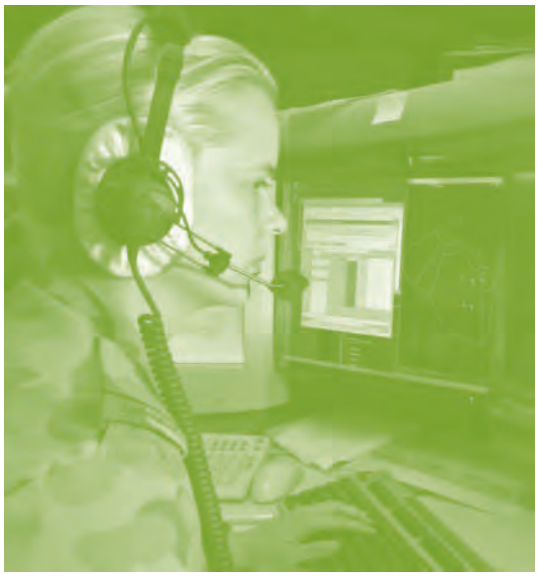
57 GROWTH

THE BUSINESS OF DEFENCE SUSTAINING CAPABILITY



CEDA
COMMITTEE FOR ECONOMIC DEVELOPMENT OF AUSTRALIA

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THE BUSINESS OF DEFENCE SUSTAINING CAPABILITY

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About CEDA

CEDA (the Committee for Economic Development of Australia) is the unique Australian institution that brings business, university, government and community leaders together in pursuit of Australia's national development. It publishes a range of research papers and holds more than 250 events, conferences, boardroom briefings, and chief executive roundtables each year.

CEDA advocates policy in the national interest rather than lobbying for special interests. Around 1000 member organisations range from private firms and universities to governments, community organisations and private individuals. In 2005, its events attracted more than 21,500 attendees.

CEDA
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foreword

This CEDA report comes at a pivotal moment in the evolution of Australia's defence industries. For some time a number of leaders in the defence and business communities have been turning their minds to the best way to manage the interaction between suppliers of equipment, goods and services, and the requirements of the Australian Defence Organisation. In recent months, the Federal Minister for Defence the Hon Dr Brendan Nelson MP has signalled his intention to review defence industry policy.

The business of defence is, without a doubt, of critical importance to our nation. With this report, CEDA aims to provide a range of views and perspectives from experts involved in the decision-making processes. What becomes clear in reading these papers is the complexity of stakeholder requirements and expectations.

Key themes explored by a number of authors are:

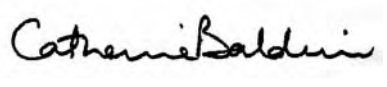
- the tension between Australia's need for domestic capabilities and the benefits of buying from high-volume overseas sources
- the tension between the benefits of market competition and the need to help suppliers thrive in a single-buyer environment
- the alignment of procurement and maintenance with national defence strategy.

This report sprang from the desire of CEDA members – in particular a number of South Australian members – for a better understanding of the future of defence procurement in Australia. Progressively we have come to appreciate that these papers will be useful for all Australians to gain a better understanding of the issues around the business of defence.

I would particularly like to thank the co-leaders of this research project: CEDA's South Australian director, David Shetliffe; Jeff Clayton, a member of our SA Advisory Council; and our research director, Professor Ian Marsh.

CEDA gratefully acknowledges the valuable contribution of the authors – possibly the most well-qualified group ever assembled to examine this issue – who have demonstrated both enthusiasm and dedication to the topic.

The timing and scope of this collection of papers will provide valuable input to the Federal Government's review. Beyond the review, I trust that CEDA's initiative and the insights of the authors will promote a stronger public debate on an issue vital to both Australia's economic development and our defence and foreign policy interests.



Catherine Baldwin
Chief Executive, CEDA

INTRODUCTION:

THE business OF defence

IAN MARSH is CEDA's Research Director. Ian also holds the ANZSOG Chair of Public Management at the University of Sydney. He has been an associate professor of the Australian Graduate School of Management, research director of the Liberal Party of Australia, an associate of McKinsey & Co, and private secretary to a former federal minister for defence. He holds a PhD from Harvard (1985).

Ian is author of several books, including *Australian Political Parties in Transition?* (2006), *Into the Future: The Neglect of the Long-Term in Australian Politics* (with David Yencken) (2005), and *Beyond the Two-Party System: Political Representation, Economic Competitiveness and Australian Politics* (1995).

In this collection of papers the authors argue that Australia's defence industry strategy is at a turning point. As the Defence Minister Dr Brendan Nelson has himself recently declared, "... we are now embarked on a review of defence industry policy ... and the reason for doing it is that the government clearly has objectives as far as defence expenditure is concerned … government … (should) not … confuse domestic presence with indigenous capability … government (can) use its … defence procurement … to ensure that we support particular activities we think are important in defence industry in Australia."

However much they may otherwise differ, all the contributors to this study share the view that a review of policy is timely.

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

There are three primary reasons. The first results from the globalisation of the industry structure. Much future procurement will involve Australian firms as sub-contractors to the global supply chains of major offshore primes. This new pattern of relationships poses a host of collaborative, technical and distance challenges for Australian firms.

The second reason to develop a new approach arises from the unique character of the defence industry. Government is the sole buyer. In the interests of national sovereignty it needs to preserve local capabilities at least sufficient to sustain through life support and repair in times of war. But this is no easy task. Sub-contract relationships to offshore primes reduce its degrees of freedom in developing an industry structure to its own taste. Further, technological and other uncertainties remain large and can evolve significantly through the life of a project. At the least, these latter considerations increase the pressure on government to be clear about what it wants. It also invites government to play a more active role in the development of collaborative capabilities at the firm level and to develop new forms of linkage with its industry partners.

Third, uncertainty surrounds Australia's geopolitical outlook, yet procurements involve long-term dec-isions. The key issue here concerns the extent to which Australian forces will operate in conjunction with those of major allies or semi-independently in more localised conflicts.

While there are differences of emphasis and perspective between the papers, there is general agreement that the response requires more investment in the conception or strategic phase of projects, closer links between the services and industry specialists in the development of equipment requirements, and more transparency. In addition, alliance contracting and other novel approaches are likely to become more prominent in the relationship between government and its suppliers in delivery phases. These are a response to technological developments and other uncertainties, such as bidding for work with international primes. But these organisational developments need to be associated with acceptance of a more directly catalytic role by government and more transparency in relationships.

The UK Defence White Paper: A model for Australia

In general, for its clarity about challenges, about the capabilities required to sustain national sovereignty and for its detailed attention to organisational and institutional issues, the United Kingdom's (UK's) recently produced *Defence Industrial Strategy: Defence White Paper*, presents a model for what is required, in another key, for Australia.[1]

Brief outlines of the nine chapters within this report follow.

Aligning defence and industry strategy

Paul Dibb introduces the collection with a call for a much closer alignment between defence strategy and defence industry. He cites the recently introduced UK White Paper as a model for Australia. Dibb reviews the history of past efforts to better link defence and industry. The most recent framing envisages the identification of industry capabilities that are essential to achieving through-life support, combat repair capabilities, and desired levels of national sovereignty. This was to avoid the boom and bust environment associated with project-by-project acquisitions.

This policy was designed to vary the relationship between suppliers and purchasers towards one in which the sustainability of key industry capabilities would be the primary consideration. Open competition would occur only in this context. Despite repeated statements of intent, the Australian defence establishment has mostly failed to realise this outcome. The only notable exception is the Defence Electronic Systems Sector Plan. Further, the Defence Capability Plan 2001–2010 was intended to be associated with a more open climate of information exchange. This was realised in 2002 and again in 2004 when comprehensive revisions were published. But thereafter "Defence's enthusiasm for publishing such detailed information seems to have gone". This is despite the fact that there have been significant changes in procurement.

Dibb concludes that Defence does not accept that its dominant purchasing power can and should shape the industry. This is by contrast with the UK approach where this framing is whole heartedly embraced. Dibb proposes an similar approach for Australia and concludes with a detailed discussion of the required steps.

Procurement

In the second paper, former Defence Chief **Chris Barrie** discusses the environment surrounding defence procurement and recommends steps to strengthen present arrangements. Noting the impact of Australia's ageing population, he repeats his call for wider discussion of a new scheme of national service. Given the shrinking of the relevant age cohort, an all-volunteer military is, in Barrie's view, hardly likely to be tenable. But a viable military force is essential for Australia's security. To gain public recognition of the stakes, the issue must be publicly identified and there must be debate about how adequate numbers can be sustained.

Turning to procurement, he notes that Defence created a new National Support Division in 1997 to strengthen its links with industry. He discusses the various factors that should shape this relationship. So far as investment in industry is concerned, he endorses Dibb's call for a fresh approach based on the identification of essential industry capabilities. He also notes the savings that have accrued from a much more extensive use of private sector contracting. The scope for reducing waste nevertheless continues. Further, with improved cooperation between suppliers and the department, it should be possible to reduce the lead times for major items of capital equipment from the present 10 to 15 years to eight years. But to accomplish this, the current stop–start procurement model needs to be replaced by a closer, alliance relationship between Defence and its suppliers. This is reinforced by developments in technology.

Barrie also discusses the size of national stockpiles and, as noted at the outset, emerging problems concerning the recruitment and retention of skilled personnel, not only in the Services but also in industry. He recommends a complete separation between the Defence Materiel Organisation (DMO) and the Department and concludes, like Dibb, with a call for a new statement of government policy along the lines of the UK White Paper.

Innovation

Richard Brabin-Smith turns to the priorities for defence innovation in Australia. There are four broad circumstances where Australia needs to conduct indigenous defence research and development.

First, Australia's unique maritime and land environment means that critical needs will not always be met by other defence equipment suppliers. Second, there will be compelling national security considerations such as technology support to counter-terrorism. Third, even Australia's closest allies will not always share with us defence information that they regard as too sensitive. Fourth, new ideas can emerge with compelling potential benefits.

Brabin-Smith also describes the role and achievements of the Defence Science and Technology Organisation (DSTO). For the future, he anticipates that Australia's specific geographic needs will continue to drive a need for research and innovation. Further, global industry consolidation might narrow options unacceptably from the perspective of Australia's own priority needs. Participation in joint projects led by overseas partners could well expand to fill this gap. Finally, Brabin-Smith calls for further cultural change: greater national recognition of the importance of science; greater willingness in defence industry to seize opportunities for innovation; and less reluctance within Defence to embrace local innovation.

Competition

In the fourth paper, **Mark Thomson** reviews the role of competition in Australian defence procurement. Australia's strategic defence industry requirements are usually expressed as the in-country capability to repair, maintain and modify Australian Defence Force (ADF) equipment. These imperatives justified government ownership of most of Australia's defence industrial assets until 1986 when the government commercialised its assets and introduced competition for major projects. In tandem with this, the Australian Industry Involvement (AII) was introduced to develop strategically important local industry capabilities and to maximise local content consistent with achieving value for money.

However, in practice, the AII program served economic rather than strategic imperatives. Although some through-life support capabilities accrued for the ADF, local content was also given implicit preference as an end in itself. In 2001, former defence minister Peter Reith proposed a new "strategic approach", aiming to move away from a project-by-project approach and towards longer term multi-project partnerships between defence and selected firms via "open book" alliance contracting. Progress in implementing this scheme has been somewhat limited, except in the case of the $6 billion Air Warfare Destroyer project. Thomson concludes by recommending that the government sort out the strategic capabilities it needs to keep in-country and then use open competition on the global market for the remainder.

Valuing defence

Stefan Markowski and **Peter Hall** also consider how the value of the defence industries might be estimated. They outline an economic framework for assessing the benefits of in-country defence industries. The "defence value-adding chain" is made up of the value and cost of defence-related capabilities; defence material imports and domestic industry supplies; and the interface between the Australian Defence Organisation and the upstream suppliers of goods, consumables and services in the defence industries. In theory, the value of the end product of the defence value-adding process – national security provision – should determine that of intermediate outputs and capabilities of upstream suppliers. However, since the true social value of national security cannot be assessed in peacetime, judgment is unavoidable.

Markowski and Hall then discuss the distinctive nature of the defence industry, paying particular attention to ownership and competitive issues. To be internationally competitive, they argue for specialisation in niche products. They are critical of policy justifications such as job creation and technology transfer, which are too frequently invoked as a rationale for defence industry protection. For example, in the case of technology, the best way to accelerate technological change in civil industry is to target the civil industry directly. But they also recognise that the valuation of the benefit of defence capabilities presents many technical and practical challenges. To the extent that it reflects judgments about the value of national defence, subjective elements are unavoidable. The judgement involves an assessment of the most efficient way of achieving security objectives, and the potential for domestic suppliers to deliver products and services. Established industry interests may seek to influence these judgments and political considerations may affect defence strategic analysis. The only counter to such pressures is transparency in decision making and accountability throughout procurement processes. If government is to support domestic defence industries, it should be strictly based on strategic defence considerations only.

Industry structure

Bob Wylie then provides a detailed account of the role and structure of Australia's defence-related industries. He focuses on six major procurement areas to illustrate the links between local firms, their business activities, and the military capabilities they supply and support. These procurement areas comprise non-combat support, defence information capability, naval ships, boats and submarines, army land-based manoeuvre, defence munitions, and military aviation. In each area, he reviews current and prospective workload, the major suppliers and the links between local and international firms.

Wylie argues that a robust defence industry broadens the military options open to Australian government in pursuing strategic objectives. But he also notes that, to remain strategically relevant, local defence industry must adapt to the new complexities in procurement, including the impact of increasingly complex and knowledge-intensive systems. Learning by doing, learning by using, and learning through the interaction of users and producers are now all critical to industry's capacity to supply the complex platforms and systems that Defence needs, and to support its preparedness. Further, procurement of knowledge-intensive systems is shifting industry focus increasingly to services. Effective support of such systems often requires close geographic and functional proximity between the customer and local service suppliers. In a context in which Australian procurement is closely linked to international suppliers, this creates a compelling rationale for continuing to foster the capacity of local industry to provide such support.

Case Study 1: The Joint Strike Fighter

In the first of two case studies of procurement, **Christopher Wright** examines the impact of the Joint Strike Fighter (JSF) program on the Australian defence industry. He reviews the prospects for the sector should the procurement approach adopted for JSF be applied broadly across future defence acquisitions. The JSF involves local consortia seeking to qualify for Lockheed Martin's global supply chain. Via a (nominally) competitive process, Australian companies are being considered as tier 3 suppliers.

Wright suggests that, in a complex technological environment, companies that have a clear focus and that offer discrete products or services are best positioned to succeed. Moreover, in some aspects, smaller companies may find themselves in a more advantageous position for through-life support. As the JSF program moves into the production phase, companies that are able to maintain their cost, schedule and quality performance and to offer complete packages competitively may be the base for sustainable industry capability in Australia. These companies are unlikely to be the larger primes that have traditionally dominated Australian defence industry.

Wright predicts that the JSF has the potential to significantly affect the worldwide defence industry. He notes that AII and its forebears have no place in this approach. Significant structural adjustment will follow the JSF approach. The burden of this will fall mainly on the larger primes. The decision as to what capabilities remain will be market driven, not government prescribed. The JSF approach favours a market mechanism, not government intervention, as the instrument of choice. This approach will complicate any alignment between defence strategy and industry capability. To the extent the JSF model prevails, the shape and structure of the industry will depend on the management decisions of US companies further up the value chain. The US defence industries' own traditions are an additional complicating factor. Historically its culture has strongly preferred domestic suppliers to those offshore.

Case Study 2: The Air Warfare Destroyer

In the second case study, **Derek Woolner** examines procurement of the Air Warfare Destroyer (AWD) project, the most complex naval surface vessel project ever attempted in Australia. He argues that the problems associated with past acquisitions mostly reflect decisions made (or not made) early in the project, well before the contractual phase. The Collins submarine provided a classic example.

Successful procurement requires broadly a three-step process:

1. A pre-contract strategic phase evaluating geopolitical, technical and production issues
2. A contract phase, when the detailed specifications and the relationship between purchaser and providers are considered
3. A project management phase.

The AWD project illustrates these latter requirements. This project will be managed under the alliance contract model that provides incentives for the contractor to save on cost, but requires transparency both between the purchaser and contractors and between individual contractors, who might often have directly conflicting interests. The critical risk factor for the AWD project is the air warfare system, for which the US navy's Aegis system has been preferred. In selecting Aegis, the government has avoided the risk of a new or unproven system. Woolner also applauds the choice of shipbuilder ASC because of its experience in testing unique designs and developing through-life support arrangements, and its strong links with a US builder.

Nevertheless, problems might be expected from the integration of the Aegis system with others of the vessels' systems. Aegis requires a large displacement vessel. It also requires commensurate crew numbers. Yet for a decade, the Royal Australian Navy (RAN) has suffered personnel recruitment and retention difficulties; hence, the RAN requires a crew significantly smaller than any similar vessel. This will demand significant work on ship automation and management systems, and complex integration of sensors, command and weapons – historically, such work has caused problems.

These risks have been recognised in the appointment of the AWD Principal's Council to represent the interests of the major parties. Woolner concludes that this role should be extended. Alliance contracting requires a mechanism to retain a broad program focus, and to allow alteration of alliance arrangements if necessary. The Principal's Council should consider extending its role or reporting to a new type of supervisory agency.

Defence politics

In the final paper, **Geoffrey Barker** looks at the interplay of economics and politics in major procurement decisions. First he reviews the structure of Australia's defence industry and its special relationship to the federal government. While the profitability of defence industry is broadly in line with that of the general manufacturing and services industries, the industry overall is not particularly robust in terms of its ability to meet future defence needs. The monopsony position of the government requires a

fine balance between efficiency and the political interest in a sustainable and healthy industry. Barker agrees with the government's view that a profitable and capable defence industry is imperative for Australia's self-reliance, but he wonders if current strategic policies, such as the government's Defence Capability Plan, will achieve this. Defence's four current sector plans (aerospace, electronics, shipbuilding and land) are inadequate.

Barker then reviews acquisition arrangements since the 2003 Kinnaird review and the establishment of the DMO as a semi-independent executive agency within the Defence Department. He believes that the Kinnaird review proposed a rational, market-like and outcome-driven framework for the management of acquisition projects. Its centre piece was a "two-pass" system for defence procurement: the first stage involving the analysis of options to meet an identified capability need and the second pass being the assessment of the supplier options followed by government approval for tender and contracting. This was fine in theory – but it has been breached in practice. For example, on the JSF project, only a limited process of comparing and evaluating alternative options was undertaken. The acquisition was decisively influenced by Australia's strategic alliance with the US. The purchase of naval combat systems further illustrated the role of alliance relations, the desire for maximum interoperability and the imperative of access to fast-evolving US military technology. Economic competitiveness had to be weighed against these other factors. Barker concludes that politics is unavoidable. A competitive/comparative analysis of major procurements is the ideal, but it is an unattainable one.

A new policy framework

Together these papers provide a comprehensive overview of the circumstances that confront, and the outlook for, Australia's industry support capabilities. There is substantial agreement between them on the general factors that are shaping the defence procurement and industry environment, but there are also significant differences of emphasis and interpretation.

Three factors would seem to be primary in the development of a policy framework.

First, the government's own geo-strategic determinations will prescribe likely scenarios around which general defence capabilities need to develop. There are naturally many uncertainties here, not least the emphasis between neighbourhood, regional and alliance responsibilities.

Second, these general capabilities will be the foundation for the identification of specific strategic capabilities that need to be developed in local industry to ensure through-life support of equipment and repair of critical components in times of conflict. Many factors, not least technology, create an array of options here.

Third, the capacity of local suppliers to successfully enter the supply chains of global primes will also be an important factor in determining levels of local defence industry activity. In this latter area, government can play a facilitating role, but unlike in the past, market forces will be primary.

A new policy framework needs to reconcile and balance considerations such as these – considerations that are not readily consistent and also substantively problematic.

ENDNOTE

1 UK Ministry of Defence 2005, *Defence Industrial Strategy: Defence White Paper* (CM 6697) http://www.mod.uk/DefenceInternet/AboutDefence/CorporatePublications/PolicyStrategy/DefenceIndustrialStrategyDefenceWhitePapercm6697.htm

A DEFENCE INDUSTRY

development strategy

PROFESSOR PAUL DIBB AM (PhD BA Hons) is Chairman of the Strategic and Defence Studies Centre in the Research School of Pacific and Asian Studies, Institute of Advanced Studies at The Australian National University. He was Head of the Centre from 1991 to 2003. Previously, he was Deputy Secretary for Strategy and Intelligence in the Australian Department of Defence and Director of the Defence Intelligence Organisation.

He is the author of five books and four reports to government, and has written more than 100 academic articles and monographs. He is a member of the Australian Foreign Minister's Foreign Affairs Council and is an Australian representative on the ASEAN Regional Forum register of experts and eminent persons.

Defence needs to be much better at aligning industry capability with defence strategy. Australia requires a defence industry development strategy that identifies those indigenous industrial capabilities needed to ensure national security. And it should specify those that can be met by the international market. This is not an excuse for a return to subsidies to industry by stealth. But the fact that defence is a monopsony means that it effectively determines the future shape and size of the defence industry. The changes envisaged here will demand much more of a strategic approach to the defence industry from Defence. They will also require a more discerning approach from industry about what is important when it comes to future investments, and what is not. Defining the link between defence strategy and what is required from industry has been a perennial problem. It is about time it was resolved.

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

The broader public policy context

An optimistic view, based on Defence's forecast capital investment spending and forthcoming major defence projects, is that the future of the defence industry in Australia appears assured. Australia is only halfway through the ten-year Defence Capability Plan, which is worth more than $54 billion (in 2001 prices). Major acquisitions lie ahead: the air warfare destroyers (at least $6 billion), the amphibious ships (about $2 billion), unprecedented aircraft acquisitions (including the Joint Strike Fighter and heavy transport aircraft worth more than $18 billion), as well as equipping the Hardened and Networked Army ($1.5 billion). In addition, Defence is outsourcing most of its combat support, facilities maintenance, and IT and communications to the private sector.

The down side is that the Defence Materiel Organisation (DMO) believes defence industry makes too much profit, measured in terms of return on equity. This ignores the access Australia gets to the global value chain from large international companies in return. The DMO is happy that companies are profitable, but it is not prepared to accept profitability based on winning contract change variations based on poor performance. It says that too many companies have been poor performers when it comes to schedule delivery and risk management. The DMO considers there is not enough competition and that a couple of companies dominate each defence industry sector. It therefore wants to encourage the entry of more competitors.

The most glaring deficiency in Defence's policy towards defence industry, however, is that there has not been one. At present there is a short-term approach that focuses – for understandable reasons – on schedule delivery. But there is no strategic approach aligning industry capabilities to defence strategy. Where is the equivalent of the impressive United Kingdom (UK) Defence White Paper, which was released in December 2005, called the *Defence Industrial Strategy*?[1] The answer is that the previous defence minister, Senator Robert Hill, was a strong advocate for Australian industry, but not for an industry policy. So, the DMO has not developed one.

> Much greater clarity is therefore needed from Defence about which capabilities should be retained onshore, and those that can be met from a wider market overseas.

Realising the link between defence strategy, capabilities and industry priorities has been attempted before on a number of occasions and failed.[2] And yet the need is obvious: defence procurement does not occur in anything that resembles a perfect market because Defence is in effect a monopsony buyer. If Defence does not make clear which

industrial capabilities Australia needs, then industry will make independent decisions and those local capabilities that are required to maintain our national security may disappear. This may constrain the choices about how we use the Australian Defence Force (ADF) in the future.

Much greater clarity is therefore needed from Defence about which capabilities should be retained onshore, and those that can be met from a wider market overseas. In the case of the UK, this has been done industrial sector by industrial sector, and attention is given to what is expected of particular defence companies.[3]

Such an approach is at odds with dominant models in Canberra of good public policy practice. And yet to promote a sustainable industrial base that retains in Australia those industrial capabilities needed to ensure national sovereignty, it is self-evident that Defence needs to make its priorities clear.

Indifferent progress with defence industry policy

In Australia, industry has always been the orphan of defence policy. It has never received sustained attention. One of the reasons for this is that defence industry in Australia is not large (13,000 employees and a turnover of only $4.7 billion).[4] Indeed, for a long time the Defence Organisation refused to recognise that there was any such entity as "defence industry" as distinct from the bureaucratically worded "defence policy for industry."[5]

Successive Defence white papers have given disappointingly thin attention to the future of defence industry in this country. They have generally seen the role of industry in Australia as being little more than to "repair, maintain, modify and adapt" defence equipment.[6] They were, of course, acutely aware of raising unrealistic expectations in the private sector about what could be built in Australia without huge subsidies. The second world war left some unfortunate legacies in this regard, even though with total mobilisation of national resources, Australia was not able to approach a position where supply for its armed forces came solely from within.[7]

After the second world war, the establishment and maintenance of large-scale production facilities appropriate only to major expansion took a low priority because of the absence of an identified requirement, the high cost and the lack of a continuing peacetime workload to exercise and maintain skills. Throughout the post-war period, "peaking" in defence orders on Australian industry created problems for management and the workforce. It created pressures for orders out of phase with priority requirements, or in excess of them. This remains a problem.

Defence industry in Australia has, nevertheless, become much more efficient and cost-effective. This has been because of the policy by successive governments to transfer the ownership of government-owned factories and dockyards to the private sector. In the past, the majority of Defence expenditure in the aircraft, munitions, naval ship modernisation, refit and construction, and electronics industries were deemed to not be economically viable for commercial reasons.[8] And most of the maintenance and servicing of military equipment was undertaken by single-service establishments.

Under past policies only some 30 per cent of expenditure on new defence capital equipment was incurred locally, often involving substantial subsidies. This reflected the nature of equipment then being procured and the poor competitiveness of Australian industry at the time.[9] When tender responses were considered, local firms benefited from the government's purchasing preference policy, which provided a notional discount to the tender price equivalent to 20 per cent of the value of the local content. This was in addition to the application of relevant tariffs, bounties and other forms of general industry assistance. Where there were deemed to be sufficient strategic benefits to justify the additional cost, the minister for defence could provide a price advantage in excess of the 20 per cent preference. Defence offsets policy provided that technology transfer and work to the value of 30 per cent of the imported content of a project must be placed with Australian industry.

This heavily subsidised approach to the defence industry in Australia changed radically in the late 1980s with the introduction of high local content major projects, such as the Collins submarines, ANZAC frigates and Project JORN. In addition, the government recognised that, despite heavy subsidies, its state-owned defence factories and dockyards were ill-matched to Australia's strategic needs. They lapsed into the poor performance and high costs that characterise state monopolies. As a result, the government decided to privatise state-owned defence facilities and to use fixed-price (as opposed to cost-plus) contracts, with payments against milestones (rather than elapsed time). These were seen as radical steps in an industry that had become far too used to featherbedding.

By the mid-1990s, some 80 per cent of Defence's expenditure on facilities, equipment, goods and services was being spent in Australia.

By the mid-1990s, some 80 per cent of Defence's expenditure on facilities, equipment, goods and services was being spent in Australia. This represented a major increase over the previous decade, resulting from high levels of Australian industry involvement in major local equipment projects. The share of capital equipment expenditure in Australia jumped from 25 per cent to 64 per cent in the decade to 1995. At the same time, the Commercial Support Program opened significant new areas of activity to Australian industry.

For the first time, in 1993 the government made explicit its priorities for industry support. It identified the following industry capabilities as most important for Australia's self-reliance in defence:

- combat system software and support
- data management and signal processing
- command, control and communications systems
- systems integration
- repair and maintenance of major weapons and surveillance platforms.[10]

Another innovation was for the government's major defence procurement projects to specify the industry capacity needed to provide sustainable support for the ADF. This approach recognised that through-life support is integral to defence planning of the real costs of major capital equipment over a 20 or 30-year timeframe.

But a promise that was not realised was that the Defence Organisation would consider "modifying the timing of its defence projects where this improves the continuity of workflow, encourages the sustainability of high priority skills, and does not jeopardize the capability of the Australian Defence Force."[11] It was claimed that where separate capital equipment projects share similar technologies, linkages would be established to achieve economies of scale, the benefits of commonality and a more sustainable flow of work to industry. This did not occur. Neither did the idea of establishing long-term supplier relationships in high-priority areas that are subject to low commercial demand. And the promise of reducing the costs of tendering "by reducing requirements for information from industry" also proved to be empty.[12]

The Howard government's earlier reforms

The Howard government came to power with a deeply sceptical view of the performance of the Defence Organisation. In one of his first speeches as minister for defence, Ian McLachlan asserted that defence was a business "just like any other business". He ordered that a major Defence Efficiency Review be undertaken, which had far-reaching impact on Defence's organisational structure, management and financial processes. It envisaged cost savings reaching $1 billion a year, with military and civilian staff reductions approaching 8000 and a further 12,900 positions to be subject to market testing.[13]

The new government was also highly critical of the Collins-class submarine project, which it saw as the outstanding example of the Defence Organisation's poor capability definition, contracting and project management practices. It promised to privatise ASC (although that is still to occur). More recently, it has brought about major change to the DMO by making it a prescribed authority, with management independence from Defence, and by making an appointment from the private sector as the first chief executive officer. These are far-reaching innovations and should not be underestimated. Dr Stephen Gumley has introduced radical change to the management of the DMO; in particular, he has focused on the need to deliver Defence projects on schedule and with measurable risk.

However, very little progress has been made in terms of defining strategic priorities for defence industry. The longest section in the 1997 Defence Efficiency Review concerned industry policy. But it reiterated many of the old adages that Defence was "just another customer and behaves in a commercial, mostly competitive way."[14] It did not recognise that a separate defence industry existed, only "defence policy for industry."[15] It did, however, state that there was a "narrow sector" in which Defence is the major, and in some cases the only, customer.[16] It suggested that, as far as possible, "such specialisation should be discouraged" because the Australian defence market "is too small to provide continuity of production, let alone sufficient new design and development work, for such firms to remain viable without subsidisation in most areas."[17] What the Review did acknowledge, however, was the role of demand manipulation to provide continuity benefits and better opportunities for local firms.[18] It claimed that this approach should be sufficient to retain capabilities, but the idea that Defence should designate industrial capabilities or technologies was rejected as "telling companies how to do their business".[19]

In 1998, the then Minister for Defence Industry, Science and Personnel, Bronwyn Bishop, produced a document entitled *Defence and Industry Strategic Policy Statement*.[20] It claimed to be the first time that a strategic approach had been taken to Defence industry policy. It stated that the government wanted a sustainable industry in Australia and that, where it supports strategic interests, Defence "will manage demand by varying the timing of purchases to smooth the peaks and troughs."[21] It said that Australia needs a specifically targeted set of capacities in our national industry and support base, but did not really advance that concept from the priorities that were set out in the 1994 Defence White Paper. The Statement did establish the so-called "knowledge edge" as Australia's highest capability development priority, which was to be achieved by exploiting information technologies. Intelligence, command and its supporting systems (including communications), reconnaissance and surveillance, electronic warfare and systems integration were identified as being particularly important.[22]

Where the 1998 statement did make progress was in its proposals to integrate industry into capability development; reform procurement; establish new ways to involve Australian industry in defence business; and a commitment to cultural change and improved communication. It also established, for the first time, clear procurement rules for foreign firms operating in the Australian defence market. But then, as usual, a radical new policy got bogged down in Defence's process machinery: the

Department announced 49 initiatives, many of which soon lost their way through bureaucratic suffocation.

The 2000 Defence White Paper also had bold new things to promise about defence industry policy. It asserted, "We must take a strategic approach to our defence industry base, and not regard its capabilities as simply a by-product of procurement decisions".[23] But then it merely repeated the objectives set out in the 1998 *Defence and Industry Strategic Policy Statement*. And although it argued the need for "a specifically targeted set of capacities in our national industry and support base", it did little more than chant the mantra of repair, maintenance, modification and provisioning, followed by precisely the same set of specific-industry priorities that were set out in the 1994 Defence White Paper and the 1993 Strategic Review.[24] The White Paper claimed that the government's approach was a strategic one that sought to capitalise on areas where Australia's industry base demonstrated particular strengths. In those areas, defence industry policy would recognise and foster Australian industry's innovative use of advanced technologies. Capitalising on Australia's strengths in information capabilities was highlighted, and it was particularly important that industry should have the ability to provide "high-quality support" in such areas as command-and-control systems, electronic warfare capabilities, surveillance and sensors.[25]

The White Paper repeated what every government review of defence industry has said for at least the last 20 years: that the industry needs to be competitive on an international basis and Defence will assist this through export facilitation. The problem is that the Australian defence industry exports – with few exceptions – remain pathetically small. And diversifying into civil markets has been patchy at best.

The Howard government's ideological stance on defence industry is clearly set out in the White Paper; that is, the government will shape the environment in which industry makes its decisions, but it will not intervene and shape the market itself "through subsidies and preconceived solutions".[26] The White Paper observes that the government will not limit itself to purchases from Australian industry, or pay an unduly high premium for them.[27]

The report of the Defence Community Consultation Team, headed by Andrew Peacock and Stephen Loosley and which preceded the publication of the Defence White Paper, recorded that industry asked for predictability and direction to allow it to plan in a sustainable manner. It wanted a clear articulation of the longer term requirements of both government and industry.[28] The Howard government came good on this by setting out a program of defence capability enhancements over the following 20 years. This entirely new approach to defence capability planning was outlined in the 2000 Defence White Paper and published in considerable detail in a public version of the classified Defence Capability Plan 2001–2010 (and the subsequent supplement in 2002 and an updated version in 2004).[29] These are highly informative documents. They set out development paths in each of the key capability areas, including estimated expenditure and indicative year of decision. Each project contains information on the background to the proposal, defence needs of Australian industry, Australian industry involvement (including acquisition and through-life support), potential prime contractors, estimated phase expenditure, and points of contact in both the capability staff and the DMO.

