Outsourcing/Subcontracting	☐	☐	☐	☐

14. How did these programs or practices impact on this business':

Please tick one Box per row	Negative impact	No impact	Minor/Moderate impact	Major impact
Productivity	☐	☐	☐	☐
Product quality	☐	☐	☐	☐
Client satisfaction	☐	☐	☐	☐
Cost structures	☐	☐	☐	☐
Sales	☐	☐	☐	☐
Labour skills base	☐	☐	☐	☐
Ability to implement a culture of continuous improvement	☐	☐	☐	☐
Opportunities for new business	☐	☐	☐	☐
Other impacts (please specify below)				
	☐	☐	☐	☐

Part 4 Exports

15. Has this business' involvement with the MHC improved its current or future ability to export?

Yes ..... ☐

No..... ☐

16. Does this business currently export?

Yes ..... ☐

No..... ☐ Go to question 19

17. What happened to this business' annual export sales since it became involved with the MHC?

Please tick one Box

Remained relatively stable..... ☐ Go to question 19

Decreased..... ☐

Increased..... ☐

18. What factors contributed to this business' change in exports?

Please tick one Box per row	Negative impact	No impact	Positive impact	Not applicable
Improved business programs and practices (see question 10 for listing).....	☐	☐	☐	☐
Demonstration effect associated with MHC involvement	☐	☐	☐	☐
Productivity improvements related to MHC involvement.....	☐	☐	☐	☐
Technology transfer associated with MHC involvement.....	☐	☐	☐	☐
New business links or alliances gained through MHC.....	☐	☐	☐	☐
MHC related Defence offsets	☐	☐	☐	☐
Off-shore investments.....	☐	☐	☐	☐
Change in exchange rate.....	☐	☐	☐	☐
Other factors (please specify below)				
_____	☐	☐	☐	☐

Part 5 Changes in Productivity and investment

Note: This business' productivity has changed if it uses more (or less) inputs - labour hours, skills, work effort, raw materials, machinery, management, land etc. - to produce a given level of the goods and/or services this business sells.

19. As a result of being involved in the Minehunter Coastal Project this business' <u>overall</u> productivity/efficiency has:

Please tick one Box in each column

Direction of change

Increased substantially ..... ☐

Increased slightly ..... ☐

Remained relatively stable ☐ Go to Question 21

Decreased slightly..... ☐

Decreased substantially.... ☐

20. The magnitude of this increase or decrease in overall productivity/efficiency was approximately

Please tick one Box

Greater than zero and less than 1 per cent..... ☐

1 per cent to less than 2 per cent..... ☐

2 per cent to less than 3 per cent..... ☐

Greater than 3 per cent (please specify below) ☐

21. Has this business undertaken any major additional domestic investment(s) as a consequence of its involvement with the Minehunter Coastal project?

Yes ..... ☐

No..... ☐

Part 6 Employment and financial information

22. Approximately how many full-time and part-time persons worked for this business during the last pay period in May 2001?

Please tick one Box

Zero..... ☐

1 to 4..... ☐

5 to 19..... ☐

20 to 49..... ☐

50 to 199 ..... ☐

200 or more..... ☐

23. Last year this business' annual turnover from the sale of goods and/or services was?

Please tick one Box

No more than $5 million..... ☐

More than $5 million but not more than $10 million..... ☐

More than $10 million but not more than $50 million..... ☐

More than $50 million but not more than $100 million..... ☐

More than $100 million but no more than $200 million..... ☐

More than $200 million but not more than $500 million..... ☐

More than $500 million but not more than $1,000 million..... ☐

More than $1,000 million..... ☐

24. Approximately what proportion of this business' total MHC related turnover is or was generated/produced in the Hunter Valley?

Please tick one Box

Zero..... ☐

1 per cent to less than 25 per cent..... ☐

25 per cent to less than 50 per cent..... ☐

50 per cent to less than 75 per cent..... ☐

75 per cent to less than 100 per cent..... ☐

100 per cent..... ☐

25. Did/Does this business' involvement with the MHC contribute to its net profit?

Please tick one Box

Yes..... ☐

No ..... ☐

Part 6 Defence capability

26. Which of the following statements most accurately reflects the position of this business in relation to defence related contracts?

Please tick one Box only

This business' defence related activities are crucial to its viability..... ☐

This business' defence related activities are not crucial to its viability..... ☐

This business' defence related activities enhance its viability..... ☐

27. Has this business' involvement with the MHC or other Defence contracts improved its capability to supply the Department of Defence (DoD) or its contractors?

Yes ..... ☐

No..... ☐ **Please return questionnaire to the Australian Industry Group**

28. As a result of this improved capability this business:

Please tick one Box per row	Strongly disagree	Disagree	Agree	Strongly agree
has the knowledge to supply DoDs capability requirements.....	☐	☐	☐	☐
has the resources to help supply DoDs capability requirements.....	☐	☐	☐	☐
has the capacity to help supply the DoDs capability requirements.....	☐	☐	☐	☐
can now assist in the through life support of the Minehunter vessels.....	☐	☐	☐	☐
can work in/with new areas of defence related technology	☐	☐	☐	☐
can supply defence equipment/services at a lower cost than previously.....	☐	☐	☐	☐
can supply the DoD or its contractors at a faster rate than previously.....	☐	☐	☐	☐
can provide a better quality defence product or service than previously.....	☐	☐	☐	☐

Other (please specify below)

Thank you for your cooperation. Please return this form to the Minehunter Coastal Study, Australian Industry Group, GPO Box 817, Canberra ACT 2601 or send by Facsimile to (02) 6247 0876.

APPENDIX 2: SIGNIFICANCE TESTING

Throughout this report we compare the responses of different categories of businesses. For example, we compare the responses of small businesses with those of large businesses. How confident can we be that the different responses of these groups actually reflect a real difference? If another survey of a different group of MHC companies was taken would it reach similar conclusions?

Testing the statistical significance of results provides a basis for answering these types of questions. Significance testing is particularly useful when apparently important differences are identified and these differences are based on fairly small samples. In these cases the chances that the result simply reflects sampling variation is relatively high.

The significance testing used in this study is based on the hypothesis that two observed proportions are, in reality, the same. A test statistic is calculated based on the difference between the two proportions and their standard errors. The larger the test statistic, the more confident we can be that this hypothesis is false — that is, the observed difference between the two proportions is a "real" difference (see Box A2.1).

Box A2.1: What is a significance test?

The probability of rejecting a hypothesis when it is not true is called the level of significance. The level of significance can be tested using a z test.

Specifically, the formula is: $$Z = \frac{p_a - p_b}{\sqrt{\frac{p_a(1-p_a)}{n_a} + \frac{p_b(1-p_b)}{n_b}}}$$

where p_a is the observed proportion for group a and n_a is the number of firms in group a, and p_b is the observed proportion for group b and n_b is the number of firms in group b.

The value of the test statistic Z is compared to the relevant figure from tables of values for the distribution of the standard normal curve to give the level of significance. For example, if we wish to be 95 per cent confident that the proportions are from different populations then the Z statistic would need to be 1.96 or greater. If on the other hand we are satisfied with a lower confidence interval the statistic would be lower. A Z statistic of 1.65 represents a confidence level of 90 per cent. The level of significance is usually specified before a test is made. Otherwise the result obtained from the test may influence the decision concerning the hypothesis. In practice, the value of five per cent (corresponding to a confidence level of 95 per cent) is frequently used to set the level of significance, although other values may also be used.

CHECKING FOR RESPONSE BIAS

Many of the results reported in this case study are from a survey of businesses that have participated in the MHC project. Some readers may query the extent to which these findings apply more generally.

There is a chance of bias in the results of any survey that has a response rate of less than 100 per cent. As outlined earlier, the MHC survey had a response rate of around 48 per cent. To help ascertain if the responses of businesses which completed the MHC survey questionnaire were biased a telephone non-response bias survey was conducted.

The 21 businesses contacted in this telephone survey were randomly selected from the list of non-respondents. Representatives from these businesses were asked to respond to a number of key survey questions. Significance testing techniques were then used to test whether the responses from this telephone survey were significantly different from the responses from the main survey. The results of this testing are outlined in the table below. They show that the results across the two samples were very similar. In only one instance, which related to the link between the MHC project and improved export potential, was there a statistically significant difference between the results of the two surveys. This finding suggests that the survey results reported in the Part B are not biased due to businesses choosing not to respond the mail out survey.

Proportion reporting	*Mail out survey*	*Non-response bias survey*	*Z statistic*	*A Statistically significant difference?*
MHC was first defence contract	24%	19%	0.4598	No
Technology transfer obtained?	25%	33%	-0.725	No
Technology transfer had a positive impact	80%	71%	0.4394	No
Some or all programs and practices in place	89%	95%	-1.068	No
Defence work important in the decision to implement programs & practices	69%	45%	1.893	No
Involvement with the MHC project improved current or future export potential	33%	14%	2.017	Yes
Business currently exports	47%	38%	0.752	No
MHC project helped improve business' overall productivity	35%	19%	1.530	No
Defence capability improved	82%	81%	0.102	No

Note: As outlined in Box A2.1, the *Z* statistic would need to be 1.96 or higher to be 95 per cent confident that the proportions are from different populations.

APPENDIX 3: REGIONAL IMPACTS

ADI Limited chose a green-field site in Carrington, a suburb in Newcastle, New South Wales, to design and construct the Minehunter Coastal Vessels. The Newcastle region has a long history in shipbuilding. Newcastle's excellent harbour and skilled labour force made it a logical choice for a challenging project such as the MHC project. The Carrington site, which was completed in just over a year after the MHC contract was signed, encompasses a construction hall, ship launch and recovery facilities, support trades workshops, a systems integration facility and a program management and engineering office facility (Figure A3.1).

Figure A3.1: The Minehunter Construction site at Carrington, Newcastle, New South Wales

This appendix presents estimates of "direct" employment generated by the MHC project in the Newcastle region and summarises the Newcastle region businesses' responses to key questions in the MHC survey.

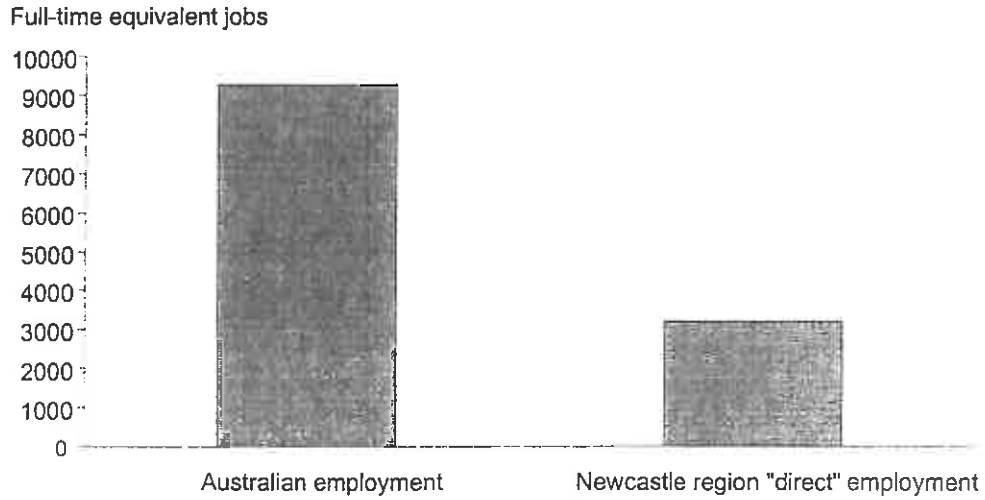
A3.1 Contribution to the Newcastle region's employment

The MHC project has generated economic activity and employment in Newcastle and the Hunter Valley (the Newcastle region). This has occurred directly through the prime contractor's operations at its Carrington site and through MHC contracts awarded to local business. ADI Limited estimates that the company has awarded more than $160 million in contracts to businesses in the Newcastle region.