The government saw the unprecedented release of such detailed information as providing a solid basis and predictability for long-term planning by Australian industry. It was heralded as also improving Defence's ability to better manage the industry capacity associated with each major defence capability area, including essential systems engineering and integration skills.[30] The problem is that Defence's enthusiasm for publishing such detailed information now seems to have gone. It is over two years since the last Defence Capability Plan was published, and yet there have been major changes to planned defence procurements (for example, Abrams tanks, the size and scope of plans for air warfare destroyers and amphibious ships).[31] The government now appears to be failing in its commitment to keep Australian industry abreast of Defence's acquisition planning "so that it can effectively perform its role as a crucial component of our national defence capability".[32] There are those in Defence who see the Defence Capability Plan as a rod for their own back: they would prefer to see a much thinner and less-informative public document.

Reith's initiatives and the sector plans

When Peter Reith became defence minister in January 2001 he soon became irritated with the DMO's overly bureaucratic, process-driven approach to defence industry policy and the fact that Bronwyn Bishop's *Defence and Industry Strategic Policy Statement* had been converted to an implementation plan containing no fewer than 49 so-called "key initiatives".[33] He brushed these aside and directed that a major speech and cabinet submission be prepared. The speech was presented on 26 June 2001 to the Defence National Procurement Conference. He said that the 2000 Defence White Paper "enables Australian defence industry, for the first time in peacetime, to plan ahead in the knowledge that there is sustainable defence business in Australia".[34] The Minister talked about the need for "a strategic vision" for Australian defence industry to overcome the perception that "neither Defence nor industry thinks they work well together or believe they have a mutually beneficial relationship".

He identified one of the crucial problems with Defence's current approach was that "project-by-project acquisition creates a boom and bust environment and, as a result, the capacity of companies to make long-term investments is

seriously constrained by the lack of any confidence that a long-term relationship with Defence is in prospect".[35] The minister stressed that, if we continued with the present unstructured approach to defence industry, there would be no guarantee that Australia will have the sort of capabilities that are necessary for the support of the ADF in future conflicts. He concluded that we must now think about how "we can link defence acquisition projects together strategically", so that we can create an environment that will lead to a sustainable defence industry in Australia. Reith stressed that we needed to define what are the key, critical defence industry capabilities that Australia requires. He noted that Defence had not been too good at defining these in the past.

He concluded that we must therefore determine Defence's overall demand for key products and services and manage them more strategically. This would require a fundamental change in the way in which Defence does business. He felt that competition for the sake of competition ends up costing Defence money, not saving it. And he was not convinced that we must necessarily re-compete follow-on phases of projects where a company is already performing well. He stated that Defence may have to consider sole source or restricted arrangements more often, while recognising that there will not be any follow-on business where companies let Defence down.

But he was equally of the view that industry needed to reform as well. Some new rules of engagement would have to be devised with industry. There would have to be a new approach to transparency and accountability. If increasing use were to be made of sole source arrangements and of follow-on business, Defence would need to ensure that it was not being ripped off. Open-book accounting procedures, with agreed industry profit margins and scrutiny of costs to ensure that they are not being padded out, was one approach.

Reith's propositions were the most far-reaching approach to the future of defence industry in Australia of any government. The thrust of his proposals, which were accepted by Cabinet in October 2001, became part of the Howard government's election platform in November 2001. That platform stated that the Coalition would:

- "Adopt a more strategic industry policy approach.
- Base this approach on sustaining key industry capabilities critical to Australia's national security needs and better demand management of its capability requirements.
- Define the key industry capabilities that it requires and develop long-term strategies to sustain them.
- Change the way Defence manages its demand, linking individual acquisitions to the sustainability of key industry capabilities within defence industry sectors …".[36]

This election platform noted that sustaining key Australian defence industry capabilities would require a fundamentally different approach by Defence to its industry relationship. The primary driver for the relationship would be the sustainability of key defence industry capabilities rather than open competition. It also noted that the capacity of prime contractors to make long-term investments in Australia was seriously constrained by the uncertain prospect of any long-term, sustainable relationship with Defence. A new approach, which focused on the sustainability of key industry capabilities, as opposed to open competition on a project-by-project basis, was required. To provide an appropriate planning base for industry, Defence needed to define the critical skills and key capabilities required from industry. The election platform stated that capacity within key sectors of the defence marketplace far exceeded Defence's long-term demand and that, as a result, "few defence companies operating in Australia make a respectable profit on a sustained basis".[37]

So, what was the Department's response to this radical policy shift by the government? It assiduously applied itself to developing what it called Sector Strategic Plans for naval shipbuilding and repair, aerospace, land and weapons, and electronic systems. These were detailed publications containing specific policy recommendations.[38]

The Naval Shipbuilding and Repair Sector Plan recommended that future Defence demand was sufficient to sustain only one shipbuilder, and that a single shipbuilding entity model provided the only feasible structural arrangement to meet the navy's new construction capability requirements.[39] Treasury and Finance, as well as the Australian Strategic Policy Institute (ASPI), opposed this approach. ASPI argued that a shipbuilding monopoly could easily become inefficient and that commercial forces should decide how many shipbuilders could be supported in Australia.[40] It also argued that there was no strong strategic reason to build the navy's warships in Australia and that "the real strategic priority" was to have the ability to repair and maintain our ships.[41] The naval shipbuilding sector plan was quietly shelved in May 2004, when the ministers for Defence and for Finance announced the government's plans to issue tenders for the air warfare destroyers and the amphibious support ships.

The aerospace and electronics systems sector plans were more fortunate and were endorsed by government in June 2004. This is because they were much less contentious. The aerospace industry in Australia, unlike naval shipbuilding, does not involve the building of platforms. The sector plan envisages consolidation around two or three platform-based through-life support primes and one or two system through-life support primes possibly including an engine prime. Such an industry structure would emerge as an outcome of ADF operational capability needs and the new strategic approach to industry, rather than as an objective of the aerospace sector plan.[42] A current critique by Defence is that by intervening in competition policy this

has locked out smaller players from improving their aerospace business and allowed a couple of large companies to generate non-economic market power, which is reflected in increasing maintenance costs. The Aerospace Sector Plan did note that the defence market is highly fragmented with the ADF operating some 20 different aircraft types, supplied by 11 different Original Equipment Manufacturers (OEMs) out of five different countries. It asserted that Project AIR 9000 would help resolve nine helicopter types "into about half that number" and there would also be "an opportunity to rationalise the ADF's airlift capability requirements".[43] Almost three years later, none of this has happened.

The Defence Electronic Systems Sector Plan was the most successful of the published plans because, unlike the others, it actually came up with a list of critical industry capabilities. These were:

- secondary and tertiary military systems integration
- mobile military communications
- electronic warfare
- niche capabilities in radar
- underwater acoustic technologies.[44]

Defence announced that all acquisitions in these sectors would be undertaken in Australia, except where the industrial capability does not reside in the country and cannot be obtained without compromising value for money. Defence set out what it expected industry to be capable of doing to win contracts for systems integration work. The Department also identified core, and enabling or emerging technologies that underlie Defence self-reliance, and which warrant the particular focus of public-sector and industry research and development expenditure.[45] There has been some pleasing progress by the DMO supporting industry capabilities in the electronic warfare and radar areas, but underwater acoustic technologies are lagging.

The Kinnaird Review of defence procurement

On coming to office in 1996 the Howard government was concerned the organisation it inherited did not have the necessary governance arrangements to properly manage complex defence projects. Six years later, in December 2002, the government announced it had commissioned a review on a range of issues associated with major Defence acquisitions to be chaired by businessman Malcolm Kinnaird. The report of the Defence Procurement Review was released in September 2003.[46] It made ten key recommendations designed to provide greater certainty that the ADF will get the capability it needs delivered on time and on budget. The government broadly accepted each of the recommendations. They included:

- establishing the DMO as a prescribed agency with financial autonomy from the Department of Defence[47]
- forming a new capability group within Defence headquarters to ensure that project proposals put to government have reliable cost and schedule estimates
- giving the CEO of the DMO an expanded range of powers to make improvements to the delivery of defence projects and the management of the DMO
- strengthening the two-pass approval system through Cabinet to facilitate early engagement with industry and provide a better basis for project scope and cost.

These reforms have now been successfully implemented, and the DMO is a much more businesslike organisation determined that the defence industry will deliver on schedule and cost. Companies that do not have been in for a rough time. The DMO has significantly improved its capacity to spend the capital equipment budget and the two-pass system is said to be enabling a much more accurate estimate of project costs and risks. But while aspects of the capability development process appear to have been strengthened, force structure development seems to be increasingly at the whim of the single-service chiefs and divorced from strategic policy guidance.

From the perspective of this chapter, the chief deficiency in the Kinnaird Review is its lack of understanding of the government's 2001 strategic approach to the defence industry and why this was adopted. It focuses on the sector plans rather than the policy intent of the 2001 cabinet decision (and the Coalition's election platform defence commitments). The Kinnaird Review states that it is not clear how the objectives in the sector plans will be achieved or measured. It does acknowledge the principle of demand management (bundling strategically linked projects into a common contract) appears sound, but says Defence has not demonstrated an appropriate way to implement it. The Review notes Defence is more likely to succeed in fostering and sustaining desired industrial capabilities in Australia if it develops and promulgates a list of clearly defined outcomes to industry (as it has in the electronics sector).[48]

While this in many ways is fair criticism, it shows little understanding of the reasons behind the 2001 cabinet decision. Rather, it seeks to undermine it by focusing instead on the changes in market forces that are driving restructuring and improving productivity in industry generally.[49] It emphasises how the government is enhancing the business environment, addressing growth impediments and encouraging innovation, investment and exports. It observes that industry sectors with relatively high levels of protection are being systematically exposed "to international pressures to help lift their global competitiveness".[50] Thus, changes in market forces are seen as driving restructuring and improving productivity, and by implication that is what defence industry should be exposed to. The attitude of the Review to defence industry policy is most clearly revealed by its observation that "it is difficult to see that a Defence industry policy function is appropriately retained in the DMO …".[51]

The end result is that the Kinnaird Review has set the scene in Defence to ignore the Cabinet's decisions and to use the excuse of the ill-fated sector plans to not develop any policy to determine priorities for the defence industry in Australia.[52] What Defence has done recently is to release what it calls "Road Maps" of future capability plans – such as Network Centric Warfare (NCW), Rotary Wing, Anti-Submarine Warfare (ASW) and Uninhabited Aerial Vehicles (UAVs) to better inform industry. It also has released a list of what it terms "Critical Industry Scans out to 2015". About half of them, however, simply repeat what was in the electronics sector plan (electronic warfare, radar, underwater acoustics, communications and systems integration).[53]

The bottom line is that Defence does not seem to accept that its dominant purchasing power can (or should) shape defence industry. Instead, it argues that the competition for customers is actually quite intense between different parts of Defence. Ergas and Menezes believe that the weapons acquisition process is inherently imperfect, but they state: "Sellers are … exposed both to monopsony power and to the risk of the buyer acting opportunistically – that is, taking advantage of changing circumstances to increase its share of the benefits from supply."[54]

Managing a new defence industry development strategy?

This chapter has catalogued the dismal story of the swings from one extreme to the other in defence industry policy in Australia. Governments seem to have indulged in whatever were the economic fads and fashions of the time. And the Department of Defence has all too often suffocated ministerial-endorsed policies. There has been little in the way of continuity in policy to guide industry investments. Within the Department of Defence, there has been no attempt to link defence industry policy to strategic guidance.

Defence continues to think that the marketplace alone will determine the size and shape of industry capability in Australia. It correctly argues that interventionist policies are extremely hard to get right. But there is no guarantee that a purely laissez-faire policy will deliver the local industry capabilities that are required to support independent military operations.

The UK Ministry of Defence has produced an extremely detailed White Paper, which sets out with admirable clarity a new defence industrial strategy.[55] The UK government said it felt it must ensure that in future it would have access to the capabilities and modern technologies it needed – and that enough of these would remain within the capabilities of British-based industry. It specifically identifies, for the first time, which industrial capabilities are required to be sustained onshore. But it also makes plain which are those capabilities that no longer have to be retained in the UK (such as designing and building military aircraft) and that can be satisfied through open international competition, without affecting national military effectiveness.

The UK's *Defence Industrial Strategy* White Paper places great emphasis on plans for partnering arrangements with companies, or with groups of companies.[56] This signals a reduced role for competition, at least at the top end of the supply chain. Nevertheless, the Strategy signals there will be no guarantees of work and that any company will have to offer compelling value to win business. The end result is that industry in the UK can now plan for a still sizeable UK defence market with greater knowledge and assurance about official priorities. Why cannot Australia attempt something similar (recognising that the UK defence market is the second largest in the world and it has a broad-based and sophisticated defence industry)?[57]

… the Strategy signals there will be no guarantees of work and that any company will have to offer compelling value to win business.

Short of such a major challenge, there are other policy initiatives that could be undertaken. Is it all that difficult to identify in the Defence Capability Plan (DCP) technologically similar projects, phases of which could be linked together to provide a more predictable workload for industry? If a company has a good company scorecard and has delivered a particular project on schedule and on cost, is there really a need to compete the follow-on phases? Should we not be demanding from new entrants to our defence market more than just a shopfront and promises of investment, many of which seem to fade away once the particular project has ended?

It also seems that all too often industry issues are considered too late – or not at all – in the capability development/procurement decision cycle in Defence. This was something that irritated the previous defence minister, Senator Hill. The new minister, Dr Brendan Nelson, should send back to Defence submissions that do not address the case of industry involvement and have the joint recommendation of the DMO and Capability Development. And the single services are becoming notorious for wanting to go offshore for equipment purchases rather too readily: something needs to be done earlier in the Defence process about addressing that prejudice.

The defence industry also needs to smarten up its act. Too often, the quality of management is not particularly impressive. Too many companies are down in the weeds pursuing particular DCP projects, but without any real understanding of Defence's strategic direction and which force structure priorities are likely to prevail and why. Competition is natural; however, the atmosphere of antagonism within defence industry can be quite destructive. There needs to be more partnering and alliances, not less, but the DMO seems to think otherwise. Industry too needs to recognise that if it is to get

better access to defence business, it needs to acquiesce in open-book accounting, agreed profit margins and transparency in overhead rates.

We need to understand more clearly why it is that there is such low investment by the private sector in the defence industry in Australia, represented through investment strategies focused on leasing infrastructure and not building it, and focusing on service delivery not innovative secondary industry. Is this due to a failure of past interventionist policies or a lack of appropriate corporate structures and commitments? We need a better linkage of economic interests to Australian sovereignty here. Why is Australian venture risk capital so uninterested? And what can we do to make some of the large international defence companies more committed to investing in Australia?

So, what might be a sensible path ahead?

Responding to falling demand

First, it needs to be recognised that once we get over the current peak of demand for state-of-the-art, expensive platforms, industry faces significantly reduced demand from Defence in the longer term. This will require careful management, and in particular re-focusing more on the provision of through-life support services and closer support to the ADF in military operations. For the remainder of this decade, the building of air warfare destroyers and large amphibious ships in Australia will preoccupy the naval shipbuilding sector. The delivery of new helicopters, airborne early warning and control (AEW&C), heavy transport aircraft, and the Joint Strike Fighter will place large new demands on the aerospace support sector. And the supply of Abrams tanks, large numbers of new field vehicles and trailers, new artillery, as well as UAVs and delivering on project Wundurra and the Hardened and Networked Army, will simultaneously place heavy demands on the land and weapons sector. But it will then be a long time, up to 30 years, before major new equipment acquisitions will be considered. Instead, the trend worldwide is to extend the life of increasingly expensive, high-technology platforms. Industry will need to refocus on this.

Adjusting to concentrated supply

Second, Defence will have to adjust to a supply-side regime that will increasingly take on, to all intents and purposes, the characteristics of quasi-monopoly suppliers. This is already occurring as specific industry sectors in Australia become dominated by one or two companies. This trend may well intensify as our major defence suppliers in the US and Europe rationalise further through acquisitions and mergers. If we continue to favour US defence technologies we will become more dependent on the presence in Australia of the subsidiaries of very large US defence corporations. These trends will bring about the need for changed relationships and accountability with the DMO. If eventually the US comes to have only one manufacturer of combat aircraft, transport aircraft, submarines, tanks, and perhaps even surface warships, then Defence will need to work out how best to handle such a tightly limited marketplace. Sustaining competition to meet domestic requirements is likely to become increasingly difficult as global defence suppliers are rationalised more and more.

Competing for skills

Third, Australia faces the serious demographic problems of an ageing population and reductions in the cohort of young people coming into the workforce. If our economy continues to boom at the pace it has done for the last 15 years, industry will face increasingly acute competition for scarce workforce skills. To an extent, this is already occurring with the same group of engineers and systems integrators shifting from company to company and defence project to defence project. The problem is that these very same skills are in very high demand in the commercial sector. Defence and industry will need to develop, in partnership with the tertiary sector, a long-term plan to deliver sufficient numbers of skilled people into defence industry if we are to sustain our capacity for self-reliance. The alternative is a progressive run-down in the capability of defence industries to support our national sovereignty.[58]

Negotiating for overseas-supplied technologies

Fourth, we may become more – not less – dependent on access to overseas-supplied high-defence technologies. This will be particularly the case if we continue to develop – as indeed we should – a balanced, conventional war-fighting capability. As already mentioned, the number of suppliers of such technologies worldwide is likely to decrease further and, in addition, it seems likely that we will become more dependent on access to US defence technologies. This will require that we negotiate firmly with the US over its non-disclosure policies and get access to the source codes that will enable us to modify or alter the performance characteristics of US platforms, missiles and sensors. These are highly sensitive issues, even for such a close ally of the US as Australia.

Building the right capabilities

Fifth, the central message of this chapter is that we need to develop a defence industrial strategy that identifies those industry capabilities that strategic guidance suggests are important for our defence self-reliance and Australia's independence when committing the ADF to military operations. If we continue to believe that the marketplace alone will deliver a sustainable defence industry we may well end up without having key capabilities in our defence industry that are necessary to underpin Australia's defence self-reliance. Defence needs, therefore, to create a clear Australian context to inform business decisions, while at the same time ensuring competition is sustained. It needs to be remembered that competition generates more capability for the defence budget through lower prices: there must be no let up in this underlying philosophy by government.

Conclusion

Australia needs a new Strategic Industry Policy Statement, which will focus on managing demand and competition, and state what industrial capabilities are of strategic importance and why. It would confirm that the government continues to seek to maximise the economic benefits to Australia's economy, while retaining preference for the best value for money. And it would stress that (in accordance with the 2000 Defence White Paper) the Statement is further shaping the environment in which industry makes its decisions, but the government is not intervening with preconceived solutions. Rather, it should recognise that international and local defence industry trends now require clarification of those critical industry capabilities that are of growing importance to supporting the ADF's independent military operations, as well as the credibility of operations with our allies.

ENDNOTES

1 *Defence Industrial Strategy: Defence White Paper*, presented to Parliament by the UK's Secretary of State for Defence, December 2005.

2 See: "Defence Policy and Industry", report to the Minister for Defence by the Parliamentary Secretary to the Minister for Defence, the Hon. Roger Price MP, November 1992; "Defence and Industry – Strategic Policy Statement", by the Hon. Bronwyn Bishop MP, 1998; "Australia Needs a Strategic Approach to Defence Industry Policy", speech by the Hon. Peter Reith MP, Minister for Defence June 2001. This was developed into a Cabinet submission called *A New Strategic Approach to Defence Industry Policy*, which became part of the Liberal Party's re-election platform in November 2001.

3 See the UK's *Defence Industrial Strategy Defence White Paper*, pp. 59–127, which accounts for half of the total document.

4 *A Profile of the Australian Defence Industry*, Melbourne: ACIL Tasman Pty Ltd, November 2004, pp. xiv and 8.

5 See, for example, "Report of the Defence Efficiency Review", *Future Directions for the Management of Australian Defence*, Canberra: Department of Defence, 1997, p. 29.

6 See the 1976 Defence White Paper, p. 51, the 1987 Defence White Paper, pp. 76 and 78, the 1994 Defence White Paper, p.115, and the 2000 Defence White Paper, p. 99.

7 The 1976 Defence White Paper, p. 50.

8 The 1976 Defence White Paper, p. 52.

9 The 1987 Defence White Paper, p. 77.

10 See the Strategic Review 1993 and the 1994 Defence White Paper, pp. 115–16.

11 1994 Defence White Paper, p. 117.

12 1994 Defence White Paper, p. 118.

13 Report of the Defence Efficiency Review, p. 54.

14 Report of the Defence Efficiency Review, p. 29.

15 Report of the Defence Efficiency Review.

16 Report of the Defence Efficiency Review, p. 30.

17 Report of the Defence Efficiency Review.

18 Report of the Defence Efficiency Review, p. 34.

19 Report of the Defence Efficiency Review.

20 *Defence and Industry Strategic Policy Statement*, Canberra: Department of Defence, June 1998.

21 *Defence and Industry Strategic Policy Statement*, p. 13.

22 *Defence and Industry Strategic Policy Statement*, pp. 2 and 6. In 1997, Defence produced a document called Defence Needs of Australian Industry. A much longer (some would say encyclopaedic) version was published in 1999, but sank without a trace.

23 2000 Defence White Paper, p. 98.

24 Compare the industry priorities at pp. 99 and 100 of the 2000 Defence White Paper with the almost identical words at pp. 115–16 of the 1994 Defence White Paper, which in turn were based on pp. 72–3 of *Strategic Review 1993* (Canberra: DPUBS, Defence Centre, December 1993).

25 2000 Defence White Paper, p. 100.

26 2000 Defence White Paper, p. 101.

27 2000 Defence White Paper.

28 2000 Defence White Paper, p. 103.

29 *Defence Capability Plan 2001–2010*, Canberra: Defence Publishing Service, 2001, 296 pages; *Defence Capability Plan Supplement 2002*, Canberra: DPS, 2002, 46 pages; *Defence Capability Plan 2004–2014*, Canberra: DPS, 2003, 188 pages.

30 2000 Defence White Paper, p. 103.

31 *The Defence Capability Plan 2004–2014* was launched by the Minister for Defence on 4 February 2004.

32 Senator Robert Hill, Minister for Defence, *Defence Capability Plan* 2004–2014, p. iii.

33 See the *Defence and Industry Implementation Plan*, June 1999 Update, Canberra: Defence Publishing Service, 1999.

34 "Australia Needs a Strategic Approach to Defence Industry Policy," speech by the Hon. Peter Reith, MP, to the Defence National Procurement Conference, Canberra, 26 June 2001.

35 "Australia Needs a Strategic Approach to Defence Industry Policy", speech by the Minister for Defence Peter Reith, 26 June 2001.

36 *The Howard Government: Putting Australia's Interests First, Election 2001. Strengthening Australia's Defences*, printed and authorised by L. Crosby, Melbourne 2001, p. 44.

37 *The Howard Government: Putting Australia's Interests First, Election 2001*, p. 47.

38 See *The Australian Naval Shipbuilding and Repair Sector Strategic Plan*, Canberra: Defence Material Organisation 2002, and *The Australian Defence Aerospace Sector Strategic Plan*, Canberra: Defence Material Organisation 2003. *The Defence Electronic Systems Sector Plan* was released as a discussion paper in June 2003. The Land sector plan is yet to be published.

39 *Naval Shipbuilding and Repair Sector Plan*, p. 7.

40 *Setting a Course for Australia's Naval Shipbuilding and Repair Industry*, Canberra: Australian Strategic Policy Institute, August 2002, pp. 4–5.

41 *Setting a Course for Australia's Naval Shipbuilding and Repair Industry*, p. 11.

42 *The Australian Defence Aerospace Sector Strategic Plan*, Canberra: Defence Materiel Organisation, June 2003, pp. 1 and 7.

43 *The Australian Defence Aerospace Sector Strategic Plan*, p. 3.

44 *Defence Electronic Systems Sector Plan*, Canberra: Defence Materiel Organisation, 2003, pp. iv, v, x and 5–14.

45 They were: photonics; monolithic microwave integrated circuits; artificial intelligence; electro-optics; RF engineering; radar technologies; data fusion; safety critical software systems; and space- based communications.

46 *Defence Procurement Review 2003*, Canberra: publisher not recorded, 15 August 2003), released by the minister for defence 18 September 2003.

47 The Kinnaird Review recommended establishing the DMO as an executive agency within the Defence portfolio, but with a separate identity (see *Defence Procurement Review 2003*, pp. 33 to 38).

48 The Kinnaird Review, p. 45. The Review observed that the ANAO had also noted the lack of specific guidance as to what industry capabilities are required is a significant omission from defence industry policy.

49 The Kinnaird Review, p. 44.

50 The Kinnaird Review, p. 44.

51 The Kinnaird Review, p. 45.

52 There are some in the DMO who say publicly that the sector plans are still a valid policy tool.

53 The new items are: nano technology, IT, molecular and biotechnologies, nuclear, chemical and biological detection and response.

54 Henry Ergas and Flavio Menezes, "Some Economic Aspects of the Weapons Systems Acquisition Process", in *The Australian National University, Working Papers in Regulatory Economics*, 30 March 2004, pp. 5 and 17.

55 For a useful summary and critique of the UK White Paper see *Strategic Comments*, London: The International Institute for Strategic Studies, volume 12, issue 1, February 2006.

56 The Strategy sketches plans for partnering arrangements covering aircraft, submarines and land vehicles. It makes clear that these will depend on the company meeting the demands for improved performance, behavioural change and industrial rationalisation.

57 *Defence Industrial Strategy*, p. 2.

58 See *A Profile of the Australian Defence Industry*, Melbourne: ACIL Tasman Pty Ltd, November 2004, p. iii: "This study confirms the impact on defence industry of the shortage of skills across a range of operational and managerial occupations. Skill shortages are already having widespread effects across industry making this an area of concern."

defence **industry** policy

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Chris has been working on aspects of strategic leadership drawn from his own practical experience, and research, as these could assist the next generation of leaders of complex and diverse organisations to be successful. He has also been involved in mentoring and coaching future leaders as well as teaching an elective on strategic leadership at the National Defense University. He has also been a regular participant in the Oxford Leadership Program.

"It seems so simple …"

It may seem a strange thing to ask a former Defence Chief to offer a contribution on Defence Industry Policy. However, the issues at the heart of getting our industry policy right should concern all Australians, and the outcomes of policy implementation will have consequences for our national security for years to come. Many experts, from the bureaucracy, academia and industry have made a contribution to this volume; these experts have identified the various problems we need to work on, and suggest solutions. Between us all there is a shared sense that we can do a lot better. In fact, in Australia we ought to set the world standard when it comes to equipping and supporting our armed forces. The critical starting point for the framing of any defence industry policy is for us to understand what our servicemen and women expect, and what is possible in meeting these demands.

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Australia can be rightly proud of the record of performance delivered by its armed forces over recent years. The professionalism, capabilities and capacity of Australia's all-volunteer defence force are testament to the progress that has been made in maintaining a modern, high-technology and highly skilled force. But, in providing support for our forces there seem to be many areas where our performance as a nation needs to be tested for adequacy and effectiveness. This perspective was a key reason for the establishment of the National Support Division in 1997 within the Australian Defence Force (ADF) Headquarters as an outcome of the Defence Efficiency Review. One of its purposes was to monitor industry issues and propose better ways of delivering equipment and support to the ADF in times of defence emergency. It also had responsibility for mobilisation planning. These are critical policy matters, but they often do not receive the attention they deserve.

Whenever we call on our armed forces to fight it can be argued that they require the very best that the nation can deliver in equipment and support, which together with money and people we know as the sinews of war. To do anything less would appear to be irresponsible. To do less would also be unacceptable for a considerable number of Australians in our community who have memories about what it is like to fight without adequate weapons, equipment, support and leadership.

Whenever we call on our armed forces to fight it can be argued that they require the very best that the nation can deliver in equipment and support, which together with money and people we know as the sinews of war.

Once combat operations begin we need to comprehend the full implications of uncertainty in our calculations. First, we cannot be sure where the operational imperative will lead us. It may be possible to contain conflict either by area or degree of violence, through good management and luck, but not always. But

we cannot be sure about this because we are likely to be facing off against an adversary who wants to win, too. Furthermore, we cannot assume that our adversary would not be able to access high technology in support of a surprise attack. Remember the brilliance of the 9/11 attacks – using United States (US) high technology to attack US targets exploiting surprise and the very systems that the US uses to further its globalisation goals.

Depending on the extent of these uncertainties our strategy may have to be modified accordingly. Long lead times for obtaining new or enhanced equipment, normally associated with the acquisition process, seem likely to entrench the concept of the "come-as-you-are" war for a democratic country such as Australia well into the future, thereby placing even greater responsibility on successive governments to pay attention to management of the supply and support function for the ADF. Our ability to respond appropriately to any attack may be limited by imbalances in force structure, operating inappropriate platforms and weapons, or sheer lack of numbers.

For these reasons I would argue that, in addition to recruiting and training our armed forces, one of the highest priorities for any government in Australia is the provision of proper support to the ADF. By this we mean appropriate logistics, appropriate weapon systems, appropriate communication systems, and the right number of platforms needed to do the job. To cite one example from recent times of our forces deployed in harm's way, questions always seem to rise about the quality of combat clothing, boots and body armour, and so on.

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Our forces will need access to highly sophisticated technology to equip them for modern battle and to overcome limitations on capability flowing from shortages of people in uniform. They will also need all the right equipment to deal appropriately with any adversary. Closer to our shores this takes on special importance when Australia would take on the dominant leadership role in military operations and bear the ultimate responsibility for achieving success. Furthermore, as losses in battle mount, equipment will need to be replaced, at least, and likely as well, built up in numbers for campaigning and training purposes. Equipment will also need to be repaired in as short a time as possible and returned to the battlefield. Equipment may also need to be modified to deal with any shortfalls in capability found out in the heat of battle and perhaps new equipment developed. And finally, supplies of ammunition and trained personnel must be kept up to the force during combat operations.

So how do policymakers gauge what would constitute proper support for our forces? Well, it is easy to see that for the foreseeable future Australia will struggle to find the number of young people we need for our navy, army and air force. While recruitment and retention have been a constant problem for defence since the 1980s, the diminishing availability of people in the 18 to 30-year-old age sector in Australia, especially beyond the next decade, dictates that equipping and supporting our force to a new standard – a standard well beyond "adequate" and reaching towards establishing a higher world standard – seems the only way we can compensate for chronic shortage of suitable, able-bodied people. In the year 2050, according to US Census data, Australia will have a total population of 24 million in a region where about four billion people live! In such circumstances numbers will undoubtedly possess a quality all of their own.

Imagine that Australia is to deploy a force of several thousand people into a nearby place where security has broken down to the point where we feel compelled to act. Our sailors, soldiers and air men and women will want to be confident that our equipment is second-to-none in the context that we will likely have to establish a dominant presence using a joint force of limited size and comprising maritime, ground and air capabilities. Our people will also know that once the operation begins it will be nearly impossible to extract ourselves before our objective is achieved, without an attendant loss of morale within the force, and loss of international standing for Australia.

Not only will our people expect to be operating good equipment, they will also want the very best in technology support for the force – to detect, identify, track and deal with any possible adversary consistent with the rules of engagement. Moreover, they will want equipment that works well in the operating environment, and if some of the platforms and systems begin to fail they will want quick repairs to restore capability. In addition, our armed forces will want more than adequate supplies of weapons and ammunition because, after all, without these elements of the "sinews of war" we do not have a defence force.

Presuming that our governments take responsibility for national security seriously what should we do about a comprehensive defence industry policy? In my opinion there are eight main areas for consideration, leading to decision-making and action:

- investment in defence industry
- getting value for the dollar
- timeliness

- technology, R&D
- stockpiling
- getting the right people into the right jobs
- building critical alliances.

Investment in defence industry

A constant dilemma for a nation like Australia is the challenge in deciding what we ought to do at home, and what we can obtain offshore. The extent to which we should rely on overseas suppliers versus indigenous suppliers is complicated also by issues of technology releasability and market size, as well as guarantees of ongoing supplies in times of crisis. Clearly there will be cases where compromise is required between doing it all ourselves, doing some of the work in Australia, or simply buying off the shelf.

A constant dilemma for a nation like Australia is the challenge in deciding what we ought to do at home, and what we can obtain offshore.

We need to recognise some of the difficulties attached to making decisions through investment in Australia in appropriate capabilities and the capacities that do not make sense from a market perspective. It is all very well to argue that the market will take care of it. For example, it can be argued that all types of ammunition should be bought from overseas because supply costs would be cheaper. And we could stockpile contingency requirements for foreseeable needs. But then how would we cope with a sudden, serious unanticipated demand? But what sort of an ADF would we have without ammunition, or at least the capacity and the capability to deliver our own manufactured ammunition to our forces? Furthermore, what about fuel? Do we simply rely on the oil companies?

For these reasons, a decision-making framework that is linked to our requirements, as these flow from strategic judgements and acceptance of reasonable risk depending on the foreseeable circumstances, is needed to guide government decision-making. Such a framework ought to be readily available to assist industry, the community and defence planners. A responsible government must have a such a framework for making appropriate defence industry investment decisions.

Getting value for the dollar

In the past the defence industry base in Australia was largely government owned. In many instances, government ownership did not produce effective competitive practices in project oversight and management, financial controls, or proper investment in new capabilities and the means of production. Over the last two decades a great deal of change has been accomplished to hand out most of the means of production to private industry, as well as the provision of supporting services, even in some battle-critical areas. These changes have introduced greater flexibility and cost effectiveness, particularly where there are first-class partnering arrangements in place. These benefits were on display during security operations in East Timor in Operation INTERFET.

But maintaining a competitive edge is going to require even greater effort. The elimination of all forms of waste – from valueless processes, unnecessary cost over-runs and under-utilisation of our people does not seem to me a luxury we can do without. Rather, since all spending on defence and security has a negative impact on our GDP, we have to excel at obtaining performance that counts from industry, government, the bureaucracy and the ADF. Coming to grips with this requirement would start us well down the road of becoming the world standard, but will require vision, energy and a determination to succeed. By eliminating all forms of waste we will be able to enhance ADF capabilities even further!

Timeliness

It seems impossible to get new equipment in reasonable timeframes. Why does it have to take 15 to 20 years to get a new piece of major capital equipment? There are huge benefits to be gained from cutting the time it takes to obtain major pieces of new equipment down to about eight years. For a start there would be significant flow-on savings to industry on the cost of participation in the business of supplying new equipment. Also, such a discipline would demand open partnering between the government, officials and industry to enable it to work, and to rely on concepts of shared risk.

If we were able to achieve an eight-year timeframe the ADF would be operating more up-to-date equipment on average. This must also be of significant benefit to morale and force capabilities. In addition, maybe it is time to start thinking of new ways of doing business. At present our major equipment acquisitions are based on a start-stop model – wherein we feverishly build up a new capability over several years only to see the workforce reduced in the absence of further orders when the contract is fulfilled. In the case of ship building, for example, a new approach could draw on a pipeline model to deliver a new fleet ship every 18 months to two years. And then we could vary the size of the fleet by varying the paying-off dates of our ships, and bypass the need for substantial upgrades.

To my mind we are limited from adopting such standards only by our imagination. Australians have a world-wide reputation for resourcefulness and innovation – let us exploit these qualities in our pursuit of becoming the world standard. The processes can follow suit.

Technology, R&D

Like our counterparts in the US it could be very easy for Australians to become hooked on the benefits of technology. We can certainly use technology on the battlefield, on and under the sea, and in the air, to exploit our natural advantages and also to obtain the best use of all the personnel we can deploy. Yet, we must be cautious. We must not permit the seductive nature of technology, as a substitute for human activity such as intelligence-gathering, to cloud our judgment about where to draw the lines that should separate the two.

A great deal of R&D effort should be put into systems that make our combat troops more effective than any other troops in the world – size-for-size. We should also invest in training systems and productivity tools that enhance the quality of our decision-making all over the battle space.

Australia's Defence Science and Technology Organisation (DSTO) has an enviable reputation for excellence in niche areas. Such a reputation has been hard to build and it must continue to be invested in – we derive enormous benefits from our close scientific and research collaboration programs with the US and the UK.

In addition, Australian industry also engages in R&D, though to a much lesser extent than in the US and UK. While we have been able to seed certain R&D programs in industry our defence industry policy should attempt to increase our national effort in this regard.

Stockpiling

How much fuel do we need? Where will it come from? Have we sufficient reserves of missiles, torpedoes and ammunition to do the job – and more? These are serious questions for our stockpiling policies, and they are not easy to answer. There is serious cost built in to any stockpiling policy – and we have to accept the risk that all the costs involved would be for nothing, except as a hedge against uncertainty.

While for budgetary reasons it has been fashionable to sell off stockpiled goods that are assessed as not being needed, many sales in defence in the last 15 years seem to have been attractive for the revenue they have generated, rather than making strategic sense. This is another matter in which a robust decision-making framework could assist.

Getting the right people into the right jobs

Australia will find it increasingly difficult to recruit people into our armed forces. In a separate presentation delivered in January at the Pacific 2006 Seapower Conference, I called for work to begin to examine the contribution a scheme of universal national service could make to our nation. We are accustomed to thinking that we are short of dollars. This is our classic refrain – trying to do more with less. But we face serious obstacles in finding the high-quality people we are going to need for the ADF, and other service organisations way out to 2050. Australia possesses an all-volunteer force – and it is this force that has proved its quality beyond doubt in recent operations. Yet recruiting is a constant problem. The government likes to have low unemployment, and when unemployment reaches an all-time low, such as we have today, then we have double jeopardy!

Australia's workforce of young people is going to reduce substantially over the years ahead. Only about four years ago it was suggested that between the years 2020 and 2030 only 40,000 new entrants would join the Australian workforce. In such a climate we will not be able to attract the number of people we need, even if we attempted the usual financial incentives used in the past, such as huge pay increases. For these reasons we ought to think how and when we should shift to a universal national service structure to obtain young people for our armed forces, and other critical institutions. There would be significant implications for training systems and our platforms and installed systems if this measure had to be adopted. We must not let this creep up on us.

In such a climate we will not be able to attract the number of people we need, even if we attempted the usual financial incentives used in the past, such as huge pay increases.

Industry will not be immune from these same pressures. There will be a serious reduction in the availability of skilled people to work in the defence industry and also logistics and support companies. Our response to all these pressures is going to demand a fair increase in national workforce planning to stem the flow of young talented people to other countries, and apply the people resource to the most demanding areas of our national economy.

Building critical alliances

Stories about the six-day war of 1967 concerned the plight of Egyptian forces who discovered that their Soviet-sourced equipment would not be well supported by the Soviet Union. For example, tanks had to be abandoned by the roadside on the way to battle after suffering damage through component failure or attack. They could not be restored to battle condition because critical spare parts were lacking, and would not be supplied, even when these tanks were needed urgently for the battle. Similarly, there were difficulties experienced by Britain in obtaining unfettered support from the US for the battle campaign in the South Atlantic during the Falklands war.

These examples are meant to illustrate what all defence planners instinctively know – self-reliance does have an important role to play in the consideration of proposals to build equipment or source critical supplies from overseas. Thus we are drawn to think carefully about the nature of any alliance arrangements in terms of reliability in war, or when mobilising for war, and the impact these arrangements might have on our capabilities and planning.

We have already acknowledged that we cannot build every platform, invent all the systems and assemble every type of missile or make all the ammunition we would need. Through alliances and supply agreements we seek to ensure continuity of supply and extra support needed in war.

Nonetheless, more careful and thoughtful investment is required in promoting our special arrangements with the US and certain European countries. We want guarantees as far as possible over surety of supplies, and we want constructive, open arrangements over software releases and access to other intellectual properties for equipment that we decide to source from overseas.

Conclusion

These are a few of the issues that a Defence Industry Policy ought to address, to explain why these are important from an ADF perspective. Also, there will be plenty of other areas to be included in the list to be worked on from the other contributions in this publication.

We need a comprehensive statement of government policy that sets out the broad principles, establishes the decision-making framework, and brings to bear an active approach to solving this important set of problems, utilising all the skills and talents available in industry, government, the bureaucracy and in the armed forces. Only in this way can we be sure of establishing a new world standard. The recent publication of *The Defence Industrial Strategy: Defence White Paper* (CM 6697) in December 2005 by the United Kingdom (UK) government establishes a precedent that Australia ought to follow. This White Paper has been intended by the UK government to build on the Defence Industrial Policy of 2002. It spells out actions that are to be taken to enhance equipment acquisition processes and all kinds of support to UK forces.

Also, while on the subject of defence industry policy one must ask why Australia persists with maintaining a Defence Materiel Organisation (DMO) within the Defence Department. The DMO should be a separate entity from the Department. It should be an entity with which the Department and ADF can have a fully fledged contract. A separated DMO would have to recruit its own workforce. Thus, we would not be funnelling expensive service personnel into the DMO, except for supervisory tasks on behalf of the service chiefs, and we would provide good job opportunities for some people to take up when they leave the forces.

Casting back to 1997, some people may recall the significant extension of the commercialisation and support program that delivered more jobs to support defence into the Australian community. Some effort was made to revitalise our defence industry policy at the time, and I was involved in the process. We may do even better the next time round. Despite this rhetoric, delivery of anything in defence industry policy that matches the magnitude of reforms and enhancements to performance that the ADF has been through is yet to be seen. For this reason it is hoped that many informed readers will take to heart the points made by the various experts who have contributed to this study, and turn these thoughts into action.

Finally, let us turn back to the concept of the "sinews of war" to observe that it will be an outcome of our defence industry policy that determines how well our strategy can be successfully enacted in the next war!

PRIORITIES FOR

defence innovation in australia

Whatever happens, we have got
The Maxim gun, and they have not

Hilaire Belloc (1870–1953)

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DR RICHARD BRABIN-SMITH AO is a visiting fellow at the Strategic and Defence Studies Centre of the Australian National University. Before this, he had spent some 30 years in the Department of Defence, where he had held many senior positions. These included head of Force Development and Analysis, head of International Policy, Chief Defence Scientist, and Deputy Secretary for Strategic Policy. Other highlights included secondment to the Pentagon in the early 1980s, attachment to the Dibb Review of Defence Capability in the mid-1980s, and membership of the senior review panel of the Defence Efficiency Review in the mid-1990s.

For millennia, science and technology have played a dominant role in determining the nature of warfare and the direction of its development. The outcomes of individual campaigns can depend on many factors, not just technology: the courage, morale and training of individual fighters; the quality of military leadership; the nature and resolve of political leadership; and (at least in democracies) the strength of popular support, economic factors (the cost of the campaign and the strength of the economy), and international opinion, for example.

But the observation about technology remains true; if I am armed with a machine gun and you have only a bow and arrow, then the chances are that you will lose. And so it is with countless other examples of how technological invention has been applied to warfighting. The stirrup, gunpowder, the rifle, the submarine, the tank, the railway (for better logistic support), air power, nuclear weapons, and the vast array of capabilities driven over the past hundred or so years by electronics (radio, radar, signals intercept, satellite surveillance, missile guidance, command support systems) all come to mind with little difficulty.

And with the increasing application of technology have come two other factors: complexity and cost. Sometimes complexity can represent an opportunity – an occasion to take a broad or systems approach to an issue and to get an overall benefit that is greater than the sum of the parts. The German use of *Blitzkrieg* at the start of the second

world war, combining the use of air power and armour, is often cited as an example. A more contemporary example comes from the "system of systems" approach made possible by the extensive integration of disparate systems that modern electronics and information technology (IT) allow. But such complexity can lead not only to high cost in itself, but also to high levels of cost (and other) risk.

This point about risk is worth a moment's reflection. In some cases, new technology is introduced to save costs – a cheaper way of doing something without compromising effectiveness. But in the majority of cases, the purpose is to gain or maintain the edge in warfighting. This means doing things that have not been done before: new doctrine; new tactics; new technology. It should be self-evident that with such newness comes risk.

This is a matter that those who wring their hands over "cost blow-outs", distended schedules and the like in defence projects should bear in mind. There are of course cases where increased costs, extended schedules or compromises in effectiveness are the consequence of incompetence – where the original estimations were culpably on the low side or where a project was just badly managed. But consider the following, would you prefer to focus your risks on the battlefield, or would you prefer instead to try to confine them within the development process?

If the former, simply acquire that which is already known or only a marginal improvement on what is already in service. This will give you low risks – until, that is, you come up against an adversary who has decided to be more adventurous in defence development and who as a consequence has superior capabilities with which to fight. Risk and progress go hand in hand, so that the issue is not one of how you avoid risk but of how you manage it.

What do these observations mean for Australia?

We are fortunate in Australia in many respects. Our strategic circumstances, at least in a classical military sense, are benign, and have been for 30 years or more. This means that, other things being equal, we can afford to follow the technological lead of others. That is, we can look to others around the world, principally in our case to the United States (US) and Europe, to take the lead in conducting the research for, and designing and developing, the state-of-the-art defence equipment that we then acquire. In this sense, the suppliers of these end-products (either as materiel, or as proven designs to which we then build) have conducted the "R&D" and have run the associated risks for us. And often when we seek to buy defence equipment, there is sufficient choice between suppliers for customers like us also to get the benefit of competition.

Further, because of who we are and where we have come from, Australia's access to defence materiel originated in the US and the United Kingdom, and in some other countries, is highly privileged. This means that we will usually be able to obtain very high levels of capability when we set

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

out to buy defence equipment. We have such privileged access in so many other areas of the defence and security business as well: policy-making, including at the highest levels; defence planning; intelligence; defence science; doctrine; tactics; and training, for example.

But where are the gaps? What are the areas in which we cannot get what we need from overseas or in which for other reasons we need to conduct our own R&D?

To my mind, there are four broad primary criteria against which to consider whether to develop an indigenous Australian R&D program:

- where Australia has critical needs that are so different from those of other nations that their products do not come sufficiently close to what we require
- where there are sensitive and compelling national security considerations
- where not even our closest allies are prepared to share sensitive information or materiel with us
- where a new idea has emerged with potential benefits so compelling that it would be folly not to take it further.

These criteria can be applied individually or in combination. They are not the only factors to consider. Others would include the margin by which the benefits would exceed the likely costs, the strength of the existing skill-base in relevant areas, the time and capital that might be required to develop the initial good idea into an end-product, and the prospect of international cooperation. And the criteria are a guide to the more detailed questions to ask, rather than a catechism with direct answers. Let us look at each one in turn.

Where are Australia's needs different?

For the past 30 years, government policy has given priority to developing a defence force designed to defend Australia and to operate in the region more generally. (The most recent complete statement on Australia's defence policies, the 2000 Defence White Paper, makes it clear that this remains the case. The subsequent two Defence Updates, of early 2003 and late 2005, do not materially change this, although a casual observer might be excused for believing differently.) This means that we need to understand the natural environment of Australia and its surrounds, and to be aware of any consequences for equipment performance and therefore for its design. It is critical to understand the consequences for military operations of, for example, our strategic geography; our ionosphere; the warm shallow waters that characterise much of our region (as well as our proximate deep ocean basins); and the climate, terrain and vegetation of northern Australia.

An example of the application of this criterion in practice is the development in Australia of the Jindalee over-the-horizon-radar network (JORN), where our needs for broad-area surveillance, as determined by our strategic geography, called for a radical and innovative solution. At the other end of the scale, an example is the design of camouflage patterns, developed for specific use in our north. A third example is the customised development of at least some command support systems, designed to reflect Australia's own approach to command and control, and our military practice and character.

A fourth example is Australia's work on aircraft fatigue and the life-extension of military airframes. Our strategic circumstances have allowed us to keep older aircraft in service for longer, and our financial circumstances were a greater imperative for us to do so than was the case for the American or French designers and operators of, for example, the Hornet and Mirage fighter aircraft.

Where are there sensitive security considerations?

This criterion can apply to how science and technology are applied in areas that are sensitive in terms of security classification. Examples include support to the Australian Intelligence Community (cryptography is an illustration), support to counter-terrorism and special forces, and some aspects of electronic warfare. In some respects, it is the obverse of the third criterion, discussed next.

Where will allies not share with us?

Given the very high levels of sensitivity associated with some defence information and capabilities, it should come as no surprise to learn that not even our closest friends and allies will share everything with us. In many cases this can be understandable, but in others the reasons can more difficult to justify, especially given the historic and continuing closeness of Australia's relationship with these countries in highly sensitive areas such as intelligence. Access to US-sourced source-code has been a sore point in this respect over many years.

Some issues are more subtle, however. Again over the millennia, a characteristic of the application of technology to warfare has been the development of a new or improved idea and then a countermeasure to it, and then the development of a counter-countermeasure, in a potentially endless sequence of step and counter-step. Perhaps the paradigm of this sequence of measure and countermeasure is to be found in the application of modern electronics to warfighting, as it is in the nature of modern electronics-based weapons and sensors that they will usually have intrinsic or potential weaknesses, as well as formidable strengths.

Again, it should come as no surprise that considerable secrecy can surround the nature or even existence of such weaknesses, as the effectiveness of a weapon or sensor can often depend critically on the adversary's remaining ignorant of any weaknesses or exploitable characteristics. Matters can be muddied further by a tendency of suppliers of defence equipment to tell potential customers more about their wares' strengths than their weaknesses, and in any event the weaknesses might develop or become apparent only with the passage of time. Another illustration relates to "stealth", or low-observable technologies, designed to reduce the signature of defence platforms and thus to make them less susceptible to detection by an adversary. These technologies are often regarded as highly sensitive, and for good reason. These, then, are some of the areas in which Australia has to tread carefully in dealing with allies and in drawing conclusions about where we need to develop an indigenous product.

A well-known example of the application of this criterion is the development in Australia of acoustic tiles for the Collins-class submarines, designed to reduce the boats' acoustic signatures. Not even our closest allies would share this technology with us, so we had to develop our own, which had the advantage of allowing the Australian technology to be tailored to our own operating environment. Another example is the ALR-2002 ESM equipment, developed in Australia after we had been burnt once too often by weaknesses in foreign-sourced sensors, and by difficulties in getting the access and information that we needed to fix the problems. A third example is the reduction of the radar cross-section of the Adelaide-class FFGs.

What other new ideas should we take forward?

From time to time, new ideas will emerge that seem attractive to take further outside a strict application of the first three criteria discussed above. After all, some of Australia's best scientists and engineers work in the defence field, especially – but not only – in the Defence Science and Technology Organisation (DSTO), and are thoroughly immersed in both their academic disciplines and the military fields into which these disciplines are applied.

Applying judgement to decide what to take further, and how far to take it, can be demanding. And sometimes a degree of ruthlessness can be needed if it starts to appear that final success will prove elusive (the technology is not quite there, the costs are blowing out, foreign-sourced alternatives are starting to appear, the benefits are looking less tangible than originally assessed, there are other priorities for the resources required and so on).

But in spite of the difficulties that are intrinsic to innovation in a demanding field, Australia has had some important successes, some of which are listed here:

- the NULKA missile decoy system that became a joint development with the US
- the Speakeasy secure communications device
- the Starlight secure computer data device
- the Shapes Vector computer network security system
- the Australian Minesweeping system
- the Laser Airborne Depth Sounder (LADS)
- the Bushranger light armoured vehicle.

(Not all of these examples come from the DSTO, and all of the examples have involved extensive partnerships with industry.)

It is perhaps not coincidental that half of the examples given above are in security-sensitive areas and therefore relate also to one or more of the other criteria discussed above. This can give rise to constraints when it comes to export potential.

What about the export of defence innovation?

From time to time, there is enthusiasm in some quarters for Australia to be more active in the export of defence goods and services, and it is important that Australia be alert to opportunities in this regard. But there are two particular impediments that need to be kept in mind. The first is that the market for defence exports can be corrupted, both in the sense of legitimate special deals with respect to price, and with respect to the practice covered by the euphemism of "agents' fees".

Second, if the criteria for innovation set out above are accepted, and the examples given above as likely to be as illustrative of the future as of the past, then it follows that the nations to which Australia would be prepared to export will in a good number of cases be limited. A simple question illustrates the point: to whom would we export the acoustic tiles developed for the Collins-class submarines? Or the NULKA decoy? Other examples are not so sensitive, such as the minesweeping system. Nevertheless, potential markets for our more sensitive areas of innovation are in practice those nations with whom we already have the highest levels of cooperation and mutual trust – but who, in many cases, already have their own rival programs or products.

These observations do not constitute a council of despair, but rather are necessary to add an element of reality and balance to the debate. The opportunities for defence exports are there, but they are fewer, and more difficult to bring off, than might be imagined.

What are the mechanisms for defence innovation in Australia?

It is pleasing to be able to note that Australian governments were very early to recognise the importance of science to our national defence: the oldest antecedent of today's DSTO was set up in 1910 at Victoria Barracks in Melbourne to work in the area of explosives. The earliest antecedent of the position of Chief Defence Scientist was formally established in 1907, with a similar position having been established in the Colony of Victoria in the mid-1890s. The DSTO today has a wide remit to advise on the application of science and technology to Australia's defence and broader security needs. More formally, its role is *to ensure the expert, impartial and innovative application of science and technology to the defence of Australia and its national interests*.[1] This statement picks up an important contemporary development; namely, the importance of applying innovative science to such broader security concerns as counter-terrorism.

The DSTO has many major successes to its credit. There are the obvious ones that are in the public eye from time to time, such as the Jindalee radar, but also those for which the whole story has yet to be fully told. These include the criticality of the DSTO's support for the F/A-18 Hornet fighter aircraft, and for the Collins-class submarines. It is a pity that its many successes are not more widely known. However, the DSTO has to live within the constraints that come from working in highly classified areas, and from commercial sensitivites, including those that attach to the need from time to time for it to remediate faults in the work of others.

Those interested in finding out more about the DSTO, its responsibilities and activities, and its extensive interactions with industry, the universities and selected Cooperative Research Centres, should refer to its web site at www.dsto.defence.gov.au

Defence also recognises the potential for innovation in others, of course, and the Capability and Technology Demonstrator (CTD) program is a particular illustration of this. This program had its genesis when the 1997 Defence Efficiency Review (DER) picked up an initiative, then in its early stages within the DSTO. In brief, the DER recommended that there should be "a program of concept or technology demonstrators, especially in the fast-moving high-technology areas".[2]

The aim of the CTD program is to provide Industry and Defence with the opportunity to demonstrate how advanced technology can provide significant enhancement in priority areas of defence capability. In selecting

projects for inclusion in the program from its inception in 1997–98 up to 2004–05, the government committed a total of $113 million to it. The figure planned for commitment for 2005–06 is some $25 million, with total annual expenditure planned to be $20 million. A rough analysis of the projects supported by the CTD program to date shows that a large majority contains a significant electronics or IT-based component, sometimes with an acoustic or photonic element. Given the increasing pervasiveness of electronics/IT and the almost infinite opportunities that these fields offer for application to defence, this should come as little surprise.

Some of the larger defence companies in Australia are involved in the CTD program. However, it appears that, outside of the Department of Defence itself, it is the small and medium enterprises (SMEs) that tend to be the dominant source of innovation and involvement in the CTDs.

A further stimulation to innovation has come from the prime minister's announcement in late 2002 of Australia's National Research Priorities. One of the four priorities is Safeguarding Australia; two of this priority's five goals, most relevant to this paper, are protecting Australia from terrorism and crime, and transformational defence technologies. This initiative has proved invaluable in supporting national-level decision-making on resource-allocation, and in providing a framework for new scientific initiatives to be brought forward, including for increased cooperation across the national scientific fraternity.

There are of course barriers to innovation as well as incentives. There can be mistrust of the new on the part of the potential end-user. Sometimes such reservations stem from a natural position that the effectiveness of a new approach needs to be well demonstrated before people should be expected to entrust their lives to it. On other occasions, however, resistance to the new can connote deep levels of conservatism, and this can prove a formidable barrier. This level of resistance seems often to come from those who, while able to describe current practices, are not able to understand the reasons behind them.

More insidious is the attitude which asserts that Australia's ability to be innovative is at best second rate. This mentality says that if a particular new idea were any good, then it would have been first thought of and exploited overseas. It is this corrosive attitude that put paid to the commercialisation in Australia of the aircraft "black box" recorder, first conceived and developed in the 1950s at what is now the DSTO at Fisherman's Bend in Melbourne. While this attitude is less prevalent now than it used to be, remnants still linger. We can but hope that the future will see it put finally to rest.

And what of the future?

Soothsaying is an error-prone activity that invites ridicule, but as we already know in principle that the future will be different from the past, we have at least to make a stab at where – and what – the differences might be.

It ought to be redundant to say that science and technology will continue to bring changes, except that the record of this being recognised in practice is not always encouraging. Suffice it to say that the nature of scientific endeavour ensures that there will always be an existing pipeline of science waiting to be applied to warfare, with new science being generated to replenish that pipeline. At the risk of gross over-simplification, a lot of the new science and technology will be smaller and smarter. For example, the scale of devices will move towards the molecular or atomic, with greater integration of electronic, photonic, mechanical and biological characteristics. What is possible with clever software will continue to grow, even more so with what quantum computing is likely to offer. Progress in medical areas could well prove phenomenal.

In brief, the opportunities that the application of new science will offer will in effect seem limitless. There need be no fear that there will be lack of opportunity – or need – for innovation. But it will be demanding: the clever application of what is on offer will require a broad perspective on which technologies are available and how they should best be integrated to achieve the particular capability target under consideration.

Will there be changes in Australia's strategic policies and priorities?

In a sense this has already happened, with the increased focus on counter-terrorism and some aspects of counter-proliferation. A particular consequence is the need for an increased focus on protection against disease, and Australia is well placed through the strength of its medical research to protect its own interests, both directly and through contributing to reciprocal global efforts.

Are other changes in strategic policy likely?

Probably not, at least at the level of policy principle, and despite some ambiguities in recent years. In brief, it appears that the government will continue to give priority to the ability to defend Australia and to operate in our region, while ensuring that we can also contribute to coalition operations in more distant theatres. If this analysis is wrong, or if the government's policies were to change, giving significantly more emphasis to operating alongside the US and downplaying the importance of operations closer to home, then there would be much less need for research and innovation relevant to our specific geographic needs. This seems unlikely, however, and even if true, it also seems unlikely that such a change of policy would cause the US to be so much more open with us that we would no longer need to innovate to compensate for difficulties of access to sensitive US information.

That said, it is well to remember that the US is spending on defence science and defence R&D at a rate that is unmatched by any other nation, or even by Europe as a

whole. A consequence is that, ultimately, the US will consolidate its lead over others in how well technology is exploited in its defence equipment, although questions of what might be affordable or suitable for Australia will need to be kept in mind. Nevertheless, with our shared values, and shared interests in the stability and prosperity of the Asia–Pacific region, the benefits that Australia gains from its access to US defence equipment and defence science will remain irreplaceable.

What about levels of choice?
Since the end of the Cold War, defence industries in Europe and the US have shrunk and merged to a considerable degree, as governments have reduced their defence forces, especially those capabilities designed for high-end warfighting. This process of consolidation is far from complete; for example, the UK's recent White Paper on Defence Industrial Strategy (December 2005) makes it clear that considerable further rationalisation is inevitable in that country, and by implication elsewhere too.

As a consequence, there will be fewer options from which Australia will be able to choose its defence equipment, raising the question of whether the breadth of choice will always be sufficient for us to meet our priority needs. To the extent that it would not be, there would be a case for Australia to take part in joint projects led by overseas partners to ensure that, at least in a few critical cases, our needs were being met. Such an approach would require Australia to be in a position to provide intellectual as well as financial capital. Perhaps we are seeing elements of this approach already with the DSTO's involvement in the development phase of the Joint Strike Fighter, although there are many other factors at play in Australia's predisposition to acquire this aircraft.

In-service upgrades?
Enhancements to in-service equipment through upgrades to electronics and software have been a feature of at least some classes of equipment for a couple of decades – though often at great expense and with great technical difficulty. Continuing advances in the underlying technologies and in the associated design philosophies will serve to increase the likelihood of such upgrades in the future, both to achieve performance enhancement and to counter the development of countermeasures.

Here too lies scope for high levels of Australian innovation, either in collaboration or independently (including, if necessary, to help overcome weaknesses associated with limited software release from the original manufacturer). A good contemporary example is Australia's software support facility for the F/A-18's new short-range missile, operated in collaboration with the British manufacturer. Another example is the recently commissioned Torpedo Analysis Facility, which will see collaboration between the DSTO and the US Naval Undersea Warfare Center on improvements to the Mk 48 torpedo and the development of its successor.

It should be noted too that such international collaboration reflects well on the quality and relevance of Australia's endeavours in defence science and the high regard that overseas agencies can have for Australia's efforts. Such demonstrable excellence can also sometimes help to overcome the barriers to the release of sensitive information discussed above.

Conclusion

In many ways, defence innovation in Australia is in good shape. It is not that difficult to derive a set of sensible and practical criteria to help with the necessary task of setting priorities and choosing what gets funded and what does not. There is a wealth of world-class understanding and experience in science and technology, and in how to apply it to Australia's national defence and security interests, especially in the DSTO, but also in some cases in industry and other research organisations. And the CTD initiative, now almost in its tenth year, has proved a valuable source of additional funding for innovation and an invaluable catalyst for cultural change.

What might the next steps for improvement be?
Removal of ambiguities in the government's defence policies would help, as would the development and publication of a new Defence Capability Plan, consistent both with a coherent interpretation of the government's policies and with the levels of funding likely to be available. There are also matters that need attention in the management of the CTD program; for example, how CTD projects that prove successful get taken further.

But the biggest steps to help improve defence innovation in Australia would come from further cultural change. This would involve greater recognition in our national psyche that our future wealth and wellbeing require us to take science more seriously, less reluctance in some parts of industry to seize opportunities for innovation, and less reluctance in parts of Defence to accept the benefits of Australian innovation that are already available.

My thanks to Hilaire Belloc (1870–1953) for his timeless observation on technology and warfare; Roger Lough and Alan Gray of DSTO and Greg Fergusson of the Australian Defence Magazine *for material relating to DSTO and the CTD program; John Wisdom's* A History of Defence Science *in Australia (1995) for historical information; and Bob Wylie for bringing my attention to the UK's Defence Industry White Paper referred to herein.*

ENDNOTES

1 www.dsto.defence.gov.au

2 *Future Directions for the Management of Australia's Defence*, Report of the Defence Efficiency Review, Commonwealth of Australia, 1997, p 39.

competition IN australian defence procurement

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For more than 30 years, successive Australian governments have grappled with defence industry policy. In more or less chronological order, they've used mandatory offsets, corporatisation, privatisation, subsidisation, premiums for local content and a straight-out preference to have work done onshore. The result has been impressive; a ponderously inefficient publicly owned defence industry has been transformed into a diverse local industry, which today employs around 19,000 people and has an annual turnover in excess of $4.7 billion. Throughout this transition the underlying trend has been towards greater competition, both within Australia and from foreign suppliers. Yet, in recent years the effectiveness of open competition for defence contracts has been called into question, and the government has been actively experimenting with alternative approaches.

This chapter explores the role of competition in Australian defence procurement, past and future. It concludes that, with few exceptions, open competition represents the best option for equipping the Australian Defence Force (ADF) at minimum pain to the taxpayer. The first section looks at the strategic rational for maintaining a defence industrial base in Australia – noting that the first, and perhaps most important, point to get clear is that defence industry is not an end in itself.

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

Strategic imperatives

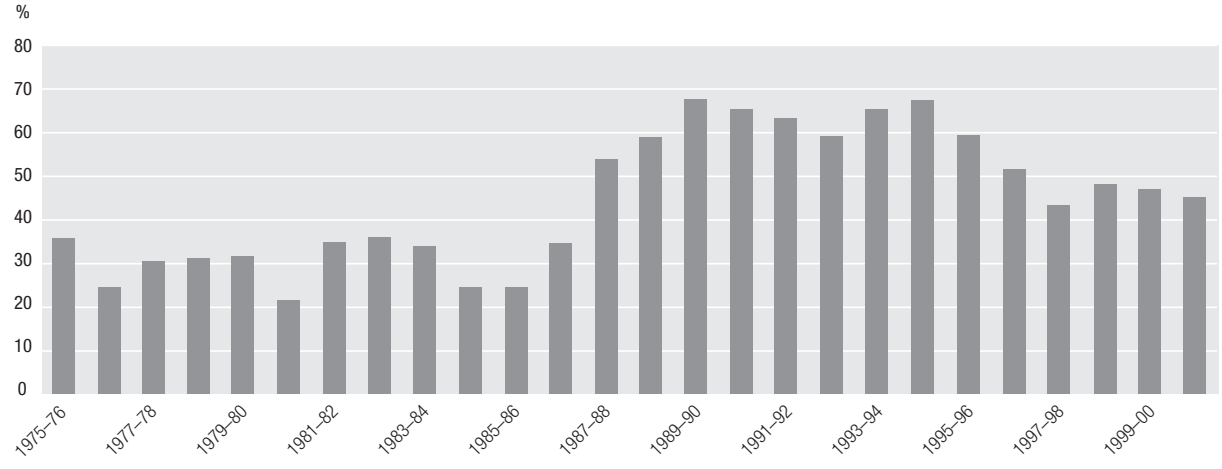
Being a small country, Australia has no choice but to rely to a significant degree on foreign sources for defence equipment. Sometimes the choice between local and overseas production is easy; for example, when technology is clearly beyond the reach of local industry. But very often the decision is more difficult, demanding a careful weighing of the claimed strategic and economic advantages of a local purchase against the presumed reduced risk and cost of a foreign purchase.

So what sort of defence industry does Australia need? From the mid-1980s a cornerstone of Australian strategic policy has been self-reliance; defined as the ability to defend the country against any credible threat without the combat assistance of another nation. But this strategic benchmark comes with the qualification that we'll plan on foreign support in non-combat areas like intelligence, surveillance, re-supply and logistics. With this caveat in place, the strategic requirements on Australia's defence industry base are usually expressed – officially at least – as the in-country capability to repair, maintain, and modify ADF equipment and provision the force.