In Chapter 9, national input-output employment multipliers, which identify the direct and indirect linkages between an industry and the rest of the Australian economy, were used to estimate that the MHC project, directly and indirectly, generated more than 9000 full-time equivalent Australian jobs (see chapter 9 and Figure A3.2 below).[8] Because MHC project contracts were awarded to businesses throughout New South Wales and to a lesser extent throughout Australia, not all of these jobs will have been generated in the Newcastle region. Even if all contracts had been awarded to businesses in the Newcastle region, the employment multipliers take into account the indirect employment effects and some of these would have been generated outside of the region.

However, the initial employment effect multipliers for the prime contractor and sub-contractor industries can be used in conjunction with their respective outputs to provide a lower estimate of the regional employment generated by the MHC project. These employment estimates, which are presented in Figure A3.2, indicate that the MHC project will have generated (or sustained from year to year) at least 3,180 full-time equivalent jobs in the Newcastle region. It should be borne in mind that this estimate of the regional employment generated by the MHC project does not take into account the indirect employment generated via the prime contractor and the subcontractors linkages to other businesses in the Newcastle region.[9]

Figure A3.2: Australian employment and Newcastle region "direct" employment generated by the MHC project



Source: Tasman Economics estimates.

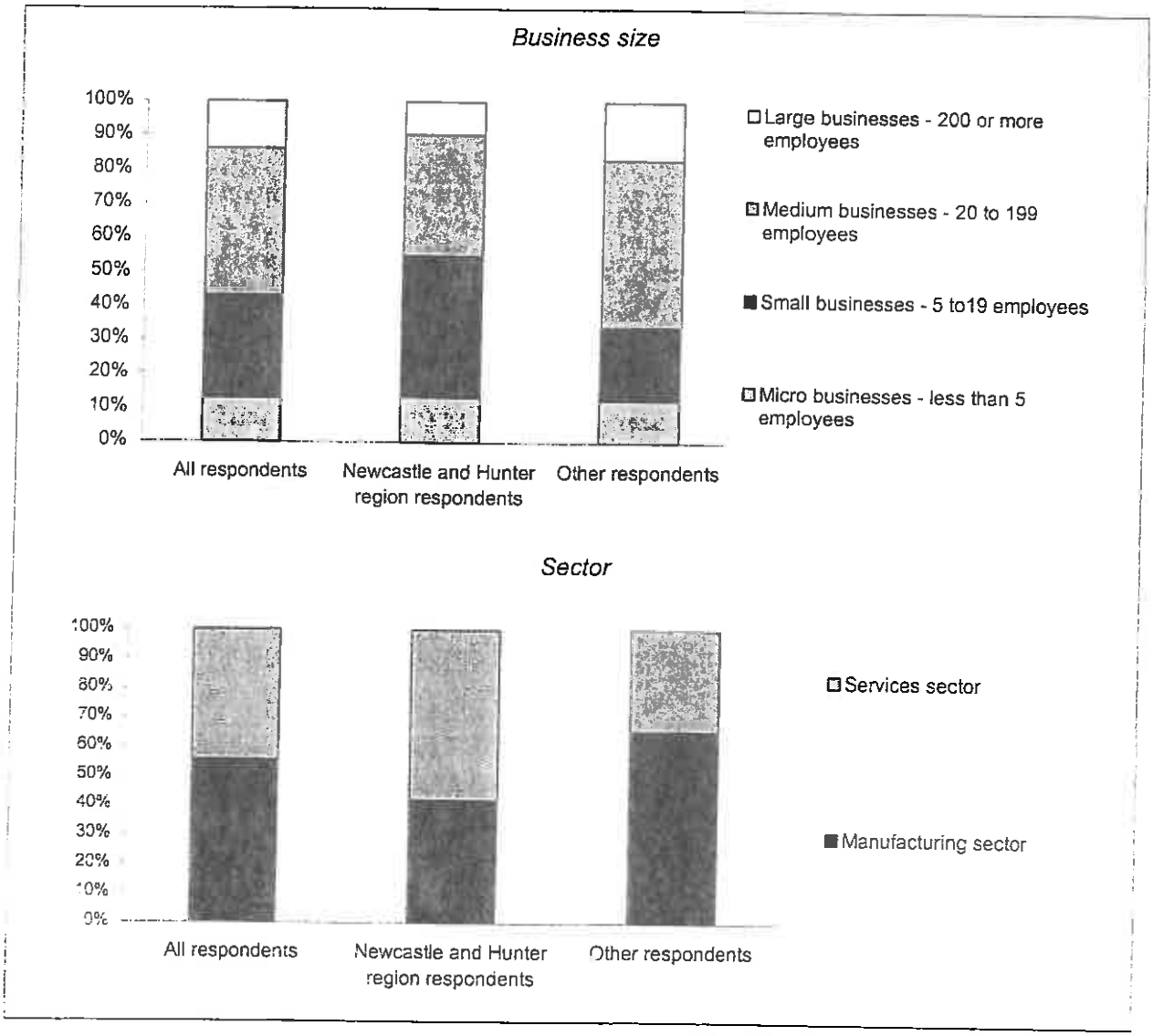
[8] Employment multipliers estimate the initial "direct" employment effects, as well as the subsequent flow on or "indirect" employment effects (known as the first round and industrial support effects) of an increase in demand (see Chapter 9, Box 10). The subcontractor industry multipliers are presented in Appendix 5.

[9] Multipliers derived from a Newcastle region MHC input-output table would be necessary to take this further step in the analysis.