The modesty of the government's stated goals for domestic defence industry reflects two sound judgements. First, that the era of national mobilisation for war is long gone. Future conflicts are anticipated to be short, sharp "come as you are" affairs that will not entail industrial mobilisation to produce military equipment. Second, that with few exceptions, it would be a waste of money for a small nation like Australia to design and produce modern weapons systems given the ready availability of foreign systems. Even when it comes to munitions, the practical reality is that for guided weapons like missiles and torpedoes, Australia has no choice but to stockpile what it can and rely on its allies in an emergency. Only in the case of non-guided ammunition (explosives, small-arms, artillery and naval shells) does Australia maintain an in-country production capability – but even here we are reliant on precursor materials from foreign sources.

Taking all this into account, there's not all that much left to be done in-country aside from what's impractical to perform overseas; that is, repair, maintain, modify and provision. With a couple of important exceptions, this has nothing to do with sovereign control. Mainly it's

FIGURE 4.1 DEFENCE EQUIPMENT SPENDING IN AUSTRALIA, 1975–2000



SOURCE: DEPARTMENT OF DEFENCE ANNUAL REPORTS

about the impracticality of sending ships, planes and armoured vehicles thousands of miles offshore for repair and maintenance. Not only would this be inefficient in peacetime, it could be impractical in wartime. Similarly for provisioning, onshore supply is the only practical way to deliver fuel, rations and other consumables to forces operating in or around the continent.

The main exceptions where sovereign control is arguably a key factor is in understanding and modifying foreign sourced equipment. Disappointingly, past experience has shown that foreign governments – including our closest ally the United States (US) – are all too often unwilling to release the intellectual property needed to effectively exploit the capability of weapons systems. In such circumstances, it's up to the Defence Science and Technology Organisation (DSTO) and local industry to fill the gap. This demands that Australia maintain a range of advanced capabilities in systems integration, software and related fields, and increasingly so as the ADF moves to be a "networked" force.

The main exceptions where sovereign control is arguably a key factor is in understanding and modifying foreign sourced equipment.

Conspicuous by its absence in the government's stated requirements of defence industry is any reference to designing or building equipment in-country. It's often argued that it's necessary to build weapons systems in Australia in order to develop or maintain the ability to support the equipment in-country, but there are enough counter-examples of foreign-built equipment being maintained and extensively upgraded in Australia to reject this proposition. More plausible is the argument that domestic manufacture is the only way to satisfy Australia's unique requirements at an acceptable level of risk. However, whether domestic construction makes any difference to the (appreciable) risk of trying to satisfy Australian-unique requirements is difficult to judge from past experience. One-off solutions are risky no matter where they are attempted.

Of course, Australian defence industry today is far more extensive than the minimal strategic capacity to "repair, maintain, modify and provision" the ADF. What's more, it's much larger than what you'd expect in an environment where there is competition from foreign firms with larger economies of scale (and often the benefit of government subsidies). This is because the Australian defence industry has consistently been protected by the government, at first explicitly and then under the veil of developing the industry capability to support the ADF. The story begins a bit over 20 years ago when Australia, along with many other English-speaking countries, started to move towards smaller government.

The end of certainty

In the mid-1980s, Australia's defence industrial base included more than 15,000 civilian government employees and at least 5000 uniformed personnel performing essentially industrial functions within the defence force. The work undertaken ranged from the manufacture and maintenance of warships and aircraft, to the fabrication of small arms and the production of ammunition and military clothing.

This is not to suggest that Australia was in any sense self-sufficient in military equipment – far from it. Not only was there a high reliance on overseas designs and technology, but most of the more advanced hardware was brought from overseas. In fact, during the 1980s less than half of Defence's capital investment budget was spent in-country, mainly due to expensive imports like the F/A-18 Hornet fighter (notwithstanding that the aircraft were assembled in Australia).

Nor was it the case that all work done in Australia occurred in government facilities; work did go to the private sector both as sub-contracts and, on occasion, prime contracts. Nonetheless, in most cases, domestic defence production was done by the government and, given the effective absence of defence exports, exclusively for the government. Not surprisingly, the arrangement proved to be both costly and often ineffective. This probably explains the government's willingness to go offshore even for assets that could be built onshore; for example, by the mid-1980s it had been almost two decades since a naval combatant larger than a patrol boat had been laid down in an Australia shipyard.

Australia's bureaucrat-run defence industrial base became increasingly untenable during the Hawke–Keating reforms of the 1980s, which progressively narrowed the scope of government through deregulation and privatisation. So it was natural when, in 1986, the government abolished the Office of Defence Production and moved to commercialise its defence industrial assets. In doing so the government sought to improve the productivity of Australian defence industry in two ways: first, by bringing the discipline of competition to the sector; and second, by generating exports to generate better economies of scale.

This change in direction was reflected in the 1987 Defence White Paper. It said that defence work would be allocated on a competitive basis unless there were compelling reasons to the contrary. Importantly, it also committed itself to use fixed-price contracts with payments against delivery milestones rather than the US approach of cost-plus contracts. The crucial difference was that the former places a much greater onus on suppliers to deliver on time and budget.

In the years that followed, the government awarded a series of contracts of unprecedented complexity to Australian industry. These included the Collins-class submarines, ANZAC frigates and a series of ambitious combat aircraft upgrades. As a consequence, the average percentage of defence investment in Australia over the decade following 1987 rose to almost 60 per cent, compared with 30 per cent for the preceding decade (see Figure 1).

Although the transfer of defence production to the private sector was accompanied by the competitive awarding of contracts, it was a qualified form of competition that continued a long tradition of giving preference to local industry.

Protected competition

Back in the 1970s, local defence industry benefited from a regime of defence offsets that negotiated work for Australian industry as a by-product of foreign procurement. Titled the Australian Industry Participation (AIP) program, its unashamed intent was to ensure that Australia received some economic benefit from multi-million dollar foreign purchases. Often the offsetting work was quite unrelated to the actual purchase, and to support this, a system of financial credits and obligations was maintained to allow flexibility in the timing and delivery of offsets.

By the late 1980s an extensive Australian Industry Involvement (AII) program had emerged. It included a foreign offsets regime set at 30 per cent of the value of foreign contracts, plus additional protection of local defence industry through tolerance of a 20 per cent premium for Australian content. In addition, a Defence Industry Development (DID) program provided modest subsidies directly to local industry.

The defence offsets program was officially closed in 1992–93. In the final reckoning, more than $4 billion of work had been directed to Australian industry. To take the place of the defunct offsets scheme, the AII program was reshaped. Rather than have a single percentage for Australian content in foreign contracts, variable percentage targets would be set for each project. The introduction of individual AII targets also saw the demise of the 20 per cent local content premium – whether this represented more or less protection for Australian industry is hard to tell, but it certainly made things less transparent.

Over time, the goals of the AII program evolved to developing and sustaining strategically important local industry capabilities to support the ADF, and maximising local content consistent with achieving value for money. Notwithstanding the fine words, the AII program was little more than a return to the flexible negotiated defence offset program of the 1970s. It even retained the option of accumulating defence offset credits through the Defence Industry Investment Recognition Scheme that continues to this day.

The problem with the AII program was that it set targets for Australian content in the absence of goals for in-country ADF support or of a business case for cost-effective Australian content. Critically, the targets were expressed in financial rather than industrial capability terms – consistent more with an economic than strategic imperative. The result was all too predictable: Australian content became a "good thing" that was given implicit preference, often without comparison with the international market. Aiding and abetting the preference for local content was its fellow traveller "the Australian unique requirement", which precluded readily available off-the-shelf foreign solutions from the start.

Thus, notwithstanding the laudable goals of the AII program and its predecessors, a good measure of what actually occurred was make-work for local industry – no doubt at an opportunity cost to the ADF in terms of capability. Of course, various through-life support capabilities accrued for the ADF as a result of the AII program. The question is whether the AII program was the most cost-effective way to achieve these support capabilities, as opposed to, say, simply contracting for through-life-support at the time of acquisition.

Moreover, it's unclear in many cases whether much consideration at all went into the through-life-support issue when setting AII targets. Certainly, there was very little forethought put into the support arrangements for the big domestic maritime projects of the 1990s, which saw Defence scramble at the end of the decade to find extra cash to cover the unforeseen "parent navy" costs of their orphan fleets. It is difficult to escape the conclusion that whatever capability benefits accrued for the ADF, they were at best a welcome by-product of an AII program focused on creating jobs and economic activity in Australia.

So how did a schizophrenic system like AII, which said one thing and did another, survive so long? The answer is that a series of moral hazards drove otherwise disparate stakeholders to interpret the goals of the program as liberally as possible. Local defence industry got a big slice of work without having to compete with overseas suppliers. The ADF got a captive local market to pander to their Australia-unique demands. And the minister of the day got to announce a succession of multi-million dollar local defence projects.

Here is the critical point: governments of both complexions have derived considerable political mileage from having the defence dollar spent in Australia – irrespective of cost-effectiveness or strategic benefit. This was true back in the 1980s with the decision to assemble F/A-18 fighters in-country, and it was equally true 20 years later with the decision to assemble Airborne Early Warning and Control (AEW&C) aircraft here – neither of which was credibly linked to developing an in-country support capability. Any suggestion that the government's motives were pure disappeared with the 1998 Defence Industry Strategic Policy Statement. Although the policy statement repeated the usual jargon about "value for money and open and effective competition", it set out six rules for foreign defence firms operating in Australia – all directed at local employment and economic benefit.

Even though local defence industry got preferential treatment throughout the post-privatisation era, competition has remained active. As a rule, if work can be done in Australia it has been, but usually only after vigorous competition. When work has gone overseas, it has been a matter of competition between foreign suppliers teamed with local firms to put together attractive packages, including an ample swag of local content sweetener. What's been consistently missing is competition between local and foreign suppliers. This, arguably, is why an internationally competitive defence industry has been slow to develop in Australia despite, or perhaps because of, a long history of preferential treatment.

While Australian defence industry was enjoying the bounty of privatisation, protection and a bevy of large domestic projects through the 1990s, the international defence arms market was convulsed by the end of the Cold War.

To appreciate the pressures that will shape local and international defence industry into the future, we turn now to the impact of the end of the Cold War and the underlying economics of arms production – both of which will shape to prospects for future competition in Australia.

The peace dividend

The end of the Cold War caused global defence spending to fall by around 30 per cent. Such a precipitous drop fractured defence industry structures already stressed by the steady long-term rise in military equipment costs. Almost overnight, it became uneconomic for many countries to maintain multiple suppliers of increasingly expensive high-tech equipment – especially with political pressure to deliver a peace dividend following the long years of preparing to fight the Soviets.

The result was widespread industry consolidation. Today's top five US defence manufacturers represent the amalgamation of some 52 independent firms from the 1980s. While the corresponding European consolidation has not been as dramatic on the surface, it masks a web of joint ventures and international programs that amount to economically inefficient de facto consolidations.

In Australia, the ending of the Cold War made surprisingly little difference to the defence industry landscape. In part, this reflected the fact that a number of large domestic projects were locked in near the start of the decade. Just as importantly, it was a result of defence spending in Australia being sustained in real terms from the 1980s through the 1990s – a consequence of our independent Defence of Australia doctrine that was unconnected to the Soviet threat. But Australian defence procurement could not remain isolated from overseas developments for long. As the big domestic projects of the 1990s drew to a close at the start of the present decade, the consequences of global consolidation emerged, leaving us with the situation we face today.

Most apparent is that the number of potential foreign suppliers had fallen significantly, thereby reducing the range of equipment solutions and commercial competition available.

Most apparent is that the number of potential foreign suppliers had fallen significantly, thereby reducing the range of equipment solutions and commercial competition available. However, with a long tradition of choosing between the best on offer from both sides of the Atlantic, Australia is arguably in a better position than the US or many European countries that are, to varying extents, locked into buying locally. In fact, a cunning pattern has emerged in recent decisions.

Where a platform needs to be tightly integrated into coalition networks, or where the technical capability edge is critical, US equipment has been sole sourced. Examples include the Collins-class submarine combat system and torpedoes, F-35 Joint Strike Fighter (JSF) and the combat system for the planned air warfare destroyers. But where platforms are less likely to be intimately integrated into coalition networks, or the technical capability is simply less critical, we actively contest projects between US and European manufactures to get the best deal. Examples include the armed reconnaissance helicopter, air-to-air refuelling aircraft and additional troop lift helicopters, all of which were won by European firms.

Another important development following the Cold War is that European and US defence firms are increasingly eager to re-establish viable economies of scale through exports. As a consequence, they are often willing to allow firms in arms-importing countries like Australia to bid as sub-contractors into global supply chains. This benefits the seller by establishing a wider base for innovation and competition at the sub-contractor level, and benefits the buyer in the same way as an economic offset assuming, that is, they are successful in winning work. Of course, it would be entirely accidental if any of this resulted in an industry capability relevant to the needs of the ADF.

One thing that the end of the Cold War did not change was the age-old cycle of measure and countermeasure that drives up the technical sophistication and cost of successive generations of military equipment. If this was ever in doubt, the US's stated goal post-9/11 of maintaining a clear lead in key capability areas has settled the matter. This means that, as in the past, it will continue to be increasingly difficult to maintain a broad range of defence industry capabilities in Australia as rising costs steadily erode the viability of already small economies of scale.

A new strategic approach

Following the release of the 2000 White Paper – in fact, on the same day that the unclassified $50 billion Defence Capability Plan was made public in mid-2001, then Defence Minister Peter Reith foreshadowed a new "strategic approach to defence industry policy".

The main thrust of Reith's argument was bold. He argued for a move away from project-by-project competition in every case towards longer term multi-project partnerships between defence and selected firms via "open-book" alliance contracting. In doing so, he was at pains to point out that this did not spell the end of competition; not only would competition continue where the market could sustain it – including importantly between sub-contractors – but the selection of long-term partners would occur competitively. Nonetheless, it was a substantial policy shift which carried the clear implication that there would be fewer prime contractors in the domestic market once the dust settled.

This was not, as in Europe and the US, a case of dwindling defence spending forcing a consolidation. In fact, Reith's speech came only six months after a generous long-term defence funding boost from the government. Instead, it reflected his judgment that the 1987 policy of open competition for fixed-price contracts had outlived its usefulness. The crux of his argument was that the established project-by-project approach created a "boom and bust" environment that hindered long-term investment by firms and, moreover, led to unstructured industry development that left no guarantee of support for the ADF. Underpinning this argument was the fact that Defence is usually the sole purchaser (what economists call a monopsony buyer) whose every decision unavoidably shapes the local defence industry, like it or not.

Reith also responded to the post-Cold War industrial and technical situation head-on by suggesting that Australia should commit early to multinational programs to get a slice of the action in global supply chains. In doing so, he acknowledged that this might mean that local industry would lose design work and that entire projects could go overseas. The consolation, he argued, was that it was better to manufacture parts in high-volumes for a global market than produce a small number of "Australian orphan" platforms at home. This prepared the ground for signing onto the JSF program the following year.

A return to central planning?

Defence's response was to commence work with local industry on producing four sector plans to give effect to the new strategic approach. Of these, only three have appeared: aerospace, electronics and shipbuilding. The fourth, land, is yet to see the light of day, but it is anticipated shortly.

With the exception of shipbuilding, to which we shall return presently, the remaining two plans were relatively modest in their recommendations and in impact so far. The aerospace plan endorsed open competition for acquisitions, upgrades and maintenance, and encouraged the already established trend towards longer through-life support contracts. Its most ambitious proposal, which went well outside of industry matters, was that the ADF should reduce the number of aerospace platform types – an eminently sound suggestion that Defence has shown no sign of taking up in recent decisions. The electronic systems plan also endorsed competition, but proposed that, where appropriate, projects be grouped into "strategic work packages". However, more than two years later, no actual packages have been identified and it seems unlikely that the end result will be a radical change.

In contrast to the cautious approach of the electronic and aerospace plans, the shipbuilding plan was bold, proposing no less than that a single shipbuilding "entity" be created to deliver the nation's entire decade-long naval

construction program through an alliance with Defence. The argument put forward was that there was insufficient work to sustain cost-effective competition and that a 26 per cent premium would accrue if a project-by-project competitive approach was adopted in lieu of the proposed monopoly arrangement. This was notwithstanding that there was around $11 billion of work planned for the sector in the Defence Capability Plan. If this was not enough, the plan also purported to show that the current practice of replacing ships at the end of their hull design life (about 30 years) delivers the "worst annualized value" and that keeping vessels for 20 years would achieve "optimal annuity value". Thus, not only would we have a shipbuilding monopoly, but it would get to build 50 per cent more vessels (and Defence would pay monopoly rents 50 per cent more often). Fortunately for the taxpayer, the plan was quietly shelved after errors in Defence's modelling were pointed out.

Predictably for plans developed in consultation with local industry, the three documents have one thing in common: the implicit assumption that preference would continue to go to local industry. The electronics plan went as far as to define most of the current range of in-country work as critical to the ADF, effectively quarantining it from overseas competition in all but exceptional circumstances.

Reith's 2001 speech had set out an ambitious vision for a more strategic approach to defence industry. However, aside from several instances of firms winning work in global supply chains, the impact has been limited to say the least. The land plan is still pending, the aerospace and electronics plans have been ineffectual (and largely endorsed competition anyway), and the shipbuilding plan was torpedoed. But it did not sink without trace, because among the flotsam bobbed a new concept: managed competition.

Managed competition

Lured by the combination of established shipyard infrastructure, potential job creation and the sheer majesty of warships, the Howard government (and its Hawke–Keating predecessor) have been willing to chance building highly complex ships and submarines locally. Nowhere else in Australian defence industry are the risks and costs as high.

So it was surprising when the government announced it would forego traditional competition and build three Air Warfare Destroyers (AWD) through a novel alliance approach using so-called managed competition. The AWD project is the most complex naval surface vessel project ever attempted in Australia, and its intricacies and peculiarities deserve close examination. While open competition for fixed-price contracts in a monopsony environment might not be perfect, the AWD project shows just how problematic a more interventionist approach can quickly become.

In 2005 Defence concluded three separate competitions to choose a shipbuilder, designer and combat system integrator for the $6 billion AWD project. Here the term competition is used very loosely, it was more a matter of picking partners on the basis of promised labour rates, profit margins, overheads and infrastructure costs for a yet-be-defined project through a yet-to-be defined alliance. Indeed, even now, the design remains up in the air with the distinct possibility that the preferred designer (US firm Gibbs & Cox) will be replaced by the fall-back option (Spanish firm Navantia). And, although much was made in the media of the cost battle between Victorian shipbuilder Tenix and the winner, South Australian company ASC, it remains entirely unclear how either firm could reliably estimate costs in the absence of a design.

Leaving aside how the partners were chosen, and notwithstanding that the alliance is so far little more than a shotgun wedding, one fact stands out: almost two decades after selling off its shipyards, the government is now directly back in the business of building warships as the head of a multi-billion dollar consortium. Moreover, under its "managed competition" approach, Defence reserves the right to mandate subcontracts in order to maintain local defence industry capabilities. Unfortunately, this is reminiscent of the ill-advised intervention by Defence with the Collins combat system subcontract in 1993. The problem is that every time Defence makes a decision within the alliance – for industry reasons or otherwise – it will unavoidably absolve its partners of responsibility for the result.

If this is not enough, the government owns ASC and is rightly eager to sell it back into the private sector. The question is when to do so. If they sell early, they risk disrupting the aggressive timetable for the AWD project, which is yet to choose a design, let alone formalise a contractual framework for the alliance. If they sell after the outstanding issues with the project are resolved, they will present potential buyers with a fait accompli for which the successful bidder can hardly be held to account. More importantly, they will have lost the opportunity to have a private-sector perspective from ASC in the AWD negotiation process – which is arguably just the sort of benefit that selling the firm should deliver. Then there is the problem of integrating a new corporate culture into the nascent alliance once ASC's new owner takes over.

On top of all this is the question of who might be allowed, or excluded, from bidding for ASC in order to fulfil Defence's vision of a long-term local naval industry structure that can sustain competition. This appears to have been a factor in at least one firm not bidding for other work lest they be excluded from ASC sale. It would be a mistake to compromise open competition today in order to confect the promise of onshore competition for naval projects in 15 years time. If we wind up with only one naval shipbuilder in Australia, so be it – we can always keep them on their toes by using foreign competition.

It increasingly looks like Defence has gotten itself into a fine pickle through managed – more like mangled – competition. But was there an alternative? Sure there was, it went something like this: sell ASC to the highest competent bidder, then use open competition to award the AWD project (including long-term through-life support) as a fixed-price contract with incentives. There was no impediment to such an approach: the decision to pursue an alliance for the AWD had nothing to do with competition being impractical.

But perhaps Defence is having second thoughts. There's a second big naval project planned to run concurrent with AWD. It aims to build two massive flat-top amphibious vessels, each larger than the old aircraft carrier HMAS *Melbourne*. Not only is the project being pursued through a conventional acquisition strategy, but despite an initial "strong preference" to build the vessels in Australia, a foreign build is now under serious consideration. This is understandable, given that the premium for local construction is reportedly as high as $600 million in a $2 billion project. This begs the question of how much extra the taxpayer is paying in the $6 billion AWD project for the pleasure of seeing jobs created in South Australia.

Future competition

Aside from the AWD project, Defence appears largely committed to the use of competition when purchasing equipment. At least that's what its actions seem to be saying. On the policy side things are less clear.

In 2004 Defence announced that the longstanding AII program would be replaced with a new Australian Industry Capability (AIC) program. Defence's website describes the AIC program as the "key tool through which Defence satisfies its requirements for in-country support of the equipment it acquires". Yet, almost 18 months later, the new policy is yet to be made public. So while defence pursues its policy of managed competition, industry and the taxpayer are left to guess what the rules of the game are.

One thing that's unlikely to emerge from a review of defence industry policy is a dilution of competition.

This might be about to change. If media reports are to be believed the government looks set to clarify its defence industry policy. This is long overdue; local firms deserve to know the government's priorities, and the taxpayer deserves to know how their money is being spent.

One thing that's unlikely to emerge from a review of defence industry policy is a dilution of competition. It was reasonable of Reith to point out the limitations of project-by-project competition back in 2001, but with the benefit of hindsight five years later we can see that the alternative is neither compelling nor without its own set of challenges. In theory a well-managed monopoly might trump competition in a monopsony situation, but no convincing proposals have emerged from the considerable work put into the sector plans developed jointly by Defence and by local industry. In the aerospace and electronics sectors the competitive approach was largely endorsed, while in shipbuilding the departure from competition looks increasingly risky.

Rather than flirting with exotic acquisition strategies or interventions to shape the local defence industry market, the government should simply sort out the strategic capabilities it needs to keep in-country and then use open competition on the global market to equip the ADF for the rest. This should not be so hard. After all, it would simply put Defence in line with the government's own procurement guidelines that prohibit discrimination on the basis of "foreign affiliation or ownership, location and size", except where necessary for the "protection of essential security interests".

Given the long history of preferential treatment of local industry and the small economies of scale inherent in Australian defence projects, the result might be less work being done in Australia. But then again, Australian defence industry has repeatedly shown itself to be adaptive and innovative – it may be that we will see the emergence of more internationally competitive domestic suppliers. In any case, aside from areas of strategic necessity, defence industry is no more deserving of protection than other Australian manufacturers who have long been subject to the cold winds of foreign competition.

There are defence industry capabilities that are essential for strategic reasons, but the vast bulk can be maintained by taking a long-term approach to through-life-support at the time of acquisition. In some very special circumstances it may be necessary to use restricted tenders or sole-source acquisitions to maintain an essential local industry capability, but this should be the exception not the rule.

The benefits of an economically and strategically rational defence industry policy would be twofold. First, it would allow scarce resources, including skilled personnel, to be focused into maintaining truly strategic defence industry capabilities. Second, the cost of equipping the ADF would fall as Australia increasingly linked into foreign programs with larger economies of scale, thereby freeing up money to develop combat capability – which, after all, is what it's supposed to be all about.

THE economic benefits OF defence industries

5

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PHOTO: THE BOEING COMPANY

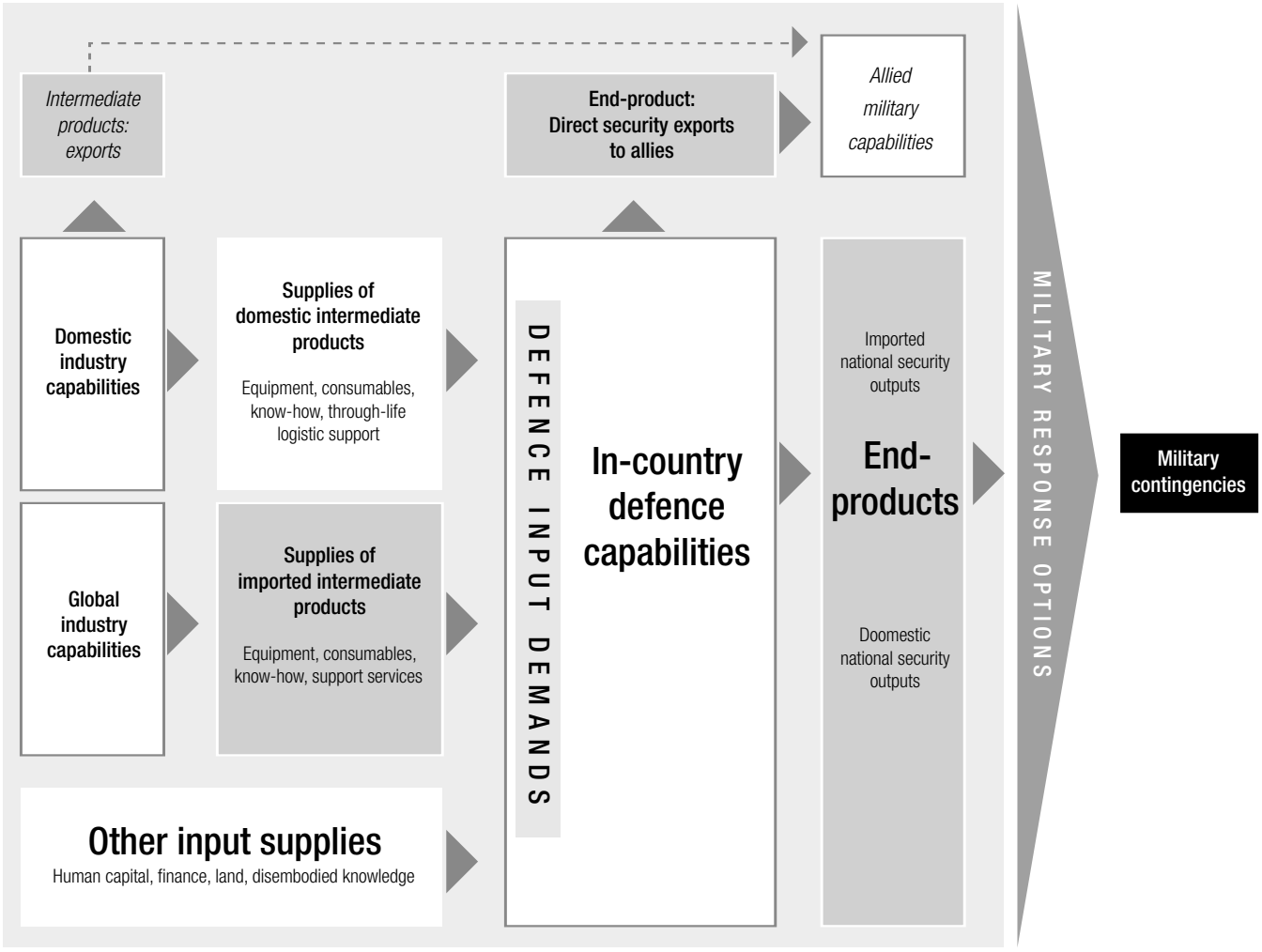
Many people now question government support for the defence industry, especially those who do not see high levels of industrial self-sufficiency as a necessary component of national security provision. This chapter discusses the economic framework within which an evaluation of defence industry might be conducted. By doing this we hope to assist readers in making their own dispassionate cold-blooded assessment of arguments presented by other contributors to the debate on the need for support for defence-related industry in Australia. Factual information needed to make such judgements is provided by others in this publication, particularly Bob Wylie. Issues surround how much Australia should rely on its allies, particularly the United States (US), for defence support and at what cost; what military and industry capabilities are needed in-country to underpin domestic national security; how such capabilities are to be formed and sustained over time and at what cost to the taxpayer; and which defence-related goods and services should be imported.

The framework adopted here is the defence value chain; that is, the sequence of value-adding activities that progressively converts inputs into the end-product "national security" or "defence". This framework also allows us to examine the nature of "defence" and the capabilities needed to produce it; the value and cost of defence-related capabilities; direct imports and exports of "defence"; and the interface between the National Defence Organisation (NDO or Defence) and its upstream supplier of capital goods, consumables and services – industry. We also distinguish between domestic industry supplies for Defence and imports of defence materiel. It is in this context the value or economic benefit of in-country defence industry is discussed.

National security provision and defence value chain

First we describe the defence *value-adding chain*. To capture the value-adding process, Defence is assumed to be the "producer" of defence and the government to be ultimately responsible for the provision of national security and the allocation of resources needed by the NDO to carry out its tasks. Similarly, capital inputs and consumables are sourced by Defence from "Industry", while human resources are obtained from "households", normally through labour markets but failing that by conscription. Industry may or may not be distinct from Defence: arsenals and shipyards have often been owned

FIGURE 5.1 DEFENCE VALUE CHAIN



and operated by NDOs. The end product "defence" may be sourced directly from a larger nation acting as guarantor and protector of a small nation's sovereignty or from several allies and "friends". This setting, while stylised, is useful to consider concepts fundamental for later discussions of defence industry.

Figure 5.1 presents a stylised representation of the defence value-adding process. The chain of value-adding activities runs from left to right; that is, from upstream industry capabilities and the production of intermediate products to downstream military capabilities (for a definition see Wylie in Chapter 5). Arrows indicate flows of goods and services through the defence value chain. Production capabilities, inputs and outputs are represented as boxes.

The end product of the process is national security, which, in this stylised description of defence production, is interpreted as a set of final outputs comprising two subsets, one related to deterrence and the other to actual deployment. Deterrence-related outputs comprise the (usually unobservable) instances of prevention of hostile acts against Australia and its interests, which would have occurred if domestic military capabilities had not been in place. Expenditures on deterrence-related defence capabilities may be viewed as premia paid on an insurance policy. Deployment-related outputs comprise the actions Defence takes to:

- counter threats to, or violations of, national sovereignty
- provide other forms of service at the direction of government (for example, peacekeeping).

The fundamental logic behind this value-adding chain is that the end product, including deterrence, should drive the requirements for inputs into final activities and, thus, determine the intermediate outputs, activities and capabilities of upstream producers, including industry. Benefit to the nation is created downstream when the NDO's capabilities are either deployed in a war-fighting or peacekeeping role, or their availability in peacetime is sufficient to deter potential aggressors. However, the cost of national defence is incurred when resources are drawn into employment at various stages along the chain.

Value is created when something is produced for which someone is prepared to pay. Costs are incurred when resources are taken up to produce intermediate and final

goods and services, regardless of whether the final product is sold or paid for at the end of the day. To avoid waste, it is important to demonstrate that the social benefit (value) attributed to an increment in in-country defence capability – say, an additional armour battalion or a defence-specific industry capability – is equal or greater than the (social) cost of resources used to form and sustain that capability element. Thus, as national defence capability is formed, each new increment of it should be assessed to determine whether it delivers net social benefits to the "taxpayer" or "society at large".[1] The term "social" indicates that all relevant costs and benefits borne/derived by the taxpayer should be included in this assessment, as opposed to only those costs and benefits that are incurred/derived directly by the owner/operator of a particular capability element. For example, the total cost of acquiring, operating and decommissioning a firing range should include costs borne by adjacent land-users in relation to noise or access restrictions, and the cost of site clearance when the land is returned to civilian use. All such costs may be additional to what it cost Defence to acquire the site, build and maintain the necessary facilities, and to operate and decommission the range.

The true combat-related performance characteristics of defence capabilities are not observable in peacetime, nor can their true social value be determined until they are actually deployed.

In principle, the final product (national security provision) should drive the defence value-adding chain and ultimately provide a justification for one resource allocation rather than another higher up the chain. This logic applies to the valuation of a military capability – say, a parachute battalion – and an industry capability – say, a facility making and maintaining the parachutes. That said, the contingent nature of many defence outputs makes it very difficult to assess the true social worth of defence capabilities, both those that are combat-related and those that are formed upstream to provide war fighters with equipment, consumables and training. Capabilities to produce combat-related defence outputs have to be formed "just in case", often on the understanding that it is most unlikely these capabilities will ever be deployed in anger. The true combat-related performance characteristics of defence capabilities are not observable in peacetime, nor can their true social value be determined until they are actually deployed. If the formation of national defence capabilities deters potential adversaries, it is difficult to determine the precise extent to which they have provided value for money. Successful deterrence results in no observable conflict and if peace results from deterrence-providing military capabilities, it is usually not possible to determine the extent to which the absence of hostilities has resulted from defence spending on one type of military capability as compared with another.

Even if defence outputs could be observed and quantified, many of them are "public goods" characterised by non-excludability of non-payers from consumption/use and non-rivalry between users so that one user's consumption does not reduce the availability of the good for other users. These conditions discourage commercial, private market provision and imply that government must arrange supply of these products if they are to be provided at all.[2] It is a challenge to find a workable and reliable way of valuing such goods. There are no market-generated price signals to indicate preferences for one type of defence output compared with any other. Choices are made by the government as part of a broad "package" of public goods that it promises to deliver. When political parties contesting an election promise alternative packages of public goods, the electorate influences the mix of what is to be provided, including defence.[3] On the other hand, in peacetime, the electorate is not normally involved in deciding the specific composition of defence expenditure, which it leaves to "experts" to determine.

Military capability formation

To respond to military contingencies, Defence must form appropriate *military capabilities*; that is, it must acquire and combine factors of production to form production units capable of delivering specific services, or military end products that may be required under various threat scenarios. These capabilities are shown in Figure 5.1 as "In-country defence capabilities". At the aggregate level, the key or "core" capability to produce national security is the potential to deter aggressors and/or engage effectively in combat. Since few, and possibly none of these threat scenarios will ever actually materialise, what the government has to provide through its investment in defence is in the nature of a *contingent capability* – a capability that has the potential to be used if certain contingencies occur, but which will otherwise only ever be visible under the inevitably artificial circumstances of exercises or simulations.[4] To have this potential, Defence must acquire inputs such as weapons systems, facilities and other physical assets, intellectual property, skills and consumables. It may also have to ensure that certain upstream industry capabilities are available in-country.

To determine the military capabilities needed by Defence, strategic planners must consider an appropriate military response to each contingency or, since each military contingency may be dealt with in several different ways, a set of *military response options* (see Figure 5.1). For example, to enforce peace in a neighbouring state, a small expeditionary force may be required. This may be highly

labour intensive with a relatively large number of peacekeepers on the ground to win the hearts and minds of the locals, or highly capital intensive (aircraft, armour) to show the force needed to intimidate troublemakers. To form appropriate *response capabilities* and, thus, to acquire elements of capability such as weapons systems and consumables, Defence and the government of the day must determine which military contingencies are most likely to materialise, what they involve, and what needs to be done to address them. Such judgments are always ultimately subjective and influenced by political pressures. Given the budget constraint set by the government, decisions are then also required on what additional investments in new capabilities have to be made to ensure that sufficient national security outputs will be produced by Defence if and when required. These investments may also include the formation of upstream industrial capabilities that are deemed essential to national security provision.

Defence and the government of the day must determine which military contingencies are most likely to materialise, what they involve, and what needs to be done to address them.

The value chain framework emphasises the complementarity between investments in military capability and the capability of upstream defence suppliers. If it is thought imperative to acquire a particular force element to enhance national defence capability, it becomes important to consider the security of upstream supply as well. In some cases, there may be an irrefutable logic behind establishing and maintaining industry capability in-country, dedicated to the defence needs of uncontested strategic importance. However, subjective judgments and political pressures both come into play in determining which Defence capabilities actually are essential and whether industry capabilities are genuinely required, in-country, to support them.

Thus, the value chain framework obscures intrinsic ambiguities associated with determining the need for, and value of, domestic defence-related industry capabilities. Any investment in defence-related industrial capability can be justified on a just-in-case basis as one can always think of a threat scenario calling for a particular military response option supported by a related industry capability. If budgetary considerations are ignored, it is always prudent to have as many response options as possible and a wide range of associated military and industrial capabilities – just in case. It is only with the benefit of hindsight that we learn which particular military and industrial capabilities have actually been useful. When budgets constrain choices, capability investments must be prioritised. This is a highly politicised process in which logic and cold-blooded assessment may easily give way to expediency.

A final point to note here is that acquisitions are not always prioritised by comparing all desirable options in each planning period. Often, individual services take turns at acquiring new equipment and do so in a sequential order that may not reflect the priorities of Defence overall.

National security imports *versus* domestic production

Defence does not produce all national security: some of it is "imported" *directly* through international alliances such the 1952 ANZUS Alliance between Australia, New Zealand and the US. Similarly, some of the services produced by Defence may be "exported" in the form of a country's contribution to alliance-based military operations (for example, the Australian contribution to the US-led coalition forces in Iraq) or to other international military operations (for example, the UN-led peace-enforcement operations in East Timor in 1999–2000). Military alliances tend to involve non-market arrangements between the allies, where promises of mutual assistance are bartered between alliance members on the basis of "equitable sacrifice". But there may also be "export markets" for defence services: some countries specialise in the provision of mercenary peacekeepers while others export logistics support services.

To understand what determines the ratio of imported security relative to domestic security production it is necessary to know about the highest level strategic considerations that shape requirements for national security provision. That is, which military response options depend critically on domestic defence capabilities, which depend on outputs supplied by allies, and which may involve some but not critical dependence on allied resources. In practice, how much national security is actually imported varies widely – for reasons that are political, and technological, as well as economic. Only a hyperpower such as the US may achieve high levels of military self-sufficiency, since it cannot rely on a more powerful protector for support and must also protect its smaller allies and military dependants. But even the US is not totally self-sufficient in all its military inputs and benefits. It imports some defence materiel. It also imports national security directly as it often prefers to conduct its military business through leading coalitions of smaller nations to increase the international legitimacy of its actions and to share their cost with allies.

Most nations import at least some national security and "self-reliance" is a phrase often used to describe a degree of self-sufficiency in national security provision. In the Australian context, "self-reliance" is described as one of the principles that shape "the defence of Australia without relying on the combat forces of other countries" (DoD 2000). In practice, however, desired and actual

levels of self-reliance may diverge widely – for example, when key enabling aspects of military capability (such as military intelligence, communications and consumables) are not produced or available domestically and, like it or not, must be imported from allies. In so far as the formation of upstream defence capabilities is deemed necessary for national security provision, "self-reliance" may also involve a degree of domestic self-sufficiency in the supply of capital goods and consumables for the armed forces.

Intermediate industry products

The military equipment used by Defence is analogous to the intermediate inputs into civil industry production and military consumables equivalent to civil industry materials inputs. In Figure 5.1, intermediate products include goods such as equipment and consumables, and services such as know-how and through-life logistic support. However, since Defence does not sell its services and the effectiveness of its weapons and other inputs becomes apparent only in deployments, it is difficult to determine the value intermediate products add to final output. By assigning value to the downstream military capabilities, the government imputes value to upstream intermediate products. If a particular downstream capability is deemed to be more valuable, it is likely to claim a larger share of the Defence budget and, thus, Defence may be willing to pay higher prices for intermediate products that are inputs into this capability. But the ambiguity surrounding value adding in producing defence outputs exacerbates the difficulty of knowing whether scarce resources are being optimally allocated to Defence generally and among competing uses within national security provision.

If an analogy were to be drawn with the derivation of input demands in a commercial production environment, the price that the input user might be willing to pay for an additional quantity of the input would reflect the contribution of the incremental unit of the input to revenue from sales of the end-product. But since military response activities are not commercial, revenue-producing operations, how is the value of inputs to be determined? The availability of an incremental main battle tank may be both necessary and sufficient to achieve a victory of inconsequential nature for the nation's sovereignty, or it may tilt the scales in a battle that changes the course of national history. In dollar terms, the value of the incremental tank is somewhere in the range between zero to infinity (the Shakespearian "horse" that under the right conditions may be worth a "kingdom"), with the expected average weighted value depending on a particular combination of most credible scenarios. And this could be true of every capability element.

Defence industry

The goods and services required as physical inputs to military capability formation can only be produced if there are adequate production capabilities upstream in the value-adding chain. In Figure 5.1, they are described as domestic and global industry capabilities located in what is often described as "defence industry".

On the input supply side, most countries, and in particular small economies such as Australia, import a significant proportion of their defence equipment and intellectual property.

The meaning of "defence industry" is ambiguous. We are aware of at least half a dozen definitions that focus variously on firms, industrial assets and sectors; on sales, actual output and potential output; and on the importance or criticality of outputs to national security (see, for example, Sandler & Hartley 1995, pp. 182–5). In principle, domestic defence industry comprises all those elements of in-country industry capable of undertaking work for the armed forces or for the export of defence products to other countries. It includes business entities located in-country and fully owned by residents, as well as local subsidiaries of foreign companies. Ambiguity stems importantly from the fact that almost any producer of goods and services could, potentially, be drawn into the service of national defence – not just shipbuilders and aircraft manufacturers, but also boot-makers, cattle farmers and the providers of educational services.

Two sorts of factor determine the range and diversity of Defence's demands on industry suppliers: first, the scale of potential conflict or engagement; second, the particular demands of *specific types* of military activity. In relation to scale, in an all-out "total" war, government may declare every asset and resource in the economy to be at the disposal of the "war economy". The national defence industry in this case coincides exactly with the country's entire domestic industry structure. On the other hand, if a country is, has been and expects to be involved only in border protection and occasional peacekeeping missions, the extent to which it will need to engage the support of local industry will be rather limited. The second determinant is more subtle in its effects. The nature of actual and potential warfare changes continuously as the result of technological change and new developments in strategic thinking. Parts of the economy that would have supported defence in the past may no longer be relevant (think of arboriculture and timber shipbuilding); other parts may suddenly acquire new strategic significance (for example, pharmaceuticals to prosecute or counter chemical and biological warfare).

On the input supply side, most countries, and in particular small economies such as Australia, import a significant proportion of their defence equipment and intellectual property (designs, software source codes and

so on). They attract foreign direct investment (FDI) through the formation of wholly owned subsidiaries of multinational companies, purchase equity in local firms, create joint ventures with foreign equity holders, or set up new, greenfield site operations. Movements of labour bring skills and expertise from abroad. Given this mobility of resources, especially human, financial and intellectual capital, it becomes difficult to be sure what domestic industry capabilities actually exist at any one moment and might be available in future.

Within the domestic defence industry, production entities may be privately or publicly owned. The ownership of firms in Industry shapes and structures interactions between buyer and seller. With public industry ownership, the domestic demander of defence materiel and their domestic producer form a continuum of vertically integrated production activities, from system design and development, to production, to use and in-service support. In this case government determines the in-country military capabilities and direct imports of national security from allies, and also the capabilities and product structure of (in-country) up-stream industry activities. The defence value chain in such circumstances is similar to the Soviet-style centrally planned economy with market interfaces limited to imports of defence materiel and other inputs from abroad and the employment of personnel. Arsenals and naval shipyards have long been government-owned, even in countries with the impeccably capitalist credentials of the US, but, like the Soviet enterprises, are often inefficient, expensive to sustain, unresponsive to changing customer demands and riddled with industrial relations problems. A classic example of such a problem-ridden enterprise was the Williamston dockyard before its privatisation in the 1980s (ASPI 2002).

With private ownership of industry, production and the through-life support of defence materiel tend to be separated from their use as the buyer and the seller are economically and legally different entities. Since the early 1980s, private ownership, or at the very least "corporatised" state ownership, has been seen as a key to successful industry development. Also, the private sector has been viewed as more likely to take advantage of dual technologies to supply both military and civilian customers to broaden its customer base. Not surprisingly, the past 20 years have seen large-scale privatisation of government enterprises and contracting out of civilian-type services, previously produced by Defence in-house, to commercial contractors. But even if the transfer of ownership is necessary to enhance efficiency it is by no means sufficient. The commercial enterprise is normally at its best when exposed to forces of real international competition. This is often precluded by local content policies justified by the imperatives of national security provision. Domestic demands are usually too small to sustain multiple sources of supply while Defence may lack commercial experience to use its market power to extract efficiency dividends from local sole source contractors.

Irrespective of ownership, defence firms will be internationally competitive without subsidy only if they achieve significant economies of scale or scope, or specialise in niche product markets. Otherwise, they will have to depend for their existence on the local content preferences of their home governments. In the latter case, cost premia are most likely to be incurred by Defence if it elects or is instructed by the government to buy local.

Modern warfare requires quick turnaround times to service equipment and rectify battle damage.

On the other hand, a diversified large producer in a small economy may only stay in business if Defence uses it as a sole source supplier and, thus, is willing to bear the attendant risk of monopoly pricing or quality degradation. However, when defence firms in Australia specialise in the provision of logistic support services, particularly equipment maintenance, they become niche market operators and, as such, they benefit from the "natural protection" provided by Australia's geographic isolation from major industrial centres overseas. In contrast to manufacturing, the provision of services usually requires close proximity of the service deliverer to the customer. There is also the additional strategic argument in support of in-country provision of services. Modern warfare requires quick turnaround times to service equipment and rectify battle damage. As lead times to respond to military contingencies are increasingly short, the capability to manufacture military materiel in-country is less important than the capability to sustain the existing military capabilities. This argument also applies to knowledge-intensive weapons systems that require frequent software upgrades and continuous maintenance. The capability to sustain such systems in-country is a critical aspect of military self-reliance. Claims are often made that the ability to manufacture such systems is a pre-condition for effectively maintaining them in-country. This argument can easily be overstated as complex equipment, civil and military, has been be well maintained in Australia, despite having been manufactured overseas (for example, the Qantas fleet of aircraft).

Industrial self-sufficiency

Creating and maintaining domestic defence-related production capabilities is largely an issue for nations that believe they should maintain a degree of defence self-sufficiency.[5] Actual country experience reflects a variety of approaches. Of the group of highly industrialised OECD nations, only the US could sustain a largely independent war effort drawing on a local industrial base capable of meeting virtually all its military requirements. France claims to have the capability to design and manufacture

90 per cent (by value) of the equipment needed by its armed forces (Kausal et al. 1999, pp. 1–69). The United Kingdom (UK) has maintained an equally broad range of defence industry capabilities but is more trade dependent, especially on US imports. With its policy of "indigenisation", Japan's self-defence force sources well over 90 per cent of its defence materiel from domestic suppliers (Kausal & Markowski 2000, pp. 2–44). Among smaller countries, Sweden still manufactured around 50 to 60 per cent of the equipment needed by its armed forces in 2000. Canada, Spain, The Netherlands and Switzerland appear to have maintained similar levels of self-sufficiency, although, with the inclusion of imported components in locally made sub-assemblies, this ratio may well be lower (for example, the local content in the "Swedish" Grippen aircraft is said to be about 50 per cent) (Markowski & Hall 2003). However, as service provision accounts for an increasingly larger proportion of defence-related industry capability in small countries, a local content target of about 40 to 50 per cent appears to be more realistic. Australia's self-sufficiency is likely to be in this range, although we do not know exactly as the visibility of imported components is obscured in complex systems where both the final system integration and that of sub-assemblies occur in-country.

What these examples show is the diversity of approaches to sourcing content in defence materiel locally. Such decisions reflect political judgement calls: it is always possible to argue that dependence on overseas sourcing of a significant input into national security could result in catastrophic failure if the supplier refused to honour its contractual commitment or was forced to default by its home government. Accepting such a risk may be seen as tantamount to a government abrogating its stewardship of national sovereignty. But, as noted earlier, only superpowers can afford high levels of autarchy in defence supply chains, and smaller countries must recognise and respond as they can to the inevitable risks surrounding dependence on imports.

Arguments apparently founded on the merits of self-sufficiency can easily be turned to other uses, both by government itself and by defence industry. First, defence materiel is exempt from restrictions on protectionist measures imposed by international free trade agreements. The intent behind the exemption is to allow nations freedom to develop self-sufficiency in defence value chains. However, governments may also use defence industry exemptions for non-defence purposes, perhaps with a view of creating jobs or protecting local industries against imports and FDI competition for reasons unrelated to national security provision. Second, once defence industry capabilities are formed in-country, lobbies often form to sustain them as legacy industries. As noted earlier, the logic of defence value chains may easily be reversed when locally made weapons systems and equipment are acquired by Defence primarily because they keep upstream industry suppliers in business, provide employment in marginal constituencies, or support broader government economic objectives.

The rationale of using defence-related industry as a springboard for job creation and the generation of in-country economic activity requires close scrutiny on a case-by-case basis. Activities in defence firms tend to be both highly capital- and skill-intensive. Workers employed in such activities tend to be highly employable and must be lured away from other industries, implying an opportunity cost in lost output that must be included in any analysis of the net benefits. Given the skill structure of defence industry (see Wylie in Chapter 5), those offered jobs in "high-tec" defence firms cannot be replaced elsewhere by the unemployed. Similarly, the calculation of multiplier-type benefits for the national economy from in-country sourcing should also take account of the economy-wide efficiency losses imposed by paying premia for high-cost local production.

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In a related vein, government and industry sometimes argue for defence industry protection on the grounds of promoting innovation and technology transfer. Defence-related industries are said to be technology-intensive and, often, more (technologically) advanced than civil firms in comparable sectors. Thus, they are said to offer disproportionate value to the national innovation system. This argument is far from convincing, as there are impediments to technology transfers, both within and among firms. Defence-related and civilian activities tend to be segregated. Producers of defence materiel are either dedicated defence contractors or, if they produce both military and civil outputs, they tend to operate dedicated plants or production facilities so that civil and defence-related activities are not mixed. Many government buyers, especially the US government, insist on strict segregation between sensitive military and civil production for national security reasons. That said, there are also "dual technologies" that have both military and civil applications. But, technology may as easily flow from civil to defence applications as from defence to civil – and often does. Many civil producers (for example, manufacturers of computer hardware and peripherals) offer sophisticated products that can easily be adapted and "ruggedised" for defence purposes.

Benefits and costs of the defence industry

As Defence is publicly owned, the benefits and costs of creating and maintaining defence capabilities should be calculated at the level of society overall. It is the society at large that is the beneficial owner of military capabilities. The net social value of a capability investment is the discounted sum of all benefits generated by it, both within and outside the defence value chain less the discounted sum of all costs, both those directly attributed to the asset and those (for example, industrial pollution) that are imposed on other activities and economic agents.

As Defence is publicly owned, the benefits and costs of creating and maintaining defence capabilities should be calculated at the level of society overall.

The social valuation of a military or industrial capability presents many technical and practical challenges, however. First, all relevant costs and benefits must be enumerated. For long-lived, defence-related capabilities, it is almost impossible to know all of the items to include. Second, as these occur at different points in time over the life of the capability, their dollar values are "dated" and should not be simply totted up. This is why a discounting process is required in relation to future benefits and costs – to take account of social time preference. There will always be dispute about the appropriate rate of discount to use. Third, the process of social valuation involves a degree of subjectivity, and net values will vary depending on the assumptions made by the valuer. Such assumptions may be made deliberately to generate the outcome that the evaluator wishes to produce. For example, those keen on demonstrating the high social value of defence-related industry capabilities may emphasise the importance of positive technological spillovers (third-party benefits) likely, in their view, to flow on from defence firms to the rest of the economy. As noted earlier, the evidence here is potentially open to varying interpretations.

On the cost side, the exercise focuses on the social opportunity cost of devoting resources to defence capability formation. Appropriate prices should be used that reflect the social value of resources in their next best use – the minimum required to attract them from an alternative employment to defence work. If the government seeks the in-country production of a product that calls for the diversion of scarce resources from other sectors, it would have to pay sufficient to attract those resources from other uses and retain them in their targeted employment.

The actual prices paid by Defence depend on competition among producers for Defence business, and the skill with which Defence engages in the procurement of its inputs. If Defence is the only domestic buyer of a product that has no export potential, its bargaining power is relatively strong, especially when it can source the product from a number of keen-to-sell suppliers. If there is only one domestic supplier (sole source) and imports are restricted, the monopoly market power of the seller could counter the monopsony (single-buyer) power of Defence. Under conditions like this, *bilateral monopoly,* the outcome of the bargaining process between the two parties is difficult to predict. Further, even if there is keen competition between potential sellers early on in the procurement process, the presence of sunk (irretrievable) costs in supplying the requirement may leave buyer and seller in a position of mutual dependence once the contract is signed. This could encourage opportunistic behaviour by either or both parties.

The true social value or economic benefit of defence-related industry capabilities depends on the value of what is actually produced at the end of the defence value chain. The decision as to what defence-related industry capabilities are to be formed and sustained in-country depends on: (1) the government's valuation of defence relative to other public goods; and (2) given the defence budget and strategic guidance provided by the government, how Defence values each element of military and industrial capability in terms of its contribution to the national defence effort. As noted earlier, such valuation decisions are highly subjective and it is the government's prerogative to decide, albeit in consultation with Defence, whether the in-country availability of a naval shipyard is more important and, thus, valuable than the formation of a rapid deployment combat unit. The valuation is more complex when a defence-related capability element also delivers some additional civil benefits, say, when a naval shipyard pioneers a shipbuilding technology that benefits a civil shipbuilder. But unless the civil shipbuilder pays a licensing fee for the transferred technology, or is able to quantify the received technological benefits, the valuation of such technology transfers is also quite subjective.

By contrast, the estimation of the social cost of defence-related military and industrial capabilities is somewhat less arbitrary. To be deployed in the defence value chain, resources needed for the production of defence must be competed away from non-defence activities. To do that, they must be offered sufficiently attractive rewards. Similarly, they must be offered sufficiently attractive returns to remain in the defence value chain. Even when Defence is the owner of upstream industrial facilities, it must acquire capital goods and other inputs through the market and hire people to work in them. Thus, inasmuch as resources are domestically and internationally mobile and free to redeploy between activities, their cost provides

an indication of value other users attach to them. While this may not be an adequate measure of the social opportunity cost of employing these resources in the defence value chain, it nevertheless is a great improvement over the largely subjective valuation of the benefit of defence military and industrial capabilities.

Conclusion

This chapter outlines a framework for considering investments in capabilities to produce national security, including upstream industrial capabilities. The social value – or benefit – of in-country industrial capabilities dedicated to defence is subjective to the extent that it reflects judgments about the value of national defence in general, the most promising ways of achieving national security objectives, and the potential of domestic suppliers to deliver sought-for levels and quality of support. Legacy industry interests may seek to influence such judgments and broad political considerations may colour defence strategic analysis. Thus, the social value of upstream industry capabilities may diverge from levels they might have achieved in the absence of legacy and political considerations. Given the contingent nature of defence outputs, it is possible to justify many investments in peacetime, the quality of which may never be put to the ultimate test. This implies a pressing need for transparency and accountability, as much in relation to industry capability investments as for publicly owned assets.

Given the contingent nature of defence outputs, it is possible to justify many investments in peacetime, the quality of which may never be put to the ultimate test.

What if a government wants to know whether it should provide support for the domestic defence industry to underpin its export potential? Exports require a market in other countries, many of which will be seeking to maximise local content in their own defence procurement, a major impediment to export penetration. Importers will often also demand "offsets" in the form of counter-trade or partial import substitution by local content. Such impediments and complications suggest that, for a small country such as Australia, defence exports are likely to be confined to particular niche market opportunities which, by their very nature, cannot easily be targeted by generic programs of government industry assistance. When governments come to consider how much support to provide, these are limitations on export market potential that they should take into account.

Finally, the social valuation of the defence industry may in principle be enhanced when there are beneficial spill-overs such as technology transfers to civil industries. Given the paucity of evidence, however, such claims can easily be overstated. If the purpose of the policy is to accelerate technological change in civil industry, government should ask whether targeting civil producers directly might not be more appropriate. The least ambiguous case for government support for domestic industry capabilities in the defence value chain is based on strictly strategic-defence considerations.

ENDNOTES

1 Also, the existing elements of capability should be assessed to ascertain whether they are obsolete or not; that is, to determine whether they continue to add more value to national defence than it costs to retain them in service. Thus, to ensure the national defence as a whole provides value for money, the *total social benefit* of national defence should equal or exceed the *total social cost* of creating and sustaining the in-country defence capability. In other words, the social benefit must be equal or greater than the social cost both at the margin, for a new increment in defence capability, and on average, across all of its elements.

2 Arranging the supply does not have to mean the use of government agencies to produce such products. While the government may be responsible for the provision of various public goods, their actual production and delivery may be contracted out to the private sector or commercially operated public entities.

3 In Australia the release of the 2000 Defence White Paper (DoD 2000) was preceded by extensive public consultations and a "marketing" exercise to sell the government's defence policy to the general public.

4 This is fundamentally different from the production of private goods and services, which can only be invented, developed, produced and delivered if adequate revenues are generated to recover the full (private) cost and make profits and pay prices sufficiently high to compete resources away from other uses. No commercial enterprise can invest in capabilities that are best never deployed.

5 Strictly speaking, a country that has no interest in defence self-sufficiency could undertake defence goods production for export only. But a defence firm exporting all its products would have to be particularly competitive to remain in-country and continue to export. Also, domestic sales are usually a pre-condition for successful exports as the willingness of the NDO to buy the product signals the endorsement of its quality and a commitment to future through-life support.

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supplying AND supporting Australia's military capability

6

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In order to analyse how Australian industry supplies and supports Australia's military capability, this chapter extends the concept of the defence value chain (see Chapter 5 by Markowski and Hall) by incorporating the constituent elements of military capability – that is, force structure and preparedness – into an overall framework. This framework is then used to analyse how Australian industry supplies and supports the non-combat elements of Australian defence capability; defence information capability; naval ships, boats and submarines; army land-based manoeuvre; munitions; and military aviation.

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

Framing the analysis: The Australian defence value chain

Markowski and Hall envisage the production of national security as a chain of value-adding activity. Industry adds value well upstream in the chain of activity through supply and support of military platforms, systems and associated equipment and stores. The chain then moves sequentially through the production of intermediate capability outputs. The annual defence budget provides one definition of such intermediate outputs. These include, for example, naval combatant operations, army-mechanised operations and air combat.

The chain then leads to downstream military capability outcomes. Again, defence outcomes can be defined in a variety of ways: the defence budget defines defence outcomes around navy, army and air force capabilities. The chain culminates in the generation of the defence component of national security.

Markowski and Hall argue that the value of the national security produced at the end of the chain determines the value of the goods and services produced at various stages along the chain. In principle, the final product of the chain (national security) should drive the defence value-adding chain. The national security product should provide the rationale for one resource allocation rather than another higher up the value chain. But Defence does not sell its services and the effectiveness of its weapons can only be established in battle.

In practice, therefore, judgement will always be required in determining how much value intermediate products add to the final national security output. Such judgements will take into account the contribution of intermediate products to military capability.

Framing the analysis: Defence capability value

"Military capability" is the power to achieve a desired operational effect in a nominated operational environment (land, sea or air) within a specified period and to sustain that effect for a designated period. Military capability results from developing a force structure appropriately prepared for operations (Department of Defence 2005, p. 2, 1.4).

"Force structure" is a sub-set of military capability and comprises the personnel, equipment, facilities and military doctrine required to conduct military operations effectively. This chapter is about the choices Defence and the Australian government make in supplying and supporting the equipment element of Australia's defence force structure as it evolves over the longer term.

"Preparedness", the second component of military capability, is more flexible and dynamic in the shorter term. As Betts (1995, p. 43) has explained, an existing force can only be maintained at high levels of preparedness for a limited period and then at the expense of longer term force structure development. Hence, the level of preparedness of the Australian Defence Force (ADF) is a second important area of choice for Defence and government.

Preparedness is a combination of "readiness" and "sustainability". "Readiness" is the ability of a military force to undertake specified military operations within a designated time. Australian industry supports ADF readiness by upgrading equipment in order to retain its military competitiveness.

"Sustainability" is the ability of a military force to continue operations for a specified period and depends on the level of maintenance and the availability of consumables like ammunition and spare parts. Australian industry supports ADF sustainability by repairing and maintaining its equipment and by supplying consumables like ammunition.

Framing the analysis: The Industry component of the defence value chain

Internationally, Australia participates actively in the global division of labour. It is also a well-regarded member of the Western strategic community and a close ally of the United States (US). The industry component of the Australian defence value-adding chain therefore has both local and overseas elements. Defence policy for industry is therefore about balancing, on one hand, the value generated by local supply of the upstream goods and services required to generate downstream military outputs and outcomes against, on the other hand, the extra cost schedule and technical risk involved.

The ADF and the wider Australian Defence Organisation (ADO) are also directly and immediately affected by developments in the wider Australian economy. For example, the ADF competes strongly with other elements of the Australian economy for skilled labour. Defence policy for industry is therefore also about choices between in-house arrangements and commercial arrangements for the provision of goods and services consumed in the generation of military capability.

Excluded from the analysis in this chapter are several industries (for example, the petroleum refining industry) whose output (for example, fuel, oil and lubricants) may be critical to defence operations, but for which defence is a relatively minor customer. The analysis also excludes a range of infrastructure (for example, civil transport infrastructure or civil telecommunications infrastructure), access to which may be critical to military operations, but of which defence is a minor user.

Framing the analysis: Institutions and processes

Defence is virtually the sole buyer for those goods and services produced by Australian industry that are specialised for military applications. This characteristic of the defence market is reflected in the institutions and processes Defence and Australian industry have evolved in participating in the Australian defence value chain.

As a monopsonist, defence makes choices about what Australian military capability to develop, which defines the opportunities for Australian and overseas suppliers. Within Defence key institutions for shaping such choices include the Capability Development Group and the defence capability development processes administered by that group. Australia's choices here are particularly influenced by the potential for current and prospective technological innovations to make revolutionary changes in the nature of warfare and the composition of the armed forces (Defence 2000, p. 56, 6.44).

As a monopsonist, Defence also makes choices about, for example, whether to require suppliers to compete for its business, about who is eligible to compete, and about the terms and conditions of contracts. How Defence does business therefore influences the nature and scale of Australian industry contribution to the defence value chain.

Arrangements for accessing overseas innovations are a key element of the Australian defence value-adding chain.

Arrangements for accessing overseas innovations are a key element of the Australian defence value-adding chain. These arrangements include both Australian government and commercial institutions. Australia's arrangements for accessing overseas innovations are also affected by restrictions imposed by governments on defence trade. Australia is particularly affected by US government constraints on international transfers of US technology (Wylie 2004, pp. 75–80). This is because "The kind of ADF that we need is not achievable without the technology access provided by the US alliance" (Defence 2000, p. 35, 5.9).

The Defence Science and Technology Organisation (DSTO) is the main government-level institution for identifying overseas innovation at the R&D stage of the innovation process and for advising Defence about the technical risk inherent in potential solutions to defence requirements. The ADF is also a key vehicle for identifying overseas military innovations and translating them into Australian requirements. This is institutionalised in, for example, Australia's concerted efforts to maintain inter-operability between its military forces and those of its close friends and allies.

At the commercial level, Australian companies play a crucial role in accessing overseas innovation, most obviously in terms of technology, but also in terms of management expertise. In response to Defence insistence on local support of imported military equipment, overseas companies have established local subsidiaries in order to compete more effectively for Australian defence business.

Within Defence, the Defence Materiel Organisation (DMO) and the Defence capital equipment procurement process that it administers are key institutions for tapping the capacity of local and overseas companies to supply and support materiel. Analysis of the sustained efforts by Defence and government to improve the efficiency and effectiveness of these key elements of the defence value chain is beyond the scope of this chapter. Equally important, however, is the ability of the DMO, industry and the processes by which they are linked to the defence value chain to capture the learning taking place.

Critical here is the process of learning by producing, learning by doing and learning by the interaction of producers and users (Freeman 1988, p. 3). *Learning by doing* is inherent in the production of new scientific knowledge, in incorporating new knowledge in the design of a new product, in learning new productive activities and in learning from experience with the productive process itself on how to improve it. *Learning by using*, on the other hand, is strongly associated with use of highly complex systems where the learning comes not from the experience involved in producing the system, but from the system's utilisation by the final user (Rosenberg 1982, p. 122).

On the demand side of the defence market, the DSTO and DMO are key elements of the "learning by doing" dimension of the Australian defence value-adding chain. On the supply side of the defence market, commercial suppliers here and abroad are key repositories of defence-oriented "learning by doing". This supply-side learning by doing encompasses not only developing new solutions to evolving defence requirements, but also generating more efficient and effective ways of producing existing solutions.

In Australia the navy, army and air force do most "learning by using". As military systems become more complex, Australia's ability to create and manage a defence innovation system able to harvest this learning by using will become a key source of military advantage.

"Learning by the interaction of producers and users" is the third element of Freeman's national innovation system. The defence procurement process and associated organisational arrangements institutionalise the interaction between the "learning by doing" and "learning by using" in Australia's defence value-adding chain.

Supply and support of Australian defence capability

Australian industry's contribution to the Australian defence value chain can be conveniently analysed by reference to the following elements of ADF capability:

- non-combat support
- defence information capability
- naval ships, boats and submarines
- army land-based manoeuvre
- defence munitions
- military aviation (Wylie 2004, p. 20).

The following analysis draws on commercial data about Australia's top 40 defence contractors gathered by *Australian Defence Magazine* in 2005, (2006, pp. 15–28).

Provision of non-combat support

Defence contracts out a broad range of non–combat-related services in order to release scarce and expensively trained military personnel for concentration on core combat and combat-related tasks. The process began with the Commercial Support Plan in the mid-1980s, followed by the Defence Efficiency Review in 1997.

This form of contracting out constitutes a major innovation by Defence in response to enduring financial constraints and skill shortages. By contracting out non-combat services, Defence has shifted the balance of defence industry activities away from manufacturing towards service provision, thereby encouraging established defence suppliers to change their business portfolios and new entrants to the defence industry (Wylie 2004, p. 9)

ADI Limited (turnover: $656 million; employees: 2513) undertakes a broad spectrum of defence business, including the manufacture of ammunition and explosives for the ADF. As a logical extension of munitions manufacture, ADI manages the storage, maintenance and distribution of the ADF's explosive ordnance. Similarly, BAE Systems (turnover: $525 million; employees: 2600) operates the ADF Basic Flying Training School as part of a diversified portfolio of defence manufacturing and service business.