A3.2 Survey findings

Just over 40 per cent of the MHC survey respondents businesses were located in the Newcastle region of New South Wales. This relatively high proportion is broadly consistent with the region's representation in the prime contractor's supplier database and in the survey mail out (see Figure 4, Chapter 2). However compared to the respondents from the survey as a whole, there are a number of differences in the respondent businesses from the Newcastle region. Firstly, just over 58 per cent of Newcastle region respondents were from the services sector, whereas for the survey only 44 per cent of respondents were from the services sector. Secondly compared to the survey as a whole, a larger proportion of Newcastle region respondent businesses were "micro or small" (Figure A3.3).

Figure A3.3: Characteristics of Newcastle region and other respondents



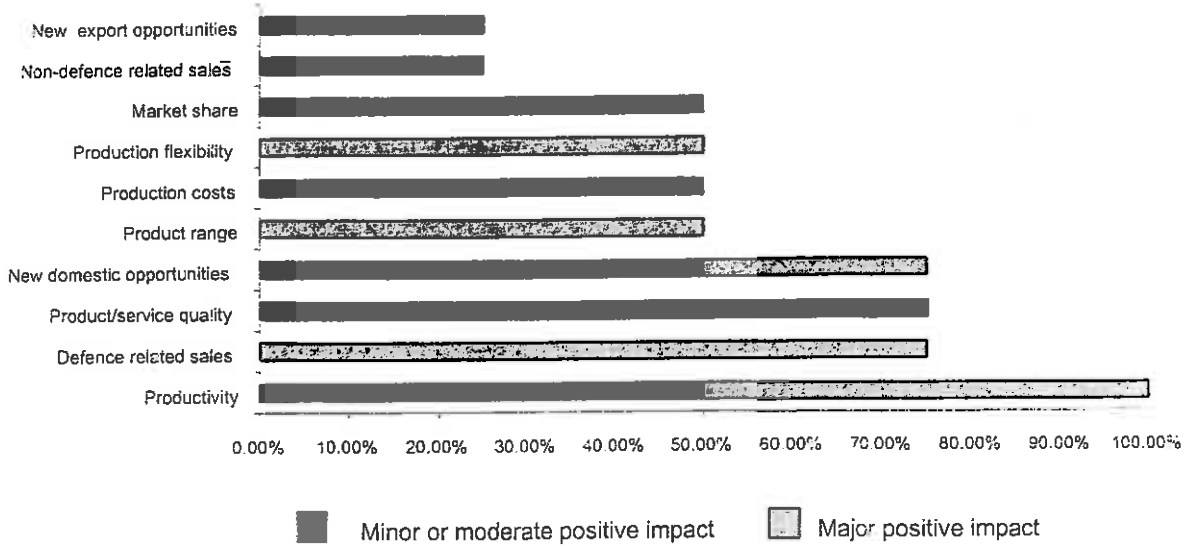
Source: MHC survey.

- **Technology**

Only 13 per cent of Newcastle region respondent businesses reported obtaining a technology transfer as a result of being involved in the MHC project. By way of comparison over 30 per cent of respondents operating outside of the Newcastle region obtained a technology transfer. The much lower take up of new technology among Newcastle region respondent businesses may in large part reflect the nature of the work done for the MHC project. For example, Newcastle region businesses reporting no technology take up provided services such as site security, provision of on-site amenities, supply & installation of floor coverings and crane hire, the potential to obtain Defence related technology transfers from these types of activities is understandably relatively low.

Although the level of technology transfer obtained by Newcastle region participating businesses was lower than the MHC survey average, those businesses which did obtain a transfer reaped positive benefits from the transfer. For example, all Newcastle region businesses that obtained a technology transfer found that the transfer led to improvements in productivity. In addition, the majority of Newcastle region businesses with a MHC project-related technology transfer reported improvements in product and/or service quality and sales levels (Figure A3.4).

Figure A3.4: Impact of technology transfer on Newcastle region businesses
(per cent of businesses reporting technology transfer)



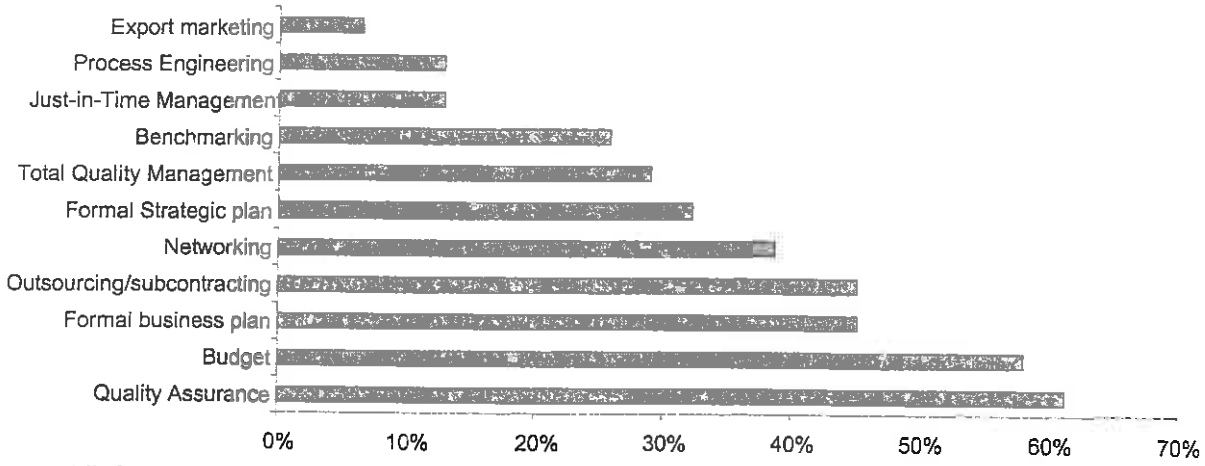
Source: MHC survey.

- **Uptake and impact of best practice programs and practices**

Over 75 per cent of MHC project survey respondents from the Newcastle region reported that their business had implemented one or more of the eleven business programs and

practices which are often associated with improved performance. Implementation rates varied, with the highest implementation rates being reported for quality assurance and the lowest for export market planning (figure A3.5).

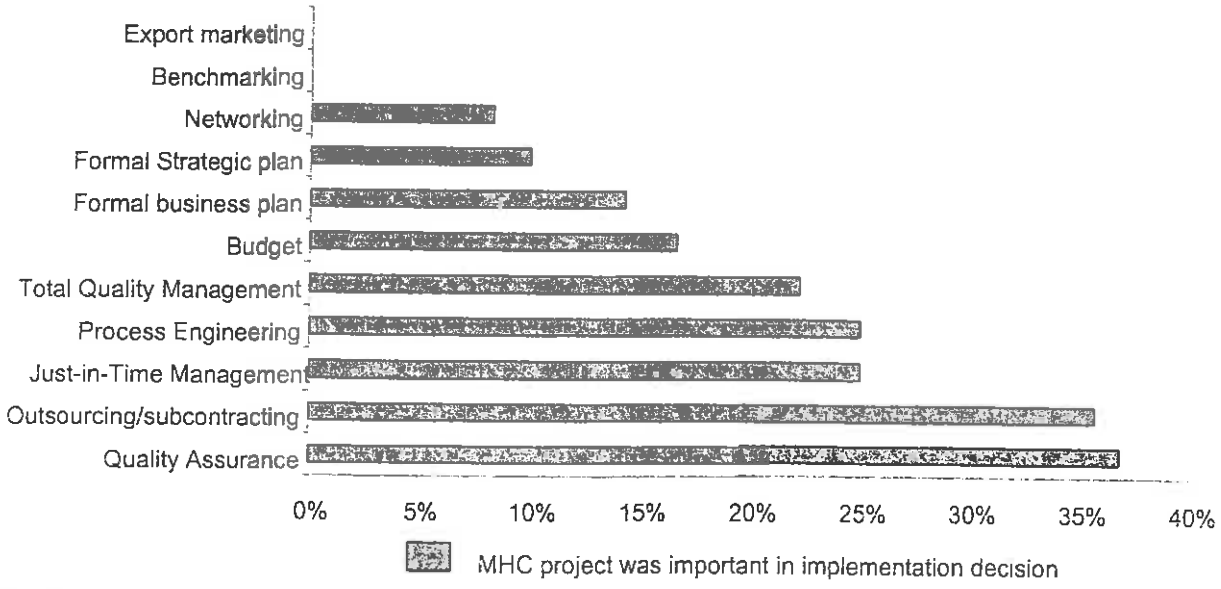
Figure A3.5: Implementation of programs and practices by Newcastle region respondents



Source: MHC survey.

Involvement in the MHC project was an important factor in the implementation decision for a significant number of Newcastle region businesses. The MHC project's role was mentioned most often in relation to the decision to implement quality assurance and out-sourcing (Figure A3.6).

Figure A3.6: The Minehunter project's role in the implementation decision
(per cent of businesses that implemented each program or practice)



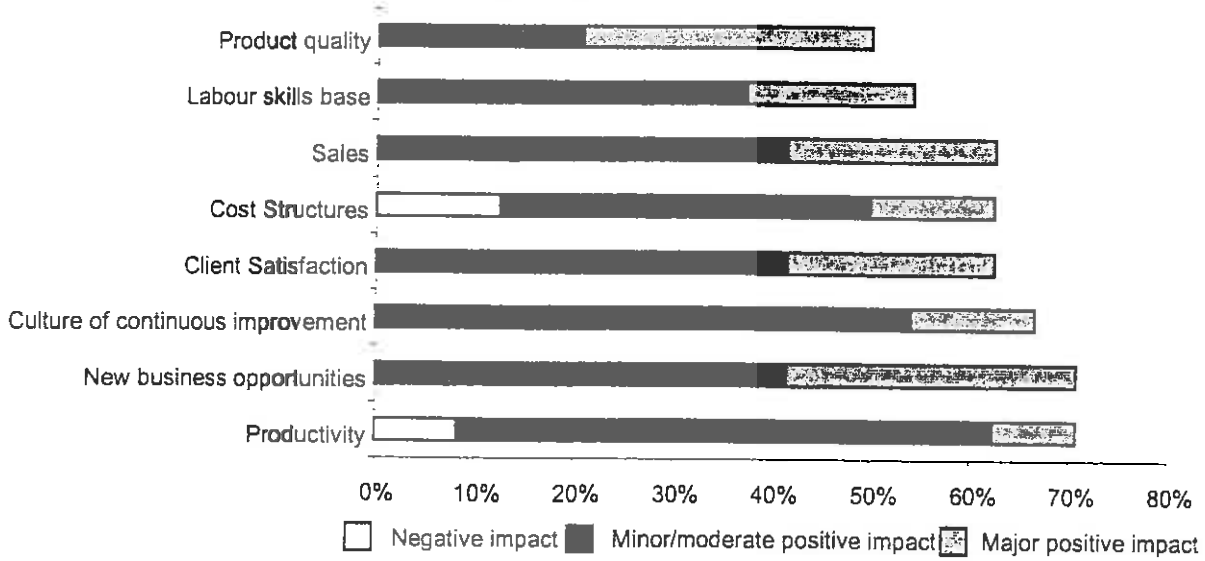
Source: MHC survey.

In most instances the implementation of these business programs and practices has had a positive impact on MHC project survey respondents in the Newcastle region (figure A3.5). For example, more than 60 per cent of respondents report that the implementation of the programs and practices has:

- helped generate new businesses;
- given them the ability to implement a culture of continuous improvement;
- increased sales;
- increased client satisfaction; and
- increased productivity.

However, a small number of respondents reported experiencing negative impacts from the implementation of the programs and practices. For example, two respondents indicated that productivity had actually declined as a result of the implementation decision. Nonetheless, as outlined below, no respondent considered that the business' overall productivity had declined as a result of being involved with the Minehunter project. The experience of MCM Manufacturing Pty Ltd, a business in the Lake Macquarie suburb of Cardiff, is a case in point (see Box 6, Chapter 4).