The Spotless Group is Australia's seventh-largest defence contractor (turnover: $328 million; defence business employees: 3000). It provides garrison support to military units throughout Australia and New Zealand. Serco Sodexho Defence Services Pty Ltd (turnover: $136 million; employees: 2300) also provides garrison support to units in the Northern Territory (NT), north Queensland and the Sydney region.

The Joint Logistic Command (JLC) of the DMO is conducting an ambitious experiment in the commercial provision of logistic support through the following contracts:

- the Defence Integrated Distribution System (DIDS), awarded to Tenix Toll Defence Logistics (Tenix Toll) in December 2003
- the Albury–Wodonga Military Area (AWMA) project, awarded to Tenix Defence Land Division in December 1997 under the Commercial Support Program.

Tenix Toll is a joint venture between Tenix Defence Pty Ltd, Australia's second-largest defence company (turnover: $650 million; employees: 2800), and Toll Holding (Australia's largest logistic and distribution company). Under the DIDS contract, Tenix Toll provides Defence's national warehousing and distribution services and maintains selected land materiel and electronic equipment. The DIDS contract is for ten years and is worth up to $920 million. Defence expects the DIDS to reduce costs otherwise incurred by $40 million and to enable reassignment of some 500 military personnel to higher priority activities (Hill 2003).

The AWMA project complements the DIDS contract and also involves the provision of materiel maintenance, warehousing and domestic services for Defence customers in the Albury–Wodonga area and nationwide. According to Tenix, the materiel maintenance element of the AWMA contract covers all equipment fleets managed by JLC (including armoured fighting vehicles, general service vehicles, engineer plant, artillery, small arms, guided weapons, electronic, radio and optical equipment, and radioactive stores test equipment).

To deliver these services, Tenix uses Commonwealth-owned/government-furnished facilities, government-furnished equipment and government-owned information technology provided free-in-aid under the AWMA project. In return, according to the Auditor General (2005, p.17), Tenix provides these services at highly concessional labour rates – $25 per hour in the late 1990s.

The DIDS experiment involves some important complexities and sensitivities. For example, the relocation of most of the army's mechanised force to Darwin in the 1990s encouraged the development of a modest capacity in NT industry to support, among other assets, the trucks and armoured vehicles involved. NT industry, backed by the NT government, were concerned that the DIDS contract would divert to southern suppliers work that might otherwise have been done in the territory. They therefore pressed for, and secured Tenix Toll's agreement to, setting aside $5.1 million worth of equipment repair work to be undertaken by local NT businesses under a two-year transition to full DIDS arrangements. These Darwin-specific arrangements are intended to condition up to 150 Darwin companies for participation in the DIDS program (Hill 2005).

Supply and support of defence information capabilities

In order to maintain a competitive military capability, Australia relies heavily on effective use of information (Defence 2000, pp. 77–97). Because information capabilities are so important in the competition for military advantage, they have driven innovation on both demand and supply sides of the defence market. As a result, Australian industry supplies and supports a broad spectrum of defence information capabilities.

At one end of the spectrum are those information capabilities that affect the ability of Australian governments to make sovereign, independent decisions about when and how to use the military forces available to them. Such "strategic sovereignty" (Wylie et al. forthcoming) becomes more important the closer a crisis or problem is to Australia, and the more directly Australian security interests are engaged. Similarly the higher the priority for Australia to conduct and conclude hostilities on terms most favourable to its interests, the more important it is to be able to make sovereign decisions about the use of available military assets.

A broad area surveillance capability linked to aircraft, ships and land platforms illustrates this *system-of-systems* end of the spectrum. Market failure logic (Stiglitz 2000, pp. 77–85) explains why the development of strategic-level information capabilities is publicly funded. While Australia's strategic-level information capabilities are therefore government-owned, many are operated and supported commercially. For example, Boeing Australia Limited (turnover: $375 million; workforce: 3400) supports Australian defence satellite communication stations in Darwin and Geraldton; and naval communication stations in Canberra, Darwin and North West Cape (*Australian Defence Magazine* 2006, p. 16).

In the middle of the spectrum are those information capabilities embedded in military platforms. When linked to weapon systems, these embedded information capabilities largely determine the military competitiveness of the platforms that host them. Radars and other sensors and associated data-handling and signal-processing systems illustrate the *operational-level* information capabilities in the middle of the spectrum.

Also in the middle of the information capability spectrum are those niche products developed to meet unique Australian requirements, or where the Australian innovation system has pioneered a solution to a common problem. Such products include, for example, the laser airborne depth sounder and mine-sweeping system developed by DSTO and licensed to Australian companies.

At the other end of the spectrum are logistic information systems and other defence business systems. It is the efficiency and effectiveness of these *defence business systems* that largely determine the productivity of the overall Defence organisation and of its constituent elements.

Supplying and supporting a system-of-systems: The Jindalee operational radar network (JORN)

In order to monitor Australia's northern maritime approaches, Australian governments have invested in an evolving portfolio of mutually supportive and complementary surveillance assets. This portfolio presently includes patrol boats, P3 Orion long-range maritime patrol aircraft, airborne early warning and control aircraft, and JORN.

JORN reflects high-frequency radar signals off the ionosphere to monitor broad areas of the earth's surface beyond the horizon. Australian defence scientists became interested in the military potential of ionospheric radar reflection in the 1950s, but did not start formal research and crucial discussions with US scientists until 1970. The seminal 1976 Defence White Paper recognised the potential importance of JORN, but a further decade of development was required before the government decided to acquire JORN in 1986.

Underpinning support for JORN innovation during its protracted development was a clear consensus within the Defence policy community about the overriding strategic importance of effective surveillance of Australia's northern approaches. In addition, the DSTO was able to take advantage of US experience to make steady progress in demonstrating JORN's ability to track ships and aircraft. Also critical was centralised control over defence budget allocations and force structure development introduced by Sir Arthur Tange with the reorganisation of the Defence group of departments in the early 1970s.

JORN's transition from government-funded research and development to commercially based development and production revealed fundamental weaknesses in the Australian defence value-adding chain. In December 1990, Telecom (the Australian government-owned telecommunications provider) won the contract to take JORN from a scientific prototype to a deployed system. Six years after the contract was signed, the Australian National Audit Office (ANAO) reported that, while 80 per cent of the JORN budget had been spent and 80 per cent of the project schedule had elapsed, the consortium had finalised less than 20 per cent of the JORN deliverables (Auditor-General 1996, p. 21).

This and other developments led Defence to reassign the JORN contract to a consortium comprising Rockwell Lockheed Martin (a US system house with extensive experience in managing complex developmental projects) and Tenix, a successful Australian naval shipbuilder (but not, at that stage of its development, a systems house). The new consortium, known as RLM Pty Ltd, assumed full responsibility for the project in 1999.

RLM began recovery of the JORN program by redefining technical deliverables in close consultation with the DSTO scientists involved in JORN development. To deliver the re-baselined project, RLM handpicked software engineers, other technical personnel and subcontractors, and co-located them in a purpose-built software development and integration facility. In order to align commercial incentives and project outputs, RLM revised project management arrangements, introduced earned value principles, clarified risk and introduced a formal, stringent process to manage it.

The Royal Australian Air Force (RAAF) accepted JORN into service in April 2003 and RLM gained a relatively modest four-year contract for JORN operational maintenance and support. By then, however, RLM's failure to gain other defence software development work (largely attributable to the hiatus in defence business that occurred in the lead up to the publication of the Defence 2000 white paper) forced it to sack 60 per cent of its handpicked software development team and to sell its purpose-built software development facility. By 2005, RLM turnover had stabilised at $55 million and its workforce at 240 people (ADM 2006, p. 23).

In the meantime, the DSTO has continued to develop JORN and the RAAF has continued to learn about the system's strengths and weaknesses in preparation for an upgrade to the current JORN system in 2007. How these arrangements will capture prior "learning by doing" and "learning by using" from the JORN system remains to be seen.

Operational-level information capabilities: Active phased array radar

In the Australian context, development of *operational-level* information capabilities tends to be more evolutionary and path-dependent. Australian companies have been prepared to assume more risk in this middle segment of the information capability spectrum, often in active partnership with DSTO.

Small surface combatants like the navy's ANZAC-class frigates need defence against air and surface attacks, to perform in complex operational environments characterised by high levels of jamming and to operate in crowded, cluttered conditions. To this end, smaller surface combatants need radars able to undertake general surveillance, to detect sea skimming missiles and to illuminate targets for weapon systems, all within stringent constraints of space, weight, power and electro-magnetic environments. Australia uses active phased array radar to solve these requirements.

By using electronic beam-forming and scanning technology, active phased array radars can generate simultaneously, for example, wide beams for searching, narrow beams for tracking and flat fan-shaped beams for determining height. Typically, active phased array radars are arranged so that static faces provide continuous 360-degree coverage, thereby eliminating the need for machinery to point the antenna at the target.

In Australia, CEA Technologies (turnover: $28.3 million; employees: 215) has pioneered the application of active phased array technology in maritime surveillance and anti-ship missile defence. CEA Technologies has developed scalable active phased array radar systems that can be adapted to varying performance/platform requirements. In September 2005, the Australian government announced its selection of CEA'S fixed-face, active phased array radar (CEAFAR) and active phased array target illuminator (CEA MOUNT) for inclusion in the anti-ship missile defence (ASMD) upgrade of the ANZAC frigates.

CEA is also the prime contractor for the Australia–United States Phased Array Radar (AUSPAR) program. Under AUSPAR the US and Australian departments of defence are collaborating in the development of CEA's existing CEAFAR technology to achieve higher power transmission capability without prejudicing CEAFAR's scalability, light weight and low cost. This represents a substantial departure from the government-to-government arrangements that dominated, for example, collaboration in JORN.

CEA Technologies' key contribution to the defence value chain was to develop, market and install a cost-effective, low-power, light-weight version of active phased away radar suitable for small ships and scalable to larger applications.

Supplying and supporting defence business systems

The Australian government participates actively in Australia's burgeoning market for information and communications technology (ICT). In 2002–03 the government concluded over 13,000 contracts worth some $1.2 billion, or about 1.3 per cent of total ICT sector income in that year. The value of Australian government ITC contracts grew 7 per cent in 2003–04 and a further 19 per cent in 2004–05.

Defence is by far the largest buyer of non-military ICT in the Australian government. Defence dominance of Australian government ICT business has receded but, in 2004–05, Defence still accounted for 22 per cent by value and 27 per cent by number of Australian government ICT contracts.

Defence tends to follow commercial best practice at the business systems end of the information capability spectrum. This business is strategically and commercially significant. For example, Defence's spares inventory comprises some 1.6 million categories of stores, valued at some $1.9 billion (Auditor-General 2004c, p. 5). Vigorous competition for this business enables Defence to benefit from commercially driven innovation in, for example, improving its management of financial and personnel data.

As part of the Defence Supply System Redevelopment Project, for example, MINCOM adapted inventory management software developed for the mining industry and applied it to Defence logistic management. The widely publicised problems that Defence and MINCOM encountered in upgrading and standardising Defence's logistic information systems illustrate the impact of project management on the defence value chain. The Auditor-General, while recognising MINCOM's difficulty in solving certain technical problems, attributed most of the problems to Defence's failure to manage the project as a strategic procurement activity (Auditor-General 2004c, pp. 5–7).

In contrast, Australia's defence value-adding chain succeeded in marshalling public and private resources to meet defence requirements for a device that allows users of secure computers to access insecure networks such as the Internet without compromising their own security. To meet this requirement, the DSTO developed the Starlight suite of products, which it licensed to Tenix in 1988. These products can be used in almost any networked computing environment where secure access to two different networks of different security classifications is required from the one workstation. The Australian departments of Defence and of Foreign Affairs and Trade use some 5000 Starlight units (AGIMO 2003).

The successful transfer of the Starlight technology from the DSTO to Tenix illustrates how the "learning by doing" element of Australia's defence value-adding chain can work. DSTO staff worked closely with the company during the entire development process. The two parties set out to develop an industry capability rather than just a product. This enabled Tenix to establish an overall capability in information security rather than merely establishing a capacity to supply and support a single product. The DSTO and Tenix continue to collaborate in the development of the next generation of Starlight technology.

Defence information capability: The challenge for Australian industry

The development of information capabilities will dominate Australian military innovation for the foreseeable future. Adapting to the needs of knowledge-intensive military operations by the ADF will pose a major challenge for the Australian defence industry. A key measure of the value contributed by Australian industry will be the extent to which it supplies and supports such key information capability developments as:

- military satellite communications (Joint Project 2008): $480 million – $650 million
- ADF joint command support (Joint Project 2030): $200 million – $300 million
- defence-wide area communications (Joint Project 2047): $250 million – $350 million
- land battlespace communication system (Joint Project 2072): $550 million – $700 million
- maritime command system (SEA 1442): $280 million – $400 million.

Supply and support of navy ships boats and submarines

A fundamentally maritime strategy for defending Australia is a logical consequence of Australia's strategic geography, its relatively small population and its comparative advantage in a range of technologies (Defence 2000, p. 47, 6.6–6.7). A credible Australian maritime strategy needs more than sufficient numbers of naval vessels suitably configured and equipped for operations

in the Australian environment (force structure). Those vessels must also be ready to undertake operations after a given period of notice and be able to sustain operations for a given period of time (preparedness). To this end those vessels must be maintained on a routine basis, repaired if they are damaged, upgraded so as to remain militarily competitive and adapted to meet the requirements of specific missions.

The Australian navy shipbuilding cycle

Australian industry's current capacity to support navy preparedness derives largely from choices made some 20 years ago. In 1987 the government awarded the $5 billion Collins-class submarine contract to ASC, then a new entrant to the naval shipbuilding business operating a purpose-built facility at Outer Harbour in South Australia. Subsequently, in 1989 the government awarded the $7 billion ANZAC ship contract to what is now Tenix, operating the newly privatised Williamstown Dockyard in Victoria. As Australia does not design naval combatants, obtaining access to the requisite overseas intellectual property was a critical feature of these commercial arrangements.

These decisions initiated a naval shipbuilding cycle that will end with the delivery of the last of ten ANZAC ships in June 2006. While this cycle was dominated by the ANZAC ship and Collins-class submarine projects, it also included the construction of oceanographic ships by North Queensland Engineers and Agents, the construction of six Mine Hunter Coastal vessels by ADI, the conversion of HMA ships *Manoura* and *Kanimbla* by Forgacs, and the capability upgrade of Australia's guided missile frigates by ADI.

The subsequent naval shipbuilding cycle started, arguably, with the awarding of the contract for Armidale-class patrol boats to Defence Maritime Services Pty Ltd in 2004. This next cycle will be driven primarily by the construction of three air warfare destroyers (to cost between $4.5 billion and $6 billion) and, subject to decisions yet to be made, of two amphibious support ships (to between $1.5 billion and $2 billion).

In 2005 the government selected ASC (turnover: $229.3 million; employees: 1020) to build the air warfare destroyers. In August 2005 the government announced the two candidate overseas designs for the amphibious support ships and foreshadowed an invitation to Australian shipbuilders to tender for their construction. The government reiterated its preference for building the ships in Australia, provided Australian industry demonstrates it can deliver the project at a competitive price. Assuming that the government does in fact decide to build both air warfare destroyers and the amphibious support ships locally, this next cycle would still entail a lower level of expenditure compressed into a shorter time frame than the previous cycle. It would begin winding down with the delivery of the second amphibious support ship in 2013.

Supporting navy preparedness

The Collins-class submarine and ANZAC ship programs demonstrate how local construction fosters local industry's capacity to repair and maintain naval ships (thereby helping them sustain operations for as long as necessary), and to modify and adapt naval ships (so that they remain militarily competitive and interoperable with friends and allies).

In December 2003 ASC signed a 25-year $3.5 billion contract for the through-life support of the Collins-class. ASC's capacity to support the Collins-class derives from its access to Kockums' intellectual property about the design, from the detailed engineering knowledge about the platform and its systems accumulated by ASC in the course of constructing the submarines, and from the tacit knowledge accumulated by the ASC workforce. The ASC can now undertake full-cycle dockings of the submarines at Outer Harbour in South Australia and intermediate dockings of the submarines at the Australian Marine Complex, Henderson, Western Australia. The latter facility is close to where the submarines are home-ported at HMAS *Stirling* and enables both ASC and the navy to learn by doing and learn by using.

ASC's capacity did not come easily: ASC and its sub-contractors encountered widely publicised technical and engineering problems in constructing the submarine and developing its combat system. The DSTO's detailed engineering model of the Collins-class helped solve these problems. The Macintosh–Prescott report documented managerial and systemic failures in Defence project arrangements that greatly reduced the value derived from local construction. This loss of value was exacerbated by failure to secure control of Collins-class intellectual property. ASC only secured access to the crucial Kockums' intellectual property after a protracted and expensive dispute which was not settled until June 2004.

Tenix and its main sub-contractors have also transitioned the expertise they accumulated during construction of the ANZAC ships to in-service support of those vessels. Routine in-service support (including ad hoc repair) crucial to the readiness and sustainability of the ANZAC ships is provided through contracts between the Commonwealth and Tenix (for hulls, hull machinery and ship systems) and SAAB Systems (turnover: $177 million; workforce: 300). The latter is responsible for ANZAC combat systems and weapon systems.

The contract for routine support of the ANZACs is managed by the ANZAC Ship System Project Office (SPO), which is out-posted from the DMO. Contractor personnel are co-located with uniformed and Australian public-service members of the SPO in an open-plan office in Rockingham, Western Australia. These arrangements make for rapid response to and resolution of defects, as well as facilitate the routine and ad hoc maintenance requirements and engineering support.

They enhance ANZAC ship preparedness by helping contractors and Defence harvest learning by doing and learning by using.

The Department of Defence, Tenix Defence Systems and SAAB Systems signed the ANZAC Ship Alliance in July 2001. The alliance is a significant innovation in Defence business practices. It aims to reduce the cost of transactions among Defence (responsible for formulating change requirements as a result of operational experience with the ANZACs), Tenix (responsible for platform in-service support, drawing on its knowledge of the ANZAC ship supply chain) and SAAB (responsible for in-service support of the ANZAC combat system, which it developed, integrated and set to work).

Supporting navy preparedness: Innovation

The contract for the provision of Armidale-class patrol boats is an important experiment in the search for more efficient and effective ways to support navy preparedness. In procuring navy ships (and other materiel), Defence traditionally specifies in detail, for example, the number of vessels it requires, their length and other dimensions and the standards to which they are to be constructed. The acquisition strategy for the Armidale-class patrol boats departed from this traditional model in favour of a "performance-based" model.

Under this model, Defence invited companies to tender for a patrol boat system generating 3000 days of operational availability each year for 15 years at a specified level of performance, with the capacity to surge to 3600 days per year. The performance requirements specified by Defence included, for example, the ability to conduct surveillance and response boarding operations at the top of Sea State 4 (wave heights of 2.5 metres) and to maintain surveillance to the top of Sea State 5 (wave heights of 4 metres). The acquisition strategy integrated the through-life support (TLS) Semaphore 2006 package into the performance-based procurement.

This culminated in the award on 17 December 2004 of a $553 million contract to Defence Maritime Services Pty Ltd for the design, construction and in-service support of 12 Armidale-class patrol boats. The innovative Armidale-class business model changed the structure of Australia's naval shipbuilding industry by enabling Austal ships (turnover: $65 million; employees: 1100) to enter the Australian defence market. Austal's US subsidiary is also drawing on Austal's expertise in building large fast aluminium ferries to construct prototype littoral combat ships for the US navy.

Supply and support of army land-based manoeuvre

The role of the Australian defence industry in the supply and support of army land-based manoeuvre capability is illustrated by its involvement in the following projects:

- acquisition of field vehicles and trailers (Project LAND 121) and of Bushranger infantry mobility vehicles (Project LAND 116)
- Leopard tank replacement project (LAND 907)
- upgrade of M113 armoured personnel carriers (LAND 106)
- supply and support of Australian light armoured vehicles (ASLAV).

Army land-based manoeuvre: Tanks

Defence is procuring 59 ex-US army Abrams tanks from the US government under US foreign military sales (FMS) arrangements at an estimated total project cost of $534 million. Australian industry will not be involved in the supply of these tanks, which are being refurbished in the US. Australian industry can add value by undertaking TLS of the tanks. This involves:

- supplying and managing the inventory of spares, including warehousing support
- providing engineering support
- configuration management
- maintenance support
- packaging, handling, storage and transport support
- technical data and publications support
- providing special tools and test equipment.

In providing TLS for Australia's Abrams tanks, Defence is likely to conclude a Cooperative Logistic Supply and Support Agreement (CLSSA) with the US government, thereby taking advantage of much larger US army purchases to obtain lower prices. This leaves Defence with the following broad options for Abrams TLS:

- TLS by army technical personnel in-house (which is constrained by the difficulties the army is experiencing in attracting and retaining technical personnel – Defence Budget 2005–06, p. 142)
- TLS by contractors located in Darwin (which is close to where most of the tanks are based but where labour is more expensive), or in Adelaide (which is at the other end of the Alice Springs–Darwin railway but where skilled labour is more plentiful).
- TLS by Tenix at Bandiana in Victoria under AWMA auspices (thereby taking advantage of lower labour costs, but at the expense of much higher transport costs and much reduced tank availability).

The forthcoming tender for TLS of the Abrams tanks is an opportunity for Defence and candidate TLS providers to address these trade-offs in competing for the business.

Army land-based manoeuvre: Light armoured vehicles
The army has operated ASLAV for some ten years. After evaluating the vehicles, Defence procured ASLAV from what is now General Dynamics Land Systems Australia (GDLS-A) in two phases, each of which has involved significant engineering changes to meet Australian requirements. These changes (for example, the addition of a commander's turret) were undertaken by GDLS-A at the company's facility in Pooraka, South Australia.

The current phase involves procurement of additional vehicles and the standardisation of the total fleet (of 257 vehicles) at an estimated total project cost of $672 million. GDLS-A is scheduled to complete this task by August 2006. In addition to modifying the ASLAV for Australian conditions, GDLS-A also provides TLS for the ASLAV fleet under a standing offer due to expire in August 2006.

As the main ASLAV operators are located in the NT and Queensland, ASLAV TLS involves trade-offs analogous to those for TLS of the Abrams tanks. Despite GDLS-A's longstanding involvement in supply and support of the ASLAV, Defence is scheduled to test these arrangements by calling tenders for TLS of ASLAV in mid-2006. The business seems likely to attract strong competition, thereby encouraging both incumbent suppliers and new entrants to offer innovative arrangements for TLS of the ASLAV.

Army land-based manoeuvre: Armoured personnel carriers
The army has operated M113s since the 1960s. Arrangements for supply and support of the M113s illustrate how the Defence choice of arrangements for logistic support influences industry capability. In 2002 Defence accepted an unsolicited proposal by Tenix Defence Land Division and awarded it the prime contract for upgrading 350 M113s at an estimated total project cost of $672 million. The upgrade is intended to improve infantry protection, firepower and mobility.

In order to take advantage of overseas technological innovation, Tenix has teamed with FFG, a German company with extensive experience in upgrading German and Danish M113s. Nevertheless, the project encountered widely publicised difficulties that were analysed by the Auditor-General in 2005.

According to the ANAO, Defence set aside the conventional competitive tendering process for the M113 upgrade because Tenix's offer was based on access to a specialist vehicle rebuild facility provided free-in-aid and on the low labour rates charged under the AWMA Commercial Support Program Contract. The impact of these arrangements on the distribution of defence industry activity is illustrated by the division of the M113 upgrade work between Tenix's facilities in Adelaide and Bandiana, the government-furnished facility it manages in the AWMA.

In Adelaide, Tenix Land Division is undertaking the:

- design and production of demonstration vehicles and initial production vehicles
- design and production of the one-man turret and external fuel tank to be fitted to the upgraded vehicles
- development and proof of tooling and preparation of production process instructions
- development of integrated logistic support arrangements.

Tenix Land Division will undertake full-scale production of the upgraded vehicles at Bandiana. This will start in 2005 and be completed in 2010. This distribution of activity between Adelaide and Bandiana reflects the much higher hourly labour rates Tenix charges for work in its Adelaide facility compared to Bandiana (Auditor-General 2005, p. 24).

Army land-based manoeuvre: Field vehicles
The army's current field vehicle and trailer (FV&T) fleet comprises some 7700 vehicles (distributed among five vehicle types and 40 different variants classified into light, medium and heavy mobility categories). It also includes some 3100 trailers, 750 motorcycles and all–terrain vehicles.

Defence is replacing this fleet at an estimated project cost of $2.4 billion–$3.1 billion under LAND 121. While LAND 121 seeks to simplify and rationalise the composition of the FV&T fleet, the project still provides for a complex inventory comprising six generic fleet ranges incorporating over 80 variants.

Military trucks are a relatively mature technology whose production is characterised by large-scale economies. Defence has decided that, because there is no strategic or operational justification for paying a premium for local production of trucks, it will import military-off-the-shelf vehicles. In this, Defence is no different to Australian civil truck operators who imported 99 per cent of the 284,000 light, medium and heavy trucks sold on the Australian domestic truck market in 2002 (Wylie 2004, p. 38).

In a significant innovation in defence business practice, the DMO has moved from contracting separately for the acquisition and in-service support of major platforms and systems. The DMO now requires the prime contractor not only to supply major platforms and systems, but also to provide their in-service support. As a result, overseas truck suppliers competing for the LAND 121 contract are teaming with local companies who would provide in-country support. That support will in turn be provided by a combination of in-house and commercial arrangements.

The army seeks to retain an in-house capacity for first-line maintenance (that is, work requiring up to ten hours for completion and to be undertaken by deployed units on continuous operations). It will also seek to maintain

significant capacity in-house for field maintenance and repair, but will rely on contractors in the rear support area to undertake repairs requiring 100 hours or more.

Army land-based manoeuvre: Infantry mobility vehicles
In addition to procuring unprotected field vehicles under LAND 121, the army is also procuring an infantry mobility vehicle that provides better personnel protection during land operations, but greater range and mobility than the armoured vehicles already in the army's inventory. ADI Limited won the Defence competition for this requirement with its Bushmaster infantry mobility vehicle.

The Bushmaster vehicle has a range of 600 to 800 km, depending on the terrain. It can carry three days of supplies, giving Australian forces exceptional mobility. According to Defence, the Bushmaster provides levels of protection against mines, mortar splinters and small arms fire unmatched by any comparable vehicle in operation worldwide.

Bushmaster development and production entailed substantial cost overruns and delays. These difficulties illustrate how poor project management arrangements reduce the value otherwise generated by local industry. According to the ANAO, "The vehicle ultimately procured by Defence was largely of an unproven design and capability, and was far more developmental than originally intended. However, Defence initially managed the project as though it was a Commercial Off the Shelf (COTS) procurement, rather than recognising the developmental nature of the project" (Auditor-General, 2004b, p. 4, para 5). These difficulties culminated in Defence reducing the number of vehicles procured from the 370 originally envisaged to 299 – a measure of the significant value lost through deficient project arrangements.

Supply and support of defence munitions

The ADF uses a combination of ballistic weapons and munitions, and precision and guided munitions. The nature and scale of value added by Australian industry varies widely across this spectrum.

Ballistic munitions and weapons
Production of ballistic weapons involves relatively mature technologies characterised by large economies of scale. ADI Limited is the only Australian producer of ballistic weapons. To this end ADI operates a mixed portfolio of government-owned and ex-government factories (Mulwala, Bendigo and Lithgow) and a purpose-built facility at Benalla.

The production of munitions is managed under the Strategic Agreement for Munitions Supply (SAMS) between ADI and Defence. This agreement, signed by the Commonwealth and ADI on 9 July 1998, provides for the supply of munitions to the ADF until 2015 with options for further extension. The agreement is unique in Australian defence industry in requiring ADI to establish and maintain a strategic capability for munitions manufacture in Australia and the Commonwealth to guarantee ADI a return on that investment.

The Mulwala facility produces propellant and high explosive (HE) for use in ADF munitions. Because it is not commercially viable Mulwala is owned by the Commonwealth but leased to ADI. Defence pays ADI an annual capability payment to maintain a Mulwala workforce, industrial competencies and systems to agreed levels.

Mulwala takes two months to produce the ADF's annual requirement for HE and propellant. For the balance of the year, ADI markets the surplus output to other interests, both nationally and internationally, and shares the profits earned with the Commonwealth.

ADI designed its Benalla facility to produce selected natures of ammunition on a small scale commensurate with the ADF's requirements. The ADF will generally purchase and consume Benalla's total annual output of ordnance. The Benalla workforce generally works to a single eight-hour shift. Under this arrangement Benalla produces, for example, hand grenades, some 24 million rounds of 5.56 mm rifle ammunition and two million rounds of 12.7 mm machine gun ammunition. It also produces a mix of 105 mm howitzer ammunition, navy five-inch gun rounds and 81 mm mortars totalling up to 50,000 rounds annually.

ADI's Bendigo facility specialises in heavy engineering for maritime and land vehicles manufacture, maintenance, repair, refurbishment and support. It recently signed a contract to supply high-mobility engineering vehicles to the US army. It is currently upgrading the Otto Malara naval gun and manufacturing the Commanders Weapon Station for the ASLAV Program. It supplies marine modules for General Electric's LM2500 engines sold world wide.

ADI's small arms factory at Lithgow has manufactured 90,000 5.56 mm Steyr AUG assault rifles for the ADF, 8000 Minimi light support weapons, 50 calibre quick change barrel machine guns. It is currently manufacturing the Aerodynamic Control Fin for the evolved sea sparrow missile, .22 calibre Steyr AUG training rifles for the ADF, Phalanx penetrator assembly and handcuffs.

Precision and guided munitions
Precision munitions comprehend a broad spectrum of capabilities and provide commensurate scope for innovation. A first step is to improve the ballistic efficiency of conventional munitions by, for example, using base bleed projectiles to achieve a greater range for the same propellant charge. The ballistic effectiveness of conventional munitions can also be improved by, for example, using a single "cargo" munition that releases bomblets on reaching the target.

A second step is to improve the accuracy of ballistic firing of conventional projectiles by using a standard NATO plug to incorporate a "one-degree" course correction fuze. This reduces the range dispersion of projectiles on the ground. Australia does not currently manufacture either conventional or course correction fuzes, both of which it imports and stockpiles.

A third step involves the incorporation of, for example, a "two-degree" course correction fuze to further improve the accuracy of conventional projectiles by reducing both range and azimuth dispersion of the projectile on the ground. Conventional projectiles can also be improved by the addition of a GPS guidance capability and aerodynamic surfaces for guidance. Such enhanced projectiles are then programmed with a grid reference for the target, and after firing they deploy aerodynamic surfaces that guide the projectile to the reference.

An example of such enhancement is the conversion by Hawker de Havilland (HdH) of a conventional MK 82 iron bomb into an air-launched stand-off weapon. HdH, a subsidiary of Boeing Holdings Australia, has drawn on prior DSTO development of a strap-on wing kit to enable the MK 82 bomb to glide unaided from point of release to its target. HdH has added a cheap, reliable GPS-based inertial guidance system linked to removable tail fins for directional control (Wylie 2004, p. 41).

Greater ballistic efficiency and effectiveness from the above first-, second- and third-order improvements can enhance ADF tactical and operational flexibility principally by broadening the options available to a commander for the deployment of indirect fire. To the extent they reduce the amount of ammunition required to achieve a given battle effect, they have important implications for logistics, local munitions manufacture (including the balance between manufacture and stockpiling) and local ordnance manufacture (by, for example, extending the barrel life of the ordnance involved.

Guided munitions constitute a fourth stage of improvement. For example, self-sensing missiles use millimetric wave radar or infra-red sensors to top-attack armoured vehicles with a shaped charge. Related improvements include terminally guided missiles that follow; for example, a laser beam reflected by the target.

This category of terminally guided missiles includes the evolved sea sparrow missile (ESSM) with which Australia is upgrading the ANZAC ships' defence against anti-ship missiles. Australia, Canada, Denmark, Greece, The Netherlands, Norway, Spain Turkey and the US are collaborating in order to share the cost and risk inherent in ESSM development and production. BAE Systems Australia and other Australian companies are contributing to the development of, for example, the missile's guidance section, thrust vector controller, and certain control surfaces to be incorporated in all ESSMs produced (Wylie 2004, p. 41).

The fifth stage of improvement involves missiles that sense potential targets and discriminate among them. The efficacy of these missiles is increasingly dependent on the technology required to integrate and interpret data from a variety of sensors (that is, "sensor fusion").

These missiles are more autonomous and independent of the launch platform. The requisite programming is fed directly into the missile itself, rather than into, for example, an aircraft's combat data system. The programming of such missiles is a matter for mission planning that is independent of the launch platform employed.

Precision guided munitions at the fourth and fifth stages of the munitions' capability spectrum involve strategic, force structure and operational considerations that are qualitatively different to those pertaining to the ballistic munitions characteristic of the first, second and third stages of the spectrum. Precision weapons are equipped with sophisticated guidance and navigation systems that can traverse large distances in all weather conditions from release to target with minimal collateral damage.

The development of precision guided weapons and of "smart" ballistic munitions is increasingly blurring the distinction between munitions and wider defence information capabilities. The software that determines guided missile capability requires upgrading in response to the development and deployment of countermeasures or to exploit improved target detection, tracking, discrimination and aim point selection. Such software must by modified for Australian circumstances and when the missiles are integrated into new platforms.