Figure A3.7: Impact of Implementing programs and practices



Source: MHC survey.

- **Improved export potential**

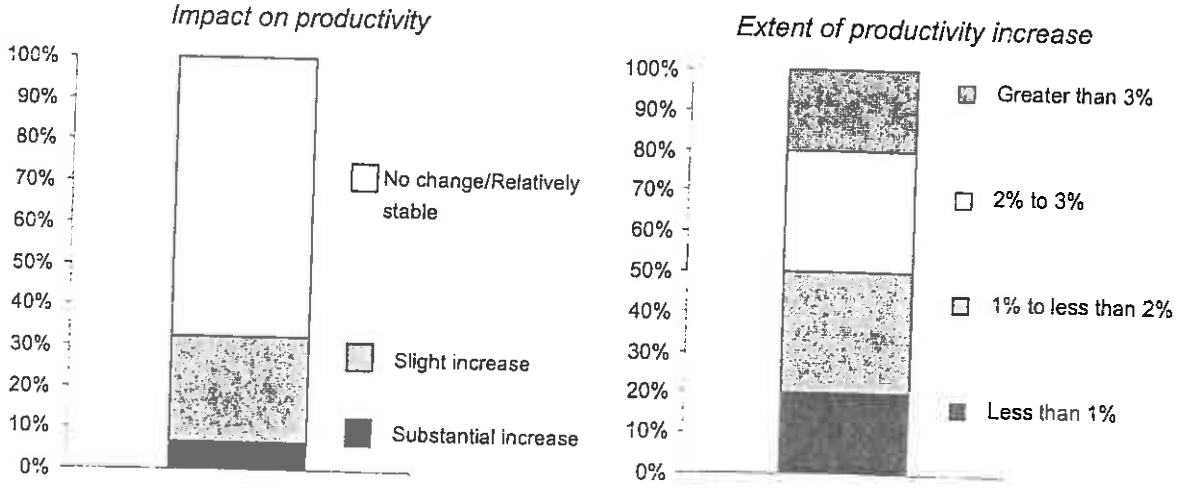
Around 20 per cent of MHC project survey respondents from the Newcastle region reported that their current or future potential to export had improved as a result of being involved with the Minehunter project. Factors contributing to the change in exports included:

- Improved programs and practices;
- Minehunter related demonstration effect;
- Minehunter related productivity improvement;
- A technology transfer obtained from involvement with the MHC project; and
- Changes in the exchange rate.

- **Improved productivity**

Around one third of Newcastle region MHC project survey respondents reported that their business's overall productivity had increased as a result of their association with the project (Figure A3.8). No business experienced a decline in overall productivity as a result of its involvement with the project. Productivity increases ranged from relatively slight changes of less than one per cent to relatively large changes, with some being greater than 3 per cent (Figure A3.8).

Figure A3.8: Minehunter related change in Newcastle region businesses' productivity



Source: MHC survey.

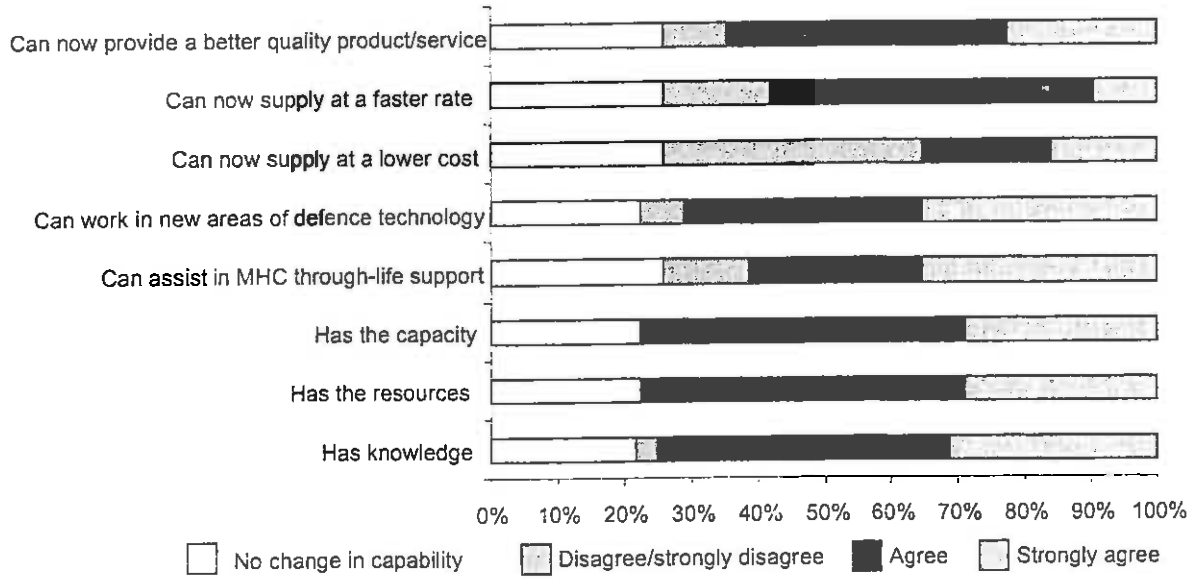
- **Defence capability and business viability**

Nearly 80 per cent of Newcastle region respondents to the MHC project survey reported that they now have improved capability to supply the Department of Defence and its contractors. As a result of this improved capability Newcastle region businesses:

- have the knowledge, resources and capacity to supply the Department of Defence's capability requirements;
- can in a variety of ways assist in the through-life support of the Minehunters; and
- can now work in or with new areas of defence related technology (Figure A3.9)

The majority of Newcastle region respondents also considered that involvement with the MHC project and/or other Defence related work had resulted in their businesses being able to supply the Department of Defence or its contractors at a faster rate, with a better quality product or service. On the other hand, only a third of respondents considered that they could now supply Defence capability at a lower cost (Figure A3.9).

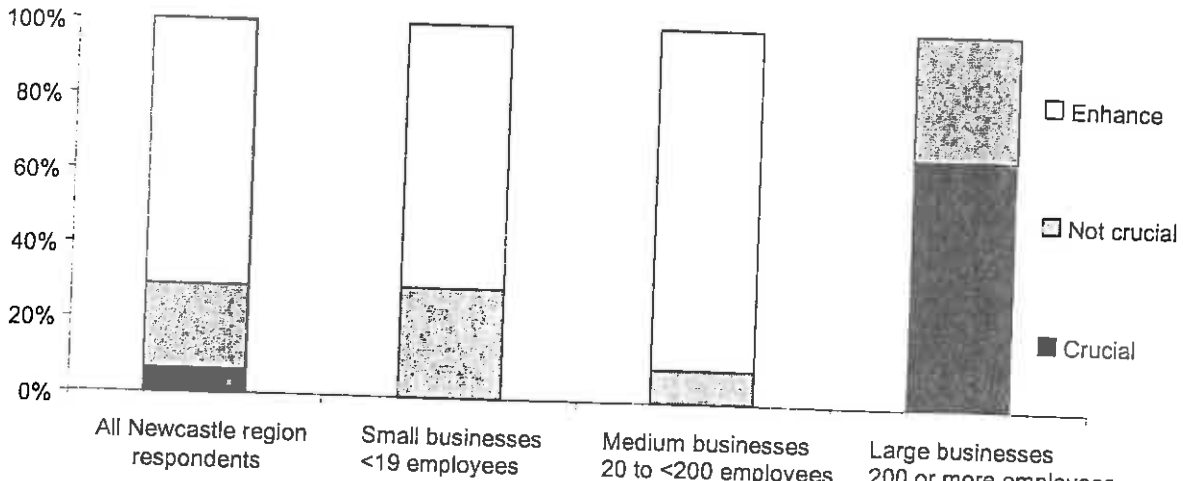
Figure A3.9: Change in the defence capability of Newcastle region MHC survey respondents



Source: MHC survey.

More than 90 per cent of survey respondents from the Newcastle region reported involvement with the MHC project had contributed to their businesses' profitability. However, for the majority of respondents, defence related work was not considered as "crucial" to viability. Most Newcastle region respondents reported that defence related work enhanced their business' viability or was, at least, not crucial to business viability (Figure A3.10).

Figure A3.10: Importance of defence related work to Newcastle region MHC survey respondents' viability



Source: MHC survey.

Six per cent of Newcastle region respondents considered that defence related contracts were "crucial" to their business viability. While this is a relatively small proportion of firms the importance of their views should not be down played as they were among the larger Newcastle region businesses which responded to the MHC survey (Figure A3.10). Thus any significant loss of defence related work could have a significant impact on employment in the region.

APPENDIX 4: INPUT-OUTPUT MULTIPLIERS

This study uses MHC project costs in conjunction with the latest Australian Bureau of Statistics input-output table to develop a database of the Australian economy which separately identifies the MHC project. In Chapter 7 this input-output database has been used to derive activity multipliers. These multipliers which can be used to estimate the MHC project's contribution to national aggregates — national output, value added and employment.[10]

As with any economic analysis, there are a number of assumptions underlying input-output databases and the derived multipliers. These assumptions include:

- the cost structure of industries remain constant over time;
- all industries exhibit constant returns to scale in production;
- there is no substitution between inputs;
- the economy is in equilibrium at given prices;
- there are no capacity constraints arising from an increase in demand; and
- there are no other constraints such as those that might arise from balance of payments induced effects.

Because multipliers cannot take into account economies of scale or the impact of a change in demand when there is no excess capacity or full employment they describe average rather than marginal effects. The assumptions also mean that multiplier analysis does not take into account all forms of interdependence between industries. The ABS (1996, p.24) notes:

> The input-output tables underlying multiplier analysis only take account of one form of *interdependence*, namely the sales and purchase links between industries. Other interdependence such as collective competition for factors of production, changes in commodity prices which induce producers and consumers to alter the mix of their purchases and other constraints which operate on the economy as a whole are not generally taken into account.

[10] National output is equal to the total value of a series of inputs. As with other industries the national output of the Minehunters is made up of intermediate inputs supplied by other Australian industries as well as imported components, wages and salaries, depreciation and returns to land and capital. Value added, on the other hand is the value an industry's activity adds to the economy. Value added is equal to an industry's gross output (its sales and other operating income, plus commodity taxes and changes in inventory) less its intermediate inputs purchased from other Australian industries or from overseas. Value added comprises the payments to labour plus returns to land and capital as well as any taxes on production, it is an industry's contribution to Australia's Gross Domestic Product (GDP). GDP is the sum of all industries value added plus any production taxes and minus any production subsidies. GDP can also be measured by adding final consumption and gross fixed capital formation expenditures on goods and services plus any changes in inventories plus the value of exports and less the value of imports. Thus consumption is a component of GDP.

The combination of the assumptions used and the excluded interdependence means that input-output multipliers are higher than would realistically be the case. In other words, they tend to *overstate* the potential impact of final demand stimulus. The overstatement is potentially more serious when large changes in demand and production are considered.

As a consequence of these assumptions the results of multiplier analysis should be considered as upper limits. Treating the estimates as upper limits is particularly important, if the change in demand is large relative to the economy as whole and there is full employment of labour and capital.

THE RESULTS

Table A4.1 presents the multipliers that have been estimated from the Minehunter input-output database that was developed for this project. This database identifies the MHC project prime contractor industry and the MHC project subcontractor industry, which supplies the prime contractor industry. The Minehunter prime contractor multipliers have been used to estimate the impact of the project on the Australian economy (see chapter 9). As outlined in Appendix 3, the initial effect component of the multipliers for the Minehunter prime contractor industry and the Minehunter subcontractor industry have been used to estimate the employment effect for the Newcastle region.