Missile software development and management is a skill-intensive and knowledge-intensive activity. Australian industry has to date played little part in supply and support of the ADF's precision and guided weapons inventory. In pursuing the advantages of precision and guided weapons, Australia's choices are constrained by the cost and high technical risk involved.

Australia imports its high-capability/high-cost precision and guided munitions like Harpoon anti-ship missiles. The US will only release to Australia on a government-to-government basis the software required to manage the Harpoon. Defence therefore manages the Harpoon and similar weapons via DSTO and the Joint Ammunition Logistic Organisation and returns the weapons to the original equipment manufacturer (OEM) for deeper maintenance – a process that can take up to 18 months (Wylie 2004, p. 41).

Supply and support of military aviation

Defence is likely to spend $A29 billion on supply and support of military aviation between 2003 and 2014 (Industry Division, Department of Defence 2003, p. 22). Some 40 to 50 per cent of this projected expenditure will be devoted to further development of Australia's military

aviation force structure by acquisition of, for example, airborne early warning and control aircraft, and, later in the decade, of joint strike fighters to replace the F/A-18 Hornets. Australia will import all of these aircraft, with about 25 per cent of the acquisition expenditure incurred in Australia (Aerospace Plan 2003, p. 23).

About 20 to 30 per cent of projected expenditure on military aviation over the next decade will be devoted to maintaining the readiness of the existing military aviation force structure. This will entail major upgrades of, for example, F/A-18 Hornet fighter aircraft, C-130 H transport aircraft, Orion P3 long-range maritime patrol aircraft, and Sea Hawk and Black Hawk helicopters. Defence has contracted the OEMs to upgrade ADF aircraft, because they control the requisite intellectual property. As a result, only about 10 per cent of Defence expenditure on the upgrade of military aircraft is undertaken in Australian industry.

Provision of the TLS required to enable the existing force to sustain operations accounts for the remaining 30 per cent of projected expenditure of $A29 billion. Some 65 per cent of Defence's expenditure on TLS of military aircraft will be incurred in Australia (Aerospace Plan 2003, pp. 22–3).

Australian industry has had mixed success in the provision of TLS of Australian military aircraft. This mixed record reflects important shifts in the way Defence has managed TLS of military aircraft. This shift can be traced through the F/A-18, Hawk Lead-in Fighter, armed reconnaissance helicopter and Joint Strike Fighter programs.

Australia announced its selection of the F/A-18 Hornet aircraft to replace the RAAF's Mirage aircraft in October 1981. Procurement of the F/A-18 was completed in May 1990. The F/A-18 project entailed extensive Australian industry involvement, primarily in order to "provide in industry the capability to undertake required engineering, maintenance and spares provision support for the aircraft, its systems, equipment and support facilities, during the service life of the aircraft" (Industry Investment and Contracting Division 1994, p. 36). In the event, the RAAF supported the F/A-18 largely in house and made little use of the capacity established in industry (Industry Improvement and Contracting Division 1994, pp. 38–9).

Defence subsequently changed its aircraft procurement business model. In the case of the Hawk lead-in fighter, for example, BAE Systems was contracted not only to supply 33 Hawk aircraft, but also to provide their in-service support. To this end, BAE Systems established the facilities and recruited and trained the workforce required to assemble the aircraft at Williamtown, where the aircraft are based. After completing delivery of the 33 aircraft, BAE Systems then converted the facilities and workforce over to TLS of the aircraft. Similarly, Defence awarded Australian Aerospace Ltd a contract for supply, assembly, test and in-service support of the army's 22 armed reconnaissance helicopters.

This approach to fostering in-country TLS capacity has important limitations. According to a recent audit of the Wedgetail Airborne Early Warning and Control project, denial of US government export licenses has precluded Australian industry from undertaking, for example:

- design and development of Wedgetail sensors, mission systems, communication systems, electronic warfare systems, electronic support systems and tactical intelligence sub-systems
- the range of system integration tasks required for Australian support of Wedgetail systems and associated test and support systems
- full Wedgetail TLS, including software and systems integration, test and evaluation, and operational and logistic support (Auditor-General, 2004a, p. 28).

Arrangements for Australian participation in the Lockheed Martin F-35 JSF program will influence the development of Australia's defence aerospace industry capacity. Lockheed Martin and its partners, British Aerospace and Northrop Grumman, are developing the JSF as the next-generation multi-role fighter for the US air force, the US navy and the US marine corps. The aircraft will be designed for low observability. It will be able to use a wide range of air-to-surface and air-to-air weapons, carried internally. It will feature an active electronically scanned array radar and advanced electro-optical and infra-red sensors.

Lockheed Martin initiated the JSF system development and demonstration (SDD) phase in October 2001 with a view to developing not only the aircraft and its systems, but also the associated supply chains. Australia is participating in the SDD phase, along with the US, UK, Canada, Denmark, Norway, Italy, Netherlands and Turkey.

Arrangements for Australian industry participation in the JSF program constitute a sharp departure from the pattern established in previous military aircraft acquisitions. The JSF program has no "guaranteed work-share" arrangements and companies will compete for participation in the JSF's international supply chain on a "best value" basis, according to their capabilities and competitive advantages.

This approach has important limitations. The Head of the Australian Defence Staff in Washington reportedly told the US Senate Armed Services Committee that "Guaranteed access to necessary JSF data and technology to allow Australia to operate and support the JSF will be required if we join the next phase of the project" (*Australian Financial Review,* 16 March 2006). The history of Australia's previous procurements of advanced US technology suggests, however, that Australia – like other non-US participants in the JSF program – will have difficulty securing access to the full range of software required to maintain the aircraft in Australia.

Subject to how Defence manages the business involved,

however, its procurement of unmanned aerial vehicles (UAV) may offer greater scope for Australian industry participation in supply and support of the platforms and systems involved. At the strategic end of the capability spectrum, Defence is exploring the potential of the Global Hawke long-endurance unmanned aerial vehicle (AIR 7000 Phase 1). At the tactical end of the spectrum, the Defence Capability Plan 2004–14 provides for the acquisition at an estimated cost of $100 million to $150 million of a tactical UAV system capable of providing airborne surveillance, reconnaissance and target acquisition to support land operations (Joint Project 129 Phase 2).

Conclusion

The concept of a defence value chain provides a useful framework within which to analyse the contribution by Australian industry to supply ADF structure and support ADF preparedness. This focus on the value added by industry and other elements of the defence value chain highlights the extent to which deficiencies in the defence business model and under-performance by industry combine to erode the defence capability value generated by indigenous supply and support of ADF structure and preparedness.

That said, the analysis also shows how a robust defence industry broadens the military options open to Australian governments in managing strategic uncertainty and, if necessary, mounting a military response to a security challenge. The analysis highlights the impact on the Australian defence value chain of the increasingly complex and knowledge-intensive systems Defence is procuring in the perennial competition for military advantage.

In the environment created by this category of procurements, the development of Australian institutions and processes able to capture learning by doing, learning by using, and learning by the interaction of users and producers will be crucial to maximising the capability value such procurements generate. Defence procurement of complex, knowledge-intensive systems is also shifting Australian industry involvement away from manufacturing goods towards the supply of services. The latter requires the customer and supplier to be located in close geographical and functional proximity, a requirement favouring local provision. On the other hand, Australia's arrangements for the supply of military hardware, ranging from ballistic munitions, hulls and machinery for naval ships, land vehicles and military aircraft, seem increasingly likely to reflect the international division of labour.

Overall, the analysis suggests the concept of an Australian defence industry is unhelpful and the notion of an Australian defence industry policy leads to an increasingly inappropriate focus on the production of goods. What emerges is the need for a Defence policy for Australian industry focused on the contribution local supply and support makes to ADF preparedness and, in turn, to the military options available to Australian governments.

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THE joint strike fighter:

A global supply chain with local impact

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On 27 June 2002, the Australian government announced its intention to join the system design and development (SDD) phase of the United States (US) Joint Strike Fighter (JSF) program. Senator Robert Hill, then Minister for Defence, indicated that this decision anticipated acquisition of up to 100 JSF aircraft at a sticker price of around US $40 million each to replace the Royal Australian Air Force's (RAAF's) ageing F-111 and F/A-18 inventories, with final sign-off expected in 2006/07.[1]

PHOTO: LOCKHEED MARTIN

From the beginning, the Australian government's approach defied expectations. The selection of a new air combat capability in JSF eschewed the formal capability development and procurement processes: competitive tendering was sidestepped; alternative aircraft solutions were dismissed; whole-of-government contestability never entertained. The perception of how defence business was conducted in Australia felt the immediate impact of the decision, and what it might mean for future investment and strategy in the defence industry.

The JSF program is a program of superlatives; the biggest US defence program and the biggest in Australia. It expects to deliver 2400+ aircraft to the US air force, navy and marine corps, and a further 700-plus aircraft to the program's international investment partners. Total export sales based on replacement of F-16, F18 and Harrier fighter aircraft could exceed 2000–3000 aircraft.

Lockheed Martin (LM) with its principal commercial partners is contracted to deliver the SDD phase, with contracts for production expected from 2007. Australian participation has opened the way for local companies to seek and win a place in the JSF global supply chain. On this basis, Ian Macfarlane, Minister for Industry, Tourism and Resources, said Australia could expect to capture at least $4 billion of work.

The aim of this case study is to examine the impact on the Australian defence industry of participation in the JSF project (assuming SDD and follow-on phases), and review the prospects for the sector should the approach taken in JSF be applied broadly across future defence acquisitions. The case study will not address capability issues and assumes that the JSF will meet the operational requirements of the RAAF.

On the JSF chain gang

The JSF project has been international from the outset, through the investment and industry involvement of the United Kingdom (UK). This has increased with the addition of further foreign partners. The international investment, and the laying aside of the "Buy America" Act and other restrictive US regulations, have led to the development of a global supply chain; a marked change from the supply practice of past US programs.

Despite the large export volumes achieved by the US defence industry, import volumes, reflecting the supply of foreign goods into the US supply chain, have been exceedingly small, less than 2 per cent for defence overall, and 1 per cent on military aircraft.[2] This reflects an industry that traditionally has not sourced inputs outside of the US,

contrasting with other industry sectors such as automotive and information and communications technology (ICT).

While the US defence acquisition program is the largest in the world, and potentially would realise significant benefits in cost reduction, innovation, access to alternative technologies and risk-sharing through increased international participation, this has not occurred. There remain significant barriers to trade and investment into the US defence industrial base. These include regulatory barriers, transaction costs, risk and lack of incumbency. On the regulatory front, US defence technology controls and security remain the largest hurdle and are sensitive to changes in US domestic politics. The Rand study has further observed that the avoidance by US primes of foreign sources of supply may simply be because of a belief that using domestic subcontractors would improve their chances of winning US government contracts.[3]

In comparison to other US industry sectors, the defence and aerospace sector has seen a dramatic decrease in competition as both the number of top-tier firms has consolidated and reduced to four, and the number of large programs has likewise reduced, such that in the words of the US Government Accounting Office (GAO), "companies that are not part of the [JSF] program could see their tactical aircraft business decline".[4] Again, this contrasts with other sectors that have witnessed increased levels of competition, partly because of globalisation. Consequently, the US defence sector has not been driven by competitive pressures towards global sourcing in the same way as have other sectors. In this environment, the US government utilises various management mechanisms to effect control over costs and other program variables. Managed outcomes rather than market outcomes are a characteristic of the sector.

What does this mean for the JSF program and its global approach to the supply chain? Over the last few years, LM has increasingly sought cross-collaboration in global partnerships. JSF is no exception. First, LM adopted a "best value" approach to awarding contracts to suppliers, and strived to construct a level-playing field based on open competition. However, this approach, economically rational and commendable as it was, failed to ensure that all of LM's international partners could win the level of work they expected to win. As such, in order to shore up the commitment of some partners, and thereby maintain forecast sales, LM adopted a new plan to use "strategic best value sourcing" to supplement the competitive approach. The cost "flexibility" this implies is evidence of the trade-off that LM and the JSF Program Office are prepared to manage in order to achieve the program's marketing goals. Ultimately, LM will want to sell more aircraft, and so the program's partners can anticipate further demands on their own, hard won "work-share".

Nevertheless, on the whole LM is implementing a market process that will direct resources in accordance with competitive value. There is no possibility of the Australian government achieving the recommendation of the Australian Strategic Policy Institute to "specify – in cooperation with industry – the size, nature and quality of work that we expect from the JSF program".[5]

JSF for Australian companies: Selling to a US prime

What can Australian companies sell to LM? In terms of supply chain management, the expected answer might be "nothing". There is no tier 1 supplier in Australia able to furnish complete systems to LM. A rational supply chain would see a small number of such supply partners forming the focus of LM's supplier management, and those partners would in turn cascade down to the lower supply tiers. This approach delivers significant cost and management savings, integration through the R&D phases, responsiveness to customer demand, and process control (delivery, production, inventory and standards).

In Australia, LM and its partner primes have bucked the trend and established a process of direct interface between the prime and prospective tier 3 suppliers.[6] LM assessed the suitability of Australian companies and issued a number of requests for tender or information. In some cases, these have resulted in contracts, offering the prospect of work to the value of $220 million (as of December 2005) through the SDD and low rate initial production (LRIP) phases.[7] Importantly, LM has been assisted by the Australian government (through the combined efforts of the Defence and Industry departments) to manage this complex and broad interface, involving as it does over 100 companies, most being small and medium-sized enterprises (SMEs). LM has noted that government facilitation was critical to the success to date.

The government's coup, in so far as positioning Australian firms for a role in the JSF supply chain, was participation in the SDD phase.[8] Without the obligation this imposed on LM, Australian firms would not, with rare exceptions, have been considered as potential suppliers. So the process thus far, although contrary to the principles of supply chain management, has delivered initial results. What, then, is LM buying?

LM requests for tender have been for discrete services or products that would be expected of a tier 3 supplier. This is reflected in the value of contracts awarded to smaller, non–defence-focused firms. As of December 2005, these contracts offered the prospect of work to a total of $190 million over SDD and LRIP. Higher systems integration and the project management required to pull together large sub-systems of the JSF are retained at the tier 1 and 2 levels. The profile of tasks required by LM has found matches in the niche capabilities of the Australian SME base. There has been less congruence with the capability profiles of the larger, Australian defence companies, which, as of the same date, have secured contracts offering the prospect of work to a value of $30 million over the same phases (14 per cent).

JSF: Theoretical industry outcomes

While we can theorise about the long-term outcomes, data to date are scarce and the program is young, so the evidence can only point to tentative conclusions. A theoretical analysis would suggest those companies with a clear focus on only one or maybe two segments of their technology sphere, that offer discrete products or services, are best positioned to win a place as a tier 3 supplier. This is the position they are likely to occupy in relation to the existing industry environment. Those companies that have a spread of products and services, higher level systems integrators and project managers, all capabilities likely built up under decades of interventionist policy, are less well positioned for tier 3 work. These companies carry greater overheads and will not necessarily see a desirable match between the JSF tier 3 opportunities and their corporate strategy. The automotive sector witnessed a similar phenomenon as parts suppliers that focused on one or two segments achieved the best economic returns, followed by the focused system integrators. Companies that tried to remain both integrators and parts suppliers performed poorly. A.T. Kearney observed "small to medium size [aerospace] companies should pursue a focused strategy – concentrating on components and parts manufacturing. They will have to exercise clear, world-class cost leadership, however, to defend their niches against competition".[9]

While the work contracted on JSF to date is consistent with the theoretical analysis, the real test will be what happens as the JSF program moves into the production phases. There are at least two challenges Australian companies must overcome. In the transition from the SDD phase to the production of components finished in Australia, companies must maintain their performance (cost, schedule and quality), and be able to offer complete packages competitively and at the production rates necessary to remain attractive to LM. Companies that successfully transition may form part of a sustainable industry capability in Australia. That aspect of Australian defence industry capability will be built on LM management decisions, tempered by the market.

What about the larger, traditional primes of the Australian defence industry? If the JSF program offers tier 3 supplier activities that the existing primes are not positioned to deliver, or do not wish to deliver, can they expect any industry benefit from JSF? The one area where the prime contractor and systems integrator skills of these companies may be required in the JSF project is in the area of through-life support (TLS). Given the nature of the proposed contract support for JSF, and assuming LM does not plan to establish a large presence in Australia, the type and scale of support as currently provided to the RAAF F/A-18 fleet by the Hornet Industry Coalition may be an indicator of the role that these larger Australian companies will play in JSF TLS, commencing in the next decade.

However, the JSF support concept ("autonomic logistics global sustainment") is still in development and the extent and nature of support to be provided in Australia remains undefined. The greater part of depot-level maintenance and upgrade may remain in the US, with Australia hosting only operational and a much-reduced level of deeper maintenance. If this were the case, smaller companies that gain incumbency with LM now, may find themselves in a more advantageous position for TLS than the current "primes", at least in some aspects. Indeed, there are real prospects for at least one of the Australian tier 3 suppliers to migrate up the supply chain to tier 2 due to its outstanding performance in the initial stages of the program. That one of these tier 3 suppliers might take the lead during the sustainment phase would pose a surprise for the larger players. LM, probably acting as a "thin prime", will be the key decider in the outcome, despite any coalitions developed at this early stage of the project.[10]

Global impact means local adjustment

If the procurement approach adopted for JSF were applied more broadly across the defence acquisition program, what would be the impact? The US GAO believes that "the JSF has the potential to significantly affect the worldwide defence industrial base".[11] The impact footprint may be large.

The model would emphasise reliance on market mechanisms for the allocation of economic resources, linked to the active promotion of Australian companies to US defence industry primes (and tier 1 and 2 suppliers), facilitated through the Australian government playing the role of a local, tier 1 or 2 supplier in some part. As a necessary corollary, new defence acquisition projects would not attempt to constrain bidders by directing specific types of work to Australian companies. Australian Industry Involvement (AII) and its forebears would remain creatures of the past. The application of this model across the entire sector in Australia would likely lead to significant structural adjustment.

The Department of Industry, Tourism and Resources has indicated structural adjustment will follow on the JSF approach. The reasons are straightforward: the government's approach relies on the market to determine which industry capabilities will be sustained through ongoing contracts. There is no attempt to direct, negotiate or win prescribed work-share that dovetails to particular shibboleths.[12] Work that is won shall be won in open competition and at the discretion of the foreign, prime contractor.

This case study suggests the JSF approach will favour companies that are able to competitively offer value at the tier 3 supplier level, and that these companies are not, on the whole, the larger, traditional primes of the Australian defence sector. Accordingly, the burden of structural adjustment will fall mainly on these larger companies.

Should the large defence companies fail to adapt to the changed circumstances, and adopt strategies and structure to meet tier 3 demands, then they can expect the volume of opportunities to fall off. This in turn may lead to a new round of mergers and industry consolidation. Some companies may choose to exit the sector.

The industry capabilities that comprise the defence sector today will be different from those following a decade of market winnowing. The capabilities in ten years will be those that have thrived under the threat of global competition, are marked by strong links to a relevant parent or have supplier incumbency with a major prime, and have survived the vagaries of US domestic politics. The decisions as to what capabilities remain will be market-effected, and not government-directed.[13]

Turning Reith on his head

On 26 June 2001, one year and one day before the JSF announcement, then Defence Minister Peter Reith called for a strategic defence industry policy, one that linked defence acquisitions so as to create a sustainable defence industry. Reith referred to the government's 1988 policy pronouncement on defence industry and the 2000 Defence White Paper, then noted his concern that "strategically unconnected acquisition decisions … will not ensure that we can sustain the critical defence industry capabilities that we need for the future".[14]

While Reith recognised the role of the market, he also trumpeted the message that government acquisition behaviour, as a monopsony buyer, is the ultimate determinate of defence industry structure. He argued that government must use its market power to shape the industry and sustain identified capabilities.

The JSF approach turns the Reith doctrine on its head by finally acceding to the market as the sole determiner of industry structure. It is an economically rational approach to the defence industry and the question of sustainable capabilities.

So, casting back to the $4 billion of work Ian Macfarlane expects Australian companies to win, a note of caution is warranted. The minister's calculus is based on an industry that owed its size and structure to previous regimes of government intervention. JSF moves away from this, relying instead on the market. This means that while the adjusted industry landscape should be more sustainable, its shape will be determined by the management decisions of US companies further up the value chain. The size and structure of this industry will depend on whether US companies can make the transition from a culture that favours domestic suppliers to a global one, and Australian companies are able to compete.

One thing is clear. The approach adopted in JSF, applied to the overall industry marks a turning point in favour of market mechanisms over government intervention, and discounts the need to link defence strategy and industry capability. *Alignment* would no longer be a policy objective of government.

ENDNOTES

1 Transcript of media announcement and follow-on press conference by Senator Robert Hill, Minster for Defence and The Hon. Ian Macfarlane, Minister for Industry, Tourism and Resources. While the anticipated price in 2002 was US$40 million per aircraft, it is reported that the US Department of Defence is now using for planning purposes, a per-aircraft price of US$95 million. As such, the Australian government will need to adjust either the budget for this program or the numbers of aircraft.

2 Lorell et al. 2002, pp. 65–8.

3 Lorell et al. 2002, p. 69.

4 US Government Accounting Office (GAO) 2003, p. 1.

5 Borgu, Aldo 2004, p. 8.

6 Tier 3 is used inclusively in this case study to refer to tier 3 and lower tiers. Many of the Australian companies referred to as tier 3 would ordinarily fit further down the supply chain. In the context of supply chain management, tier 1 companies work directly with the original equipment manufacturer (OEM) or prime, are frequently risk-sharing and investment partners, and manage the lower levels of the supply chain. Tier 2 companies take responsibility for major sub-systems. Tier 3 suppliers provide major components, sub-assemblies and discrete services. Lower level suppliers provide components, services and materials. The total number of suppliers under a supply chain approach is reduced, creating significant management savings. The direct interface between Australian tier 3 suppliers and LM is an anomaly and may not be sustainable over the long term.

7 Aggregate contract values provided by the Department of Industry, Tourism and Resources.

8 The entry price of participation in JSF as a level 3 partner was US$150 million. On an industry profit margin of 12 per cent, this is a subsidy equivalent to turnover to the value of US$1.25 billion. To be judged a success on an industry basis alone, Australian participation in JSF would need to deliver to industry contracts several factors in excess of US$1.25 billion. Industry benefits are not the only benefits from participation in SDD, though they are the headline benefits according to government announcements.

9 A.T. Kearney 2003.

10 The Australian government announced in March 2005 the formation of a JSF Industry Coalition for JSF life-cycle sustainment and follow-on development. The coalition comprised BAE SYSTEMS Australia, Boeing Australia, Thales Training and Simulation and MINCOM.

11 US Government Accounting Office (GAO) 2004.

12 Earlier Australian government defence industry policy encouraged the establishment of specific industry capabilities, as generally listed in the 2000 Defence White Paper, through competitively scoring the tenders of companies. Those companies that were able to establish, maintain or develop identified "critical capabilities" through their commercial offers were scored higher. The ability of a company to meet Australian Industry Involvement (AII) targets as laid down in request for tender documentation thereby became a key discriminator in their bids. As such, major companies tended to structure their investment in Australia and their strategy for future success around the sustainment of the "critical capabilities".

13 The shipbuilding sector of the defence industry may be an exception as it continues to witness high levels of government intervention. As of the date of writing, government is also an equity owner in this sector.

14 Reith 2001.

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THE air-warfare destroyer:

managing defence procurement

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Procurement of major items of defence equipment often conjures a popular image of waste and inefficiency. Adverse media reporting of major programs, such as that to acquire the Collins-class submarines, has fuelled an attitude that defence procurement usually runs over cost, beyond time and seldom meets the technical objectives. These failings are often linked to weaknesses in project management and inadequacies within the contractual documents that define the expectations of the government as buyer and the responsibilities of industry as the supplier. However, this focus probably has more to do with the temporal proximity of the contractual phase of procurement management to the emergence of quantifiable and then (often publicly) visible difficulties with the project.

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

It is more often likely that problems arising in any particular program reflect decisions made much earlier and, in many cases, well before matters of formal responsibilities and contractual frameworks are contemplated. Where aspects of an equipment program have been fundamentally misconceived no contract can force a desired outcome and the most efficient management may simply delay the inevitable recognition of failure. In such circumstances, some companies have gone out of business as defence suppliers. Conversely, it can be argued that the many successful procurement programs (such as the six coastal mine-hunters that were delivered on time and to cost) start with a fundamentally sound procurement strategy, subsequently reinforced by a sound contractual framework and efficient project management.

The Royal Australian Navy (RAN) is about to embark upon a program to provide three air warfare destroyers (AWD). Although the government is some way from formally announcing decisions defining the full scope of the program and from signing contracts to initiate its production phase, significant decisions have already been made. In some cases these will probably increase chances of a successful AWD program while, in others, they have created problematic areas that will require, at least, very careful attention.

It is not everywhere accepted that management decisions during the contract phase need to be seen in the larger perspective. John Moore was minister for defence during a period of seemingly unending defence procurement "disasters". These included not only the Collins submarines, but two ex-United States (US) navy amphibious transports and the modernisation of the AP-3C Orion maritime patrol aircraft of the Royal Australian Air Force (RAAF). His prognosis was that very senior officers were pressuring junior colleagues to amend contracts after they had been signed. "In no small way that has contributed enormously to failure of projects, certainly cost and time overruns."[1]

Air Vice Marshal Ray Conroy, responsible for aerospace procurement over part of the same period, argued the problems flowed in the opposite direction. He observed that the root of procurement problems was excessively ambitious technical specifications already in projects before being sent to tender.[2] This was a problem of senior officers not exercising sufficient discipline over project officers during the course of project development.

There is no doubt that complex project management is difficult. One comprehensive study of some 3000 projects found that around half failed to achieve their objectives.[3] Only 10 per cent performed better than expected. Yet achieving fundamental improvement is not primarily a matter of better contractual processes. Contracts might nowadays more clearly define legal responsibilities, have increasingly used broad outcome measures to define compliance, and more recently have sought to construct more mutually supporting producer and buyer relationships.

Yet, contracts are necessarily focused on the production and delivery phases of equipment programs. As such, they post-date the crucial period in any complex procurement program that governs its success. Experience indicates that 90 per cent of the discretionary decisions that affect the outcome of a project are made in the first 7 to 12 per cent of its life.[4]

The first three to five years of a major Australian defence equipment program may pass in detailed study and complex trade-off between critical performance criteria before any commercial provider is asked to begin negotiations. During this time the decisions that shape the fundamental nature of the project are made. For instance, before the contract to design the Collins-class submarine was awarded to the Swedish firm of Kockums, the nature of the program was largely decided.

Aiming to build practically all the Collins program in Australia determined not only the complexity of the project, but also the criteria for selecting the successful contractor. The program's project team also made an early decision to pursue the best available Combat Data System (CDS) separately from the submarine design, rather than the traditional procedure of selecting from contending boat designs with whatever system was fitted as standard. The new approach might allow maximisation of combat data system performance, but it also greatly increased project risk and, as history was to show, led to one of the more infamous of Australian defence procurement sagas.

Pursuing the CDS independently of the submarine design also influenced the nature of the contract eventually adopted. The RAN realised, following responses to the first call to industry for a submarine program based on a proven design, that nothing existing at the time was acceptable. All were too small to meet the specifications, including that they be able to accommodate the independently developed CDS. The RAN then made the crucial decision of abandoning its procurement strategy and seeking instead an optimised submarine design of a completely new, and therefore untried, nature. Consequently, the program now had three areas of extremely high risk, to which part of the solution was seen as a fixed-price contract. This in itself was later criticised as a source of some of the problems from which the project subsequently suffered. The point is that the type of contract adopted for the Collins program grew out of the development of the program itself, as a result of decisions made well before the nature of any contract became an issue.

Decisions made at an early stage in procurement programs continue to have critical impacts on their outcomes. In 1997 the RAN selected the Kaman Super Seasprite helicopter to equip its ANZAC frigates. The airframes were refurbished, ex-US navy aircraft, but they were to be fitted with a new, unique combat data system for a crew of two, rather than the three personnel required to operate the systems used by the US navy. The concept proved flawed, with the systems sub-contractor unable to provide software to operational standard.[5] Today, with more than half a decade spent in trying to rescue the program, the aircraft cannot perform the desired range of naval missions and its military utility remains in doubt. It was against a history of such projects that the Kinnaird Review of defence procurement recommended there should be increased planning and analysis in the earlier stages of defence acquisition[6] under what has now become the Capability Development Group.

Major procurement projects usually do not escape the management environment of the period in which they occur.[7] The forms of contract under which they are managed are equally subject to periodic fashions. The fixed-price contract under which the Collins-class submarines were bought was a response to both a history of dismal procurement management and the recognition of the project's significant level of risk. It is unlikely that the program would have proceeded if the fixed-price approach had not been adopted. Yet, some two decades later, the fixed-price contract was one of the scapegoats on which the Macintosh–Prescott Report placed the problems of the Collins program.[8] In retrospect, they saw it as being too inflexible and enshrining an inherent conflict between builder and customer.

Traditionally, government-owned armouries and shipyards equipped military forces. After World War 2, particularly, the speed of technological advance assisted a shift to procurement from private companies. Until the 1980s, the predominant form of procurement management was the cost-plus contract model. Suppliers provided the equipment as agreed, to an agreed price, but were compensated for variations in the cost of inputs or for changes in specifications. There was thus little incentive for suppliers to reduce costs of manufacture or for the Services to carefully assess the consequences of changed performance specifications.

In addition, the management process for cost-plus contracting was complex. Payments were made against the achievement of milestones that were not necessarily linked to the completion of some testable component, and verification of contractor performance required an extensive system of quality assurance.

The Fraser coalition government approved a number of locally sourced defence equipment programs that by the early 1980s had proved unsatisfactory. A mine-hunter program was cancelled with only two built. The inadequacies of a program to build two FFG guided-missile frigates prompted review of the dockyard in which they were being built. A support vessel was delivered three years late and at three times the cost of building her in the designer's French yard. A project to design and build a trainer aircraft for the RAAF was cancelled before it had flown.

These circumstances prompted the search for a different approach to managing defence procurement. At the time, the fixed-price contract model seemed the best approach to avoid the then current problems of escalating costs and time delays. Fixed-price contracts offered an alternative to micro-managed quality assurance procedures, since assessment of the product against the purchaser's requirements could be performed. This coincided with a desire to escape from overly prescriptive specifications to describe the purchaser's intent and instead harness manufacturers' ingenuity to achieve outcomes expressed in terms of broad performance requirements.

However, in practice, rectifying defects in the finished product often proved to be difficult. This was especially so since often, as in the case of the Collins-class program, the contingency allowance to correct production faults was unrealistically small. This sometimes froze attempts to improve deficiencies, as producers contested the need for modifications, so to avoid additional expenditure, and purchasers refused to accept the equipment without further improvements.

Currently, alliance contracting is the preferred model. In this concept the purchaser and the contractor agree on common interests so that costs for the project can be targeted, with the contractual terms allowing both to share any savings realised. In complex projects, where several major contractors may hold equally important roles, alliances interlinking participating companies are sought. This is in the expectation that efficiencies will be realised by interlinking project components and contractors will cooperate because of the additional profit that should be generated thereby.

However, successful implementation of an alliance contract requires considerable transparency, not only between the purchaser and contractors, but between individual contractors and each other. This extends not only to financial data, but often to important elements of intellectual property that many companies, particularly those trading in areas of high technology, consider to be vital for their future. It may be for this reason that the alliance contracting model, while quite popular in Europe and Asia, is little used in the US and almost unknown in Australia. Because there is no prime contractor (*primarily* responsible for the condition of the product as finally delivered) in the alliance model, successful management of complex procurement programs requires a strong oversight mechanism.

The air warfare destroyer acquisition is to be managed under the alliance contract model. Yet, while this may well create some important peculiarities, it is by no means the most significant aspect of the program. The Commonwealth will not give final shape to the project – with selection of the preferred ship design – until mid-2007. However, as with all major procurement programs, some of the most important decisions have already been made. These now determine significant characteristics of the equipment to be acquired, some requirements for their long-term support, and they indicate potential stress points that will require careful management.

The RAN intends to acquire three AWD vessels from 2013 to 2015. Their role is to provide area air-defence to a group of naval vessels in passage; that is, to be able to defend from air attack both themselves and other vessels with which they are steaming. This is a role in which in the RAN has had limited capability since the retirement, around the turn of the millennium, of its Vietnam-era DDG guided missile destroyers. The AWD has been under consideration for some time, being one of the capability renewal projects mentioned in the 2000 White Paper.[9] The project emerged in more tangible form in the initial Defence Capability Program of 2001 where it was intended to provide at least three vessels at a price of $3.5 to $4.5 billion.[10] Like most major acquisition projects, the AWD incurred a rude dose of reality on closer examination, with the cost for no more than three vessels estimated at between $4.5 billion and $6 billion,[11] (a 33 per cent increase), but with many observers expecting price at contract signature to be closer to $8 billion.

Nevertheless, before formally approving the AWD project, the government had accepted a recommendation that the program should be based around the Aegis air warfare system. There was no evaluation of competing commercial bids in this selection and there was no commercial contract to procure the Aegis system. Instead, the government acquired three operating systems for $1 billion under US foreign military sales (FMS) procedures[12] and will supply them as government-furnished equipment (GFE) to the builder, ASC in Adelaide. Prior to their dispatch to Australia, the US navy will manage the production of these systems by the supplier, Lockheed Martin (LM), as they would for US naval equipment.