Table A4.1: Minehunter industry multipliers

Industry	*Minehunter prime contractor industry*	*Minehunter subcontractor industry*
	$ million	*$ million*
Increase in demand per annum	1	1
Output		
Initial effect	1	1
First round multiplier	0.522	0.414
Industrial support multiplier	0.434	0.402
Total Output Multiplier	1.956	1.815
Value added		
Initial effect	.213	0.379
First round multiplier	.200	0.161
Industrial support multiplier	.180	0.176
Total value added multiplier	.593	0.716
Full-time equivalent employment	*Persons*	*Persons*
Initial effect	1.75	7.84
First round multiplier	4.05	2.58
Industrial support multiplier	2.56	2.25
Total employment multiplier	8.36	12.67

APPENDIX 5: GENERAL EQUILIBRIUM ANALYSIS

The STATE model used in this study is an extended version of the ORANI model. It employs some of the latest features incorporated in refined versions of ORANI, such use of a more refined investment theory. The development of the STATE model has also drawn on work carried out by the Industry Commission in developing their model of the world economy, the SALTER model, and by Stoeckel in developing the world trade model for the Centre for International Economics.

The STATE model has been used to examine the impact of constructing the ANZAC frigate in Australia (Tasman 2000). Other applications of the STATE model include examinations of:

- the impact on the economy of increasing the sport's participation rate (Tasman 1998);
- the effect of transport infrastructure upgrades (Economic Insights 1996,);
- the return to the economy from a zinc smelter/refinery (Economic Insights 1995); and
- the impact of introducing a carbon tax (Economic Insights and Swan Consultants Canberra 1995).

STATE is a multi-sector, computable general equilibrium model of the Australian economy. It has been designed with the primary aim of estimating the macroeconomic and sectoral impacts of economic policies and development projects. A model simulation provides estimates of the impact of a policy or investment change on a range of economic variables including industry output and price, employment and investment, trade flows, government revenue and expenditure, Gross Domestic Product and income. An input-output database provides the STATE model with the detail on the underlying structural relationships between industries in the Australian economy. This database separately identifies the MHC prime contractor industry and the MHC subcontractor industry cost structures.

STATE can be run as a multi-region model. However, the version used in this analysis identifies Australia as a single region or economy with fully modelled economic structures, a simpler, less detailed, structure is employed to explain the "Rest of the World".

MODEL CLOSURE

The general equilibrium modelling results reported in this study are based on long run and short run closures of the STATE model. Box 8 presented a brief description of the assumptions underlying these closures, the following section present more detail on the characteristics of two alternative closures of the model.

Long run model closure

The long run is characterised by a high degree of factor mobility in the economy. The standard assumption is that each industry's use of capital adjusts to maintain the original rates of return. That is, an improvement in the rate of return on capital leads to an increase in investment until the rate of return is returned to its original level and vice versa.

Like capital, labour is freely mobile across industries. The standard assumption for this type of modelling is that wages adjust to "clear" the labour market, or in other words to ensure a constant level of frictional unemployment. The assumption is important because it means that any change in the demand for labour is reflected in the wage rate and not the aggregate level of usage. The assumption reflects the view that Australia's long run unemployment rate is not determined by the level of economic activity but by structural features of the economy. These structural features include the industrial relations system, the behaviour of unions and the effect of the social security system on the incentive to work are the drivers of the long run rate of unemployment.

In the standard long-run environment it is assumed that the Government maintains transfers to households as a fixed proportion of gross regional income. The budget deficit is also fixed as a fraction of gross regional income. Under such an environment, tax rates are altered to meet the budget deficit constraint. A wide range of tax rates can be used to ensure budget balance. The assumption of balanced budgets is adopted to ensure a stable level of government debt.

The other important features of the long run relate to the determination of savings and the related issue of the funding of investment. The household average propensity to save (which defines the change in savings as income changes), is held fixed in the standard environment and net capital inflow is left free to adjust to any savings-investment gap.

Short run closure

The short run closure of the model is characterised by a high degree of rigidity in the economy. Aggregate real investment is held constant and rates of return adjust to maintain capital stocks in each industry at their original level. Nominal wage rates are held fixed and the rate of unemployment adjusts to reflect movements in the demand for labour. The model assumes that initially labour supply is greater than labour demand and the resulting pool of labour can be hired at the wage rate determined by the user.

At the industry level, producers are very constrained in the short run as they cannot adjust their capital stock. Any changes in the demand for capital are countered by movements in the rental price of capital and to a lesser extent the creation price of capital. As a result, a

simulation that increases a firm's demand for capital leads to an increase in the rental price of capital.

In the standard short run closure the householder's average propensity to save is held fixed, the budget deficit is variable and net capital inflow adjusts to offset in change in regional savings (given the standard assumption of fixed aggregate investment).

THE RESULTS

The STATE model, like many other models of the Australian economy, is a comparative static model. Comparative static models, compare two different environments at the same point in time. The model provides no indication of the path taken by the economy to achieve this result. The results are reported as percentage changes in national aggregates (see below).

Table A5.1: Impact of importing Minehunters rather than sourcing locally (Percentage change)

	Short run closure
Real Gross Domestic Product	-0.023
Real Household Consumption	-0.021
Aggregate labour usage (Employment)	-0.030

The results reported in Chapter 8 are reported as $2001 dollar values. These results were derived by applying the percentage changes reported above to Australian Bureau of Statistics official estimates of the respective national aggregates. For example, the short run estimates of the change in real Gross Domestic Product and consumption reported above were applied to the official estimates of Gross Domestic Product and Household Consumption in $2000-01. This short run estimate was assumed to apply for each year of the construction phase. However, because the construction of the Minehunter Coastal Vessels involved a speedy ramp up and then a ramp down over the nine years of the project these annual results were adjusted by using weights which reflect the changing value of the outputs of the Minehunter project across the nine years. This adjusted stream was then discounted to report a net present value of estimate of the MHC project's impact on the economy during the construction phase.

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