The air warfare system is at the heart of the destroyers and its performance largely will determine the degree to which the equipment provided meets requirements. In essence, the project team for the AWD has drawn a lesson from the Collins-class submarine program. Rather than pursuing the best system and platform, and attempting to combine the two, the air warfare system was identified as the crucial element around which the program should be delivered.

Further, in identifying Aegis as the preferred option, the project team chose to avoid the risk of a new or uniquely Australian system. Instead, they preferred equipment that was proven and already supported by considerable industrial and military investment. Yet, its use by the US navy and four other Western navies signified acceptable military performance and future developmental support. Since the other two air warfare systems that could have been evaluated remain under development, preference for Aegis was a strategic program judgment favouring greatly reduced risk.

Program risk now resides with the design and construction of the hull and the integration of the ship's systems, including Aegis, and with the development of lifetime support. These are not easy tasks. The air warfare system, the sensors that provide its data, and the weapons that it controls are bulky and require a hull of considerable displacement. With other requirements, such as a range of 10,000 nautical miles, the RAN wants a vessel displacing between 6000 and 8000 tonnes, one of the largest warships ever built in Australia.

However, size is not the main risk with the AWD hull. Large warships generally require commensurate crew numbers, yet the RAN has for a decade suffered personnel recruitment and retention difficulties. Minimised crew has been a particular feature of RAN acquisition (as with the Collins-class submarines) and the AWD personnel benchmark is a crew numbering not substantially more than the 163 of the ANZAC frigate, the latest class of Australian warship. In contrast, the original Aegis destroyers, the US navy's Arleigh Burke class, displace over 9000 tonnes with twice the crew, at 344.

A design based on the Arleigh Burke, offered by US naval architects Gibbs & Cox, has been chosen as the preferred vessel for the AWD hull.[13] The RAN is planning to become operators of a unique class of naval vessel.[14] It is now recognised that designing and building a unique warship is a momentous undertaking. It involves untested technical, industrial and financial risk. Also, it obliges the purchaser to both design and conduct proofing procedures to warrant the vessels' compliance with operational, maintenance and safety objectives. Contract development should be accompanied by a commitment to additional finance, both against the possible need to rectify technical failure, and to design and develop the ongoing maintenance and support program for which Australia will be solely responsible.

At least, in the choice of ASC, the government has chosen an organisation that has experience both in post-delivery trials and in developing lifetime logistics and maintenance support, having done this for the Collins-class submarines. Development of lifetime support is now being undertaken by the AWD System Centre, with around 200 people in Adelaide. A capacity for systems development will have to remain a component of lifetime support throughout the service lives of the destroyers. The operational concept outlining the RAN service of these vessels sees a significant requirement to deploy with combined task forces, most frequently US-led. Reflecting the evolving concepts of networked warfare, the US navy now expects foreign Aegis-equipped ships to be approved as fully integrated units for combined operations with them. The AWD will need their systems software continuously updated to retain compatibility with US navy Aegis vessels. Over the life of the vessels, this component of support alone can be expected to cost at least as much as the $1 billion for the initial Aegis purchase.

Following the Kinnaird Review, government now requires the parallel study of an existing (off-the-shelf) design before it will give approval to a unique procurement proposal. Hence an "Australianised" version of the Spanish F-100 class FFG remains under consideration as an alternative to the Gibbs & Cox design. This is an enlarged version of the original, since that design displaces less than 6000 tonnes. The F-100 for the Spanish navy does not meet the RAN's crew target, although with 230 it comes closer than any other Aegis ship.

Extensive automation of ship management functions will be necessary to allow a vessel of the size and functions required by the RAN to be crewed within personnel limitations. Not only will complex interfaces be needed for ship management functions, but also more highly automated integration of sensors, navigation, command and weapons systems. As shown with the Kaman helicopters, there is more than a little chance of disastrous complication in trying to cram more autonomous analytical capacity into already complicated algorithms.

This risk has been recognised and Raytheon Australia appointed to conduct combat system integration and risk reduction, including options for integrating Australian components and sub-systems into the RAN's Aegis systems. Raytheon's US parent supplies sensors and components integrated with Aegis on US navy destroyers. Although well respected, Raytheon is not without blemish and its upgrade of the AP-3C suffered significant problems and a three-year delay. Problems with the various system interfaces remain a high risk for the AWD. Should these emerge, the program may well suffer because of the purchase of Aegis through the FMS process. This now leaves the Australian government as the owners of that equipment, and its manufacturer, LM, not incorporated into the formal structure of AWD program management.

The chief management vehicle for the program is the AWD Principals' Council. It has oversight of the interests of all partners in the alliance contract. Chaired by an independent member in retired Vice Admiral, Chris Ritchie, the rest of its members represent the principal alliance partners, John Prescott for the shipbuilder, Dan Smith of Raytheon for the systems, and Lieutenant General David Hurley (representing ADF interests) and Dr Stephen Gumley (acquisition manager) for the Commonwealth. Should problems develop around the interfaces with the Aegis system there is a limited range of options that could first alert the Council and then assist it with remedial action.

The US navy has considerable technical and operational experience of the Aegis system and it has been working closely on the AWD with the RAN since signing a Statement of Principles on Surface Warfare in 2002. It has assisted other navies in the development of their Aegis programs and, in particular, responded to Norway's request to overcome technical difficulties. The AWD procurement strategy envisages the US Navy as the

agency to involve LM in the management of the program. However, the US navy will not necessarily have insight into problems unique to the Australian design and will be in no position to give early warning of the development of problems.

The Defence Science and Technology Organisation (DSTO) is well positioned to perform these functions in its role as technical adviser to both the Australian Defence Force (ADF) and the Defence Materiel Organisation (DMO). It has solved many problems of acquisition programs, notably the Collins-class submarines, where DSTO research assisted from early development to rectification of faults revealed by trials and testing. Undoubtedly, the DSTO is the most powerful proxy for the Commonwealth representatives on the Principals' Council. Risk principally lies in the extensive demands now being made on the DSTO throughout all stages of the procurement process. Particularly in the later years, approaching the trials and evaluation stage for the AWD, there is no guarantee that the DSTO will retain sufficient expertise to play the wide range of roles expected of it. Obviously, those involved in Australia's capability development and acquisition processes need to insure that the structure and staffing of the DSTO is well supported.

It will fall largely to the AWD Principals' Council to ensure the success of the program. The cooperative spirit of the alliance contracting model is all very well, but for a complex program stretching a decade or more, there must be an agency with the power to retain program focus, assess that its progress is satisfactory and, should this not be so, to alter the alliance arrangements if needed to implement effective solutions. One would hope that the AWD program proves trouble free, but history suggests that achieving a program's technological potential depends on maintaining the flexibility to allow changes in approach when technical problems inevitably appear. The decisions already taken allow us to identify areas of risk for the AWD, but we don't know if they will eventuate or how, if they do, they will come about.

There are many ways in which poor management of contracts can reduce outcomes; there is little that contract management can do to redress the consequences of poor project development. The progress of many defence equipment programs has suffered from faulty judgement in their earlier stages, inflicting towards their conclusion significant discomfort on contract managers, industry, the ADF and the taxpayer. The focus to date of the AWD program appears to have been on ways of avoiding a repetition. Nonetheless, as in all projects of this complexity, serious complications remain possible and judgements are needed on how to deal with them, should they arise. Regardless of the particular model in favour, the Commonwealth as purchaser in the AWD program needs to insure the contract permits sufficient flexibility to deal with potential problems and that its commercial alliance partners accept a framework of cooperation with this objective.

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14 This is not a novel situation for Australia. The often-claimed need for special characteristics in ADF equipment has led to the development of several unique military systems, the Collins-class submarines and the AP-3C refurbished Orion aircraft being among them. The difficulties encountered in the development of these systems and the costs involved in their ongoing maintenance have led such equipment to be dubbed "orphan systems".

THE politics OF defence acquisition

9

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Australian governments like to boast that their processes for acquiring military equipment are rational and objective and reflect a perpetual striving for the best value for taxpayers' dollars. Military acquisition decisions are claimed to be prudent trade-offs between requirements and affordability, and based on hard-headed assessments of the nation's strategic environment. At the highest policy level this is doubtless the aspiration of every Australian national government. Their primary obligation, after all, is the optimally affordable and sustainable defence of the realm.

PHOTO: AUSTRALIAN GOVERNMENT DEPARTMENT OF DEFENCE

But military acquisition decisions are taken within a complex and shifting framework of economic, political and social pressures where the optimally affordable national defence is only one consideration among many. Other considerations include most obviously the competing Budget demands of other major national government responsibilities, including health, education and welfare. Then there are the politics of Australia's global alliance relationships and responsibilities, inter-service competition for shares of the defence acquisition budget, and interstate political competition for the economic benefits – investment, jobs and growth – that flow from winning big defence contracts. At the same time, national decision-makers want to ensure a viable national defence industry and attend assiduously to the potential electoral implications of defence contract decisions. When, like the current federal government, they are committed to selling government-owned defence firms, ministers have a financial interest in wanting to maximise the market value of the firms by ensuring that their order books are full.

Bureaucratic advisers, in developing recommendations for ministers, have to be mindful of these sorts of considerations. So, too, do firms bidding for contracts. The philosophy of the Defence Materiel Organisation (DMO), which is responsible for equipping and sustaining the Australian Defence Force (ADF), is clearly pro-competition to secure best value for money. "We are rigorously enforcing the discipline of competition … you save a lot of money, government and taxpayers' money by going the competition route", says chief executive Dr Stephen Gumley. He says he is yet to have "a single instance of political interference on where projects might go".[1]

Nevertheless, the politics of defence acquisition becomes manifest in the competitive struggle for big contracts within this political, social and economic framework.[2] Sometimes firms make single bids; sometimes they form consortia to bid together for contracts; sometimes alliances of convenience are formed between firms and state governments in efforts to win lucrative contracts. Sometimes defence firms engage in pressure politics themselves, stressing their own regional economic and political importance, and reminding governments of their achievements and even their contributions to party coffers.

Sometimes, faced by these cross-cutting pressures, federal cabinet is guided by the objective competitive processes it has put in place for defence acquisitions; sometimes it simply bypasses or ignores them. Always, of course, Cabinet insists that its decisions represent the best value for money, although it rarely reveals the costs, capability and sustainability of any foregone alternatives that were considered and rejected. Hence, some defence acquisition decisions at least seem the result of almost Byzantine court politics played out behind a rhetorical smokescreen of unfalsifiable claims about the economic and technological irresistibility of the decisions made. Rational, value-neutral decisions based on objective strategic and market-competitive economic criteria are only parts of the process, and not necessarily the major parts, although they are central to after-the-fact justifications for acquisition decisions.

This chapter argues that economic and political considerations, in fact, interact to produce final acquisition decisions. Sometimes "economic" and "political" considerations shade into each other and become ambiguous. But "economic" comparisons of the price and schedule of competing bids are clearly distinct from (and more easily mathematically quantifiable than) political considerations of alliance and electoral implications. The relative importance of these different considerations probably varies case by case, but it would be naive indeed to assume that defence contracts were awarded solely on the basis of the best value for money, however defined and calculated.

This is neither surprising nor scandalous. Defence acquisition decisions, like other government spending decisions, are the prerogative of the government that stands accountable for them. At present more than $7 billion a year of the $17.5 billion annual Defence budget is spent on capital acquisition and support. More than 230 major defence projects and more than 100 minor projects are being undertaken.

This chapter will sketch the structure and nature of Australia's defence industry and its relationship to the federal government, and review current acquisition arrangements since the 2003 Kinnaird Review and the establishment of the DMO as a semi-independent executive agency within the Defence Department. Against this background the chapter will discuss several high-profile and high-cost defence acquisitions now under way. They are the acquisitions of an undisclosed but apparently diminishing number of new frontline Joint Strike Fighter (JSF) aircraft, two key naval combat systems, three advanced air warfare destroyers (AWDs), and two heavy amphibious troop transport and sustainment ships (LHDs). The development of these projects will illustrate the interplay between the economics and politics of defence acquisition.

Australia's defence industry

The ultimate reality for all players in the Australian defence industry is that there is only one buyer in the market – the federal government. This permanent monopsony obviously gives the government the whip hand in dealing with firms. Yet the federal government has to be wary about squeezing firms so hard that they cannot afford to grow, and to ensure a permanent viable and technologically sophisticated defence industry base for the ADF. The government acknowledges it has a long-term strategic and political interest in a healthy defence industry that is able to deliver complex projects on time and on budget. Its position as the sole buyer imposes its own duty of care to ensure, in the national interest, that the industry is generally able to withstand the peaks and troughs in demand characteristic of defence acquisition. As Gumley says: "We'd shoot ourselves in the foot if we used our sole buying power to actively harm national capability … are not being draconian on overheads and profits".

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As things now stand, Australia's defence industry appears to be reasonably strong and profitable, but, like the curate's egg, it is stronger and more profitable in some areas than others. Australia has no vast military/industrial complex; Australian defence industry is rather, in terms of its economic weight, a substantial cottage industry widely distributed around the Commonwealth and economically significant in some communities. The industry has benefited in recent decades by government decisions to outsource many significant non-combat functions from the ADF to private firms (a decision arguably driven at least as much by Coalition government political preference for the private sector as much as by universally obvious efficiency improvements).

An authoritative profile of the Australian defence industry in 2004 found that it comprised between 200 and 300 core companies who employed an estimated 13,000 people and generated some $4.7 billion in turnover in 2002–03.[3] The profile, by ACIL Tasman, for the Defence Council of the Australian Industry Group and federal and state government departments, found that $3 billion of the turnover was generated by the ten-largest companies in the industry, most of whom were prime contractors for the supply of defence capital equipment.

According to the ACIL Tasman profile, the profitability of defence industries "is broadly in line with that of the general manufacturing and services sectors in which they

are embedded". But it seems to be more profitable to provide services than manufactured items to Defence. ACIL Tasman reported: "Of those respondents doing defence business, some 77 per cent indicated they made a profit in doing so. Of these, the proportion of defence service providers generating a profit of 10 per cent or more was much higher than the proportion of defence manufacturers who generated this level of profit".

ACIL Tasman noted that the industry included companies manufacturing electronic hardware used in defence information capability, as well as constructing, repairing and modifying naval ships, army vehicles and munitions. Manufacturing remained the "predominant activity" of the three largest defence suppliers, ADI, Tenix and BAE Systems.

Broadly, the ACIL Tasman profile reveals an industry with significant strengths and significant weaknesses. The high-profile naval shipbuilding and repair industry has demonstrated that it can build and sustain excellent surface ships and submarines. The industry also produces advanced land vehicles for the army and munitions for all services. It has powerful niche capacities in electronics, communications, radar and information technology (IT).

There is only an extremely limited Australian military aviation design and construction industry, although there seems a reasonable capacity for the support, repair and upgrading of military aircraft. Australian firms do not produce missiles and torpedoes. They rely on overseas firms, notably American and European, for advanced air and maritime systems integration. ACIL Tasman noted that "a large proportion of Australian defence businesses are importers of intellectual property – particularly from the US", and that they do little research and development. Moreover, ACIL Tasman noted that a shortage of suitably skilled labour is a recurring complaint made by the industry.

Its profile concluded that "overall the industry is not particularly robust in terms of its ability to meet future Defence needs on time and to cost". Widely publicised disclosures of cost blow-outs and delays on high-profile projects – including army land vehicles, submarines and surface ship upgrades, helicopters, and over-the-horizon radar – have tended to reinforce this view. Although, in fairness, significant major projects (including ANZAC frigates and patrol boats) have been completed without costly budget or schedule failures.

For familiar reasons successive federal governments have acknowledged that profitable and capable defence industries are an essential feature of the level of partial defence self-reliance to which the nation aspires. The government accepts that within (unspecified) limits it is justifiable to pay a premium to have Australian firms build and/or support major assets that might be more cheaply acquired overseas. Paying a premium to ensure that Australian firms build and/or support major assets is arguably the key to improving the capacity of the local industry, particularly in the sophisticated and complex work of systems integration. Moreover, supporting major assets like ships through a notional 30-year lifecycle can more than double the initial acquisition cost. If the assets are made and supported by Australian firms, through-life support will be easier and cheaper – or so a familiar defence and industry argument runs. Whether this in fact is true is, however, questionable. Australia has maintained and continues to maintain a great deal of military and commercial equipment, including ships and planes that were not built in Australia. Nevertheless, it seems true that in the event of a military emergency Australian access to overseas supplies and suppliers could be cut off or severely restricted. So, capable local industries may be essential to maintaining the nation's war-fighting ability.

For familiar reasons successive federal governments have acknowledged that profitable and capable defence industries are an essential feature of the level of partial defence self-reliance to which the nation aspires.

Recognising these realities, and the difficulties faced by industries because of the cyclical peaks and troughs of the defence acquisition business, the Howard government's 2000 Defence White Paper called for "a strategic approach to our defence industry base".[4] At the same time the government published for the first time a detailed $50 billion ten-year Defence Capability Plan (DCP), which listed all planned projects, their pricing and notional decision and delivery dates The DCP has since been reviewed twice with some projects being removed, and other projects added. Whether the always fluid DCP is achievable within the present Defence budget remains a matter of contention, given the fast-rising costs of advanced military technology. Whether or not to continue automatic 3 per cent annual increases in the current defence budget beyond 2010 will be a political decision with profound implications for defence acquisitions.

The 2000 White Paper acknowledged that defence industry capabilities should not be regarded as "simply a by-product of procurement decisions" and noted that Australia needed a well-defined and targeted set of industrial capabilities. Over the past five years, it has taken a range of initiatives intended to implement this "strategic approach". It is to these that we now turn.

Sector plans and the Kinnaird Review

In 2001, a year after publication of the White Paper, the government announced it would adopt a more strategic defence industry policy through better demand management and long-term arrangements with industry. It would define the key industry capabilities it would require, change the way defence managed its demand, and change Defence's competition policy requirements.

Defence subsequently released draft defence industry sector plans for naval shipbuilding and repair, defence aerospace, defence electronics and for land systems. As the ACIL Tasman profile noted the sector plans provided detailed information on the nature and scale of defence demand and focused on demand management to foster defence industry capacity.

But the plans have not had a happy history. The most developed plan – for the naval shipbuilding and repair sector – concluded that future demand would be sufficient to sustain only one shipbuilder and declared that a single shipbuilding entity model provide the only structural arrangement to meet the navy's requirements. But this conclusion apparently overlooked government plans to acquire three air warfare destroyers, two large amphibious ships and other vessels from around 2008. The plan came under detailed attack from the Australian Strategic Policy Institute as risky, uncompetitive and unwarranted. The government quietly dropped this plan, and has little, if anything, to say nowadays about the other sector plans.

In a little-noticed addendum to its seminal 2003 defence procurement review, the committee chaired by Adelaide businessman Malcolm Kinnaird appeared to drive the final nails into the coffin of the sector plans. "It is not clear how the objectives in the sector plans will be achieved or measured … it is not clear that defence has demonstrated an appropriate way to implement it" (that is, the demand management envisaged in the sector plans).[5]

Much more importantly, Kinnaird laid out what is now the new model for government defence acquisitions. The Kinnaird approach provides a detailed and complex framework for decision-making and for the management of acquisition projects. It purports to be neutral, rational, business-like and outcome-driven. It sets out procedures for defining and assessing capability needs, for offering government options for deciding what should be acquired, and for risk-managing projects to deliver the goods on time and on cost.

The Howard government moved quickly to implement the Kinnaird proposals for the establishment of (1) a new defence capability group responsible for assessing and defining what capabilities the ADF should have now and into the future; and (2) the revamping of the DMO as a commercially focused and managed executive agency within the Defence portfolio, but with what Kinnaird described as "a clear and separate identity from the Defence Department". To maintain political and prudential control over the DMO, its chief executive, Dr Stephen Gumley, has to consult with an advisory board. With some 6500 employees at 50 locations throughout Australia, the DMO is currently managing more than 230 major defence projects and more than 100 minor projects, and spending close to $7 billion annually on capital equipment and support.

The heart of the DMO acquisition process is Kinnaird's mandatory "two-pass" system for defence procurement.[6] The first pass stage involves the analysis of options to meet an identified capability need. The options, presented to the government as "initial business cases", must include at least one "off-the shelf" option. An outline of the rationale and associated costs and risks has to accompany the proposal for any proposed customised or "Australianised" capability. First pass is complete when the government approves a set of options and possibly provides funding for them to be fully analysed. Second pass involves the detailed and rigorous assessment of the options and government approval for Defence to proceed to tender and contract for "a specified capability with a defined whole-of-life budget, schedule and level of performance". Throughout the first-pass and second-pass states, the Defence Science and Technology Organisation (DSTO) and the Department of Finance have oversight roles.

There are already criticisms that the Kinnaird process is slow and cumbersome, and results in delayed acquisition decisions. But it is too early to pass judgement. The test will be whether it delivers upcoming major projects on time and on cost, and it will be some years before a detailed assessment is possible. For potential contractors there is obvious comfort in Kinnaird's proposal that for complex projects up to 10 to 15 per cent of project funds should be spent in the first-pass stage to establish greater certainty about cost, time-schedule and risks. The funds would cover the cost of studies by Finance, the DSTO and by industry, thereby reducing the financial costs to potential bidders.

But perhaps the main uncertainty is how rigorously federal cabinet will remain committed to this process. Recent decisions on major defence procurements suggest that the Kinnaird approach will not always and exclusively determine the ultimate decisions of senior ministers. Other political considerations can trump rational orderly process and best value for money. The following examples illustrate this point.

JSF, combat systems and ships

In June 2002 the defence minister, Robert Hill, announced suddenly and without warning that the federal government had decided to make an initial ten-year $300 million investment to participate in the development and demonstration phase of the Lockheed Martin JSF. If the experimental plane lived up to its promise, it was the government's intention to acquire the

JSF to replace the RAAF's ageing FA-18 and F-111 combat aircraft. With an initial notional price tag of some $16 billion it would be the largest military procurement in Australia's history.

It is not a purpose of this chapter to criticise this decision: the JSF may prove well suited to Australia's needs. It may well be affordable and be delivered on time despite current doubts. What is significant is that only limited processes of comparing and evaluating other currently available combat aircraft were undertaken within Defence. The DMO, in its pre-Kinnaird mode, appeared not to have been involved. Hill said the government had acted on advice from the RAAF, and that it would "be unfair to competitors to hold out a carrot that I don't think is really there".

It seems clear that political considerations prompted this decision, which was made well before the capability and cost of the JSF were in clear focus. Hill acknowledged that prime minister John Howard, who has a deep personal interest in defence issues, was briefed on the project during a visit to Washington. Howard had committed Australia to a closer strategic relationship with Washington and wanted to reinforce Australia's credentials as a solid alliance partner. He also wanted to improve the long-term ability of Australian forces to operate with the US military. Given the proven superiority of US military equipment, there was no way the Howard government would consider purchasing one of the European alternatives already on the market.

So, for reasons of alliance solidarity and inter-operability, it joined other US allies in gambling on the acquisition of an unproved experimental aircraft of uncertain cost and performance, and with only vague post-2012 estimates of when it might start taking delivery of the planes. There have been some benefits to a handful of Australian firms who have won contracts to supply parts to the JSF project. They have made some money and improved their technological standards. But, right or wrong, the JSF decision process does not even remotely resemble the processes put in place subsequently after the Kinnaird Review. It is rather the triumph of alliance politics over competitive process.

Federal government decisions to acquire US combat systems for Australia's Collins-class submarines, and US Aegis combat systems for Australia's planned air warfare destroyers, suggest a similar tendency to default to the US for technologically complex equipment judged strategically significant and necessary for alliance relations and maximum inter-operability. Again, this is not to question the excellence of the US equipment, but to illustrate the limits to competitive process in military acquisitions. Interestingly, the Collins-class submarines are of Swedish, not American, design; the government has yet to decide whether the air warfare destroyer hulls will be of US or Spanish design. But the sharp ends of both acquisitions will be sourced from the US.

These decisions contrast with the decisions to acquire new armed reconnaissance and troop lift helicopters from European rather than US manufacturers. Here careful competitive processes appear to have been observed. Reportedly, high-level US pressure failed to change decisions. Among the decisive reasons were the excellence of the European equipment and the willingness of European firms to set up production lines in Australia and to give Australia access to sensitive computer source codes. But ultimately, the helicopters were not judged to have the strategic importance of strike fighters and naval combat systems. (Similarly, Australia is acquiring US planes and technology for its airborne early warning and control (AEWCS) capability, but has chosen European aircraft for less strategically crucial in-air refuelling aircraft).

It now seems increasingly likely that the government's decisions on air warfare destroyers and large amphibious ships will give clear pointers to the strength of its commitment to the competitive cost-focused post-Kinnaird methodology of the DMO.

In May 2005 the federal government chose Adelaide-based ASC Pty Ltd (formerly the Australian Submarine Corporation) to build the navy's three planned air warfare destroyers. At the time it was preparing to set up a scoping study into the sale of the government-owned ASC, which had built and had been contracted for the long-term maintenance of Australia's six Collins-class submarines. Hand on heart, the government swore that the ASC proposal offered the best value for money. But it was also true that Adelaide was home state of the Defence, Finance and Foreign Affairs ministers, and that ASC would be more interesting to the market if its order books included the $6 billion contract to build the air warfare destroyers.[7]

In August the federal government announced that it had selected the US firm, Gibbs & Cox, as the preferred designer for the air warfare destroyer. Gibbs & Cox is preparing what the government calls an "evolved design", which will be a modified version of the US Arleigh Burke class destroyer. This so-called "Baby Burke" will compete for selection with an "Australianised version" of the Spanish F-100 destroyer design being developed by the Spanish firm Navantia. The F-100 is the commercial-of-the-shelf option required by the Kinnaird process.

While the government will not make a final decision until mid-2007, it seems reasonable to question whether the playing field is level, given that Gibbs & Cox has been declared the preferred designer and that the government has already (for sound financial reasons) purchased the US Aegis combat system used in Arleigh Burke class destroyers (as well as in the Spanish F-100s). Add to these considerations the fact the navy itself has a strong preference for the Baby Burke, and it is not clear that price alone will be the decisive factor, even if the F-100 proves the significantly cheaper and more modern technology. (The Arleigh Burke design goes back to the 1970s, although it has evolved significantly.)

Price will ultimately be weighed in a complex balance, including alliance and inter-operability issues, the imperative of staying within reach of fast-evolving US military technology, and the preference of the RAN itself. Whatever the outcome, the decision will be justified as the best value for money – as was the decision to award the construction contract to ASC – and political factors will be dismissed as irrelevant. But details of the cost comparisons, and the recommendations of key bodies like the DMO, the Secretaries' Committee on National Security (SCONS) and the national security committee of federal cabinet are unlikely to be exposed to public scrutiny.

The competition for the navy's two LHDs will not involve issues of alliance politics. It will be a decision between the 27,000-tonne Spanish Navantia ship and the 22,000-tonne French Amaris Mistral ship. Australia's Tenix has teamed with Navantia to bid to build the Spanish ship; ADI Ltd has teamed with Amaris to build the French ship. It is already possible to see industry politics emerging in this project. Tenix, beaten for the AWD contract by ASC, is stressing its impressive record in delivering ten ANZAC frigates to the Royal Australian and New Zealand navies on time and on cost. Tenix is a family-owned firm of economic significance in Victoria, where it built the frigates, and in New South Wales (NSW). The subscript, of course, is that Tenix would be a less risky option than French-owned ADI Ltd, which has struggled to complete a $1.5 billion contract to upgrade Australia's guided missile frigates.

Already the federal government has declared that its preference is to see the LHDs built in Australia. However, it states "Australian industry will need to demonstrate that it can deliver the project at a competitive price". What does "competitive price" mean? There seems little doubt that costs could be minimised if the ships could be built offshore in, say, Korea, or if hull modules could be built offshore and brought to Australia for final assembly. But "competitive price" also has to include calculation of the long-term economic benefits to Australia in terms of jobs and investment, the cost of supporting locally built as against foreign-built ships through their notional 30-year life cycles, and the expected improvements in local expertise in the high-end systems integration aspects of the project.

What premium Australia should pay for these benefits is, of course, a political decision. It will doubtless be influenced by the state of the defence acquisition budget, but that is not the only factor. The LHDs will be by far the biggest ships in the Australian fleet, larger than Australia's last aircraft carrier, HMAS *Melbourne*. What would a decision to go offshore imply for politicians anxious to demonstrate national technological competence to the region and the world? The politics of an overseas build would arguably demonstrate limited confidence in Australian industry. Last July the industry minister, Ian Macfarlane, moved publicly to thwart what he called "something of a push from within Defence" to have the LHDs built overseas. Prime minister John Howard has reportedly expressed private concerns over the political implications of an overseas build. So again value for money, and competition, is interacting with political issues in what is expected to be a minimum $2 billion contract. Moreover, the navy is understood to prefer the Spanish ship because it is bigger, although two French ships have now been built while the keel of the first Spanish ship has yet to be laid.

Conclusion

The obvious uncertainty now is the extent to which the Kinnaird economic approach to defence acquisitions will become the norm, as against the political approach taken in the JSF and naval combat systems decisions. Some industry players say these decisions look increasingly like the exceptions rather than the rule to acquisition. They say that in recent major processes the DMO's competitive/comparative analysis has been fair and thorough and seems to be the way of the future, even if it can prove cumbersome. But the acid test will be whether the processes deliver on major future acquisitions on time and on cost.

Certainly Dr Gumley, now two years into his appointment, believes that competition produces the best outcomes, but he is sensitive to, and cautious about, political factors. "I encourage companies to read the tea-leaves to understand where government, as a purchaser, is going and what we need to do for national capability … We live in a political democracy where people are entitled to talk to their representatives. We are business-like. It's our job to present government with the data", he says.

Of course, the DMO has its own institutional values. How it selects and presents data to government is in itself arguably a political as much as an economic judgement. It is the key gatekeeper. Moreover, the DMO relies on prior judgements made by the capability group, which mediates intra-service demands on defining capability needs. While individual service chiefs genuflect dutifully towards notions of a cooperative "joint" service approach to military matters, they remain deeply committed to ensuring that their fiefdoms get their shares of the goods being acquired.

Moreover, given the acknowledged imperatives of the US alliance and of inter-operability with US forces, American equipment will be preferred when strategic considerations dominate, regardless of possibly cheaper alternatives. Politicians, meanwhile, will, as always, want to have defence projects to announce to emphasise their commitment to national security. They will want to reward supporters and to punish opponents and to demonstrate their commitment to viable and competent defence industries, especially in their home electorates and home states, and more especially where those electorates are held by narrow margins. Giving voters what they think voters want is, for politicians, the key to retaining their seats and to retaining (or gaining) power.

While Australia has made progress in taking some defence acquisitions out of politics, it will probably never take politics out of some defence acquisitions.

This chapter benefited from an interview with Dr Stephen Gumley, chief executive of the Defence Materiel Organisation, as well as with unnamed defence industry executives. I am also grateful to Dr Richard Brabin-Smith, Professor Hugh White, Dr Mark Thomson and Brigadier Greg Thomas (retd) for reading and commenting on drafts. All conclusions, errors and omissions are mine alone.

ENDNOTES

1. Interview with Dr Stephen Gumley, chief executive of the Defence Material Organisation.
2. Politics is also evident in government decisions on the locations of defence facilities. Two recent examples are the federal government's decisions to locate the defence national call centre and a new joint operational command headquarters in the marginal litmus electorate of Eden-Monaro, near Canberra, which is currently held by the government.
3. ACIL Tasman 2004, *A Profile of the Australian Defence Industry*.
4. Department of Defence 2004, *Defence 2000: Our future defence force* (Defence White Paper), http://www.defence.gov.au/whitepaper/docs/WPAPER.PDF
5. Kinniard, Malcolm 2003, *Defence Procurement Review 2003*, http://www.defence.gov.au/publications/dpr180903.pdf
6. It should be noted that the Kinnaird processes apply only to projects involving more than $20 million. Minor projects of up to $20 million are not involved.
7. Dr Mark Thomson notes that the following considerations may also have helped to underpin the choice of ASC. First, it enhanced the sustainability of ASC, thereby helping to ensure the through-life support of the Collins-class submarines. Second, it helped ASC maintain the critical mass and corporate knowledge necessary for any future submarine project.

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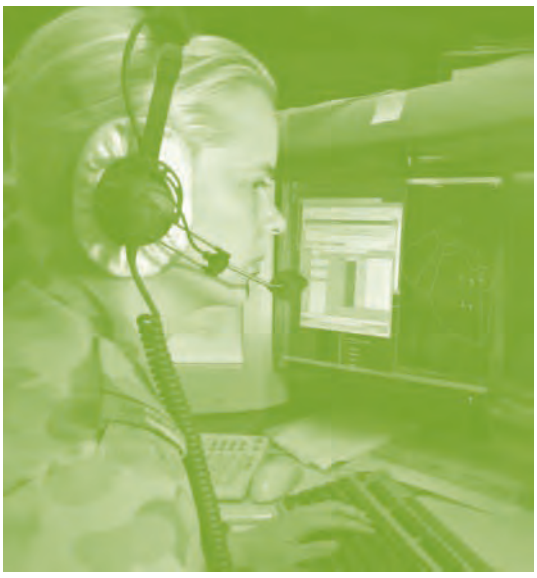

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