Studies in Defence Procurement

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2006

Library and Archives Canada Cataloguing in Publication

Studies in defence procurement [electronic resource] / edited by Ugurhan G. Berkok.

(Claxton papers, ISSN 1491-137X ; 7)
Includes bibliographical references.
ISBN-13: 978-1-55339-124-1
ISBN-10: 1-55339-124-1

1. Australia—Armed Forces—Procurement. 2. Spain—Armed forces—Procurement. 3. Canada—Armed Foces—Procurement. 4. Breat Britain—Armed Forces—Procurement. I. Berkok, Ugurhan G. II. Queen's University (Kingston, Ont.). School of Policy Studies III. Series.

UC260.S88 2006 355.6'212 C2006-903435-4

The Claxton Papers

The Queen's University Defence Management Studies Program, established with the support of the Canadian Department of National Defence (DND), is intended to engage the interest and support of scholars, members of the Canadian Armed Forces, public servants, and participants in the defence industry in the examination and teaching of the management of national defence policy and the Canadian Armed Forces. The

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CHAPTER ONE

Defence Procurement Lessons from Canada, Australia, United Kingdom and Spain

Ugurhan G. Berkok

INTRODUCTION

This *Cla ton Paper* collects the three presentations in the "Comparative Views on the Economics of Defence Acquisition" session of the conference, "Defence Acquisition: Building Canada's Future Military Forces." The conference was co-sponsored by the Defence Management Studies Program at the School of Policy Studies of Queen's University and by the Institute for Defence Resources Management (IDRM) at the Royal Military College of Canada. The paper also includes the discussion following the presentations.

Small and medium-sized countries' defence procurement exhibits specificities. First, beyond the spectrum of strategic requirements, scale limitations restrict the spectrum of capabilities for such countries. Second, capital budgets are squeezed, due to a large defence administration overhead. Third, small procurement quantities reduce the bargaining power in international markets. Finally, such countries' procurement policies are constrained by the limited scope of their defence industrial base (DIB). All three papers in this volume comment on these relevant aspects of defence procurement and demonstrate their country experiences.

The first paper, by

split into four phases. The first phase started with general protectionism in the 1960s and 1970s and culminated with the Australian Industry Participation Program (AIPP) in 1970 and was characterized by an offsets-based intervention with multiple objectives. The procurement policy was aimed at transferring technology and developing the Australian defence industrial base (ADIB) wider and deeper. This phase continued until the early 1980s, and was called the "buy-local" strategy period. It was consistent with the popular import-substitution policies of the times. Not so unexpectedly, they "benefited inefficient producers, deterred exports and penalized local buyers." Cost premia incurred by defence procurement were, accordingly, quite high.

The second phase began with a switch, in the early 1980s, to "best value for money, with direct and indirect offsets" in all sectors, defence or not. The subsequent reviews, in 1986 and 1988, refined the offsets

nal processing, C3I systems, system integration and repair, and maintenance and upgrades of major weapons and platforms. Two directions for future attention emerged from re-evaluation: first, an incrementalism in existing high-technology industrial capabilities; and second, the increased use of off-the-shelf acquisitions (or, in other words, a lowering of the cost-premium threshold associated with ADIB abilities). Although, four sectors (maritime, aerospace, land and weapons, electronic systems) were deemed worthy of strategic support, such a target proved too ambitious and elusive. Amongst the sectors, the approach to shipbuilding seemed particularly, and understandably, specific. Identifying the lack of Australian demand, which would sustain all existing shipyards, the strategic plan favoured a consolidation through a single prime contractor that would rationalize the work by allocating the subcontracts efficiently. This way, the industrial capacity would be preserved and, hopefully, the government would prevent capture of monopoly rents by the prime contractor. The current policy debate seems to reflect some confusion. Whereas an increase in off-the-shelf acquisitions appears in order and pump-priming of new and untested suppliers has been ruled out, the sectoral support plan arguably reflects a capture.

Two current relatively recent developments yield insights into the current Australian procurement debate. The first is the Australian participation in the Joint Strike Fighter project. The other is the deepening of the bi-national ANZAC shipbuilding cooperation with an additional future potential cooperation with Malaysia.

Australian defence has thus experimented with a whole spectrum of procurement strategies in its support of ADIB. The two fundamental differences between Canadian and Australian procurement experiences both derive from their geopolitics. Canada's geographic proximity to the United States as well as its traditional military alliance seem to have stimulated, first through the production-sharing arrangements and, later, by a continuing opportunity for CDIB to access the US defence market, a small and specialized but competitive defence industrial base. This industry has received and continues to receive support, but nowhere close to the levels enjoyed in Australia. The other difference is the strategic pressure on Australia to have a larger spectrum of forces imposed by its geographic location whereas Canada is largely free of direct conventional security threats. Such a strategic difference spills over to a more focused procurement policy and little defence industrial base policy in Canada.

SMART MANAGEMENT OF SMART WEAPONS

The second presentation, by **R M** (Vincent Centre for Defence Management, Royal Military College of Science – Cranfield University), focuses on defence acquisitions in a new strategic world, with particular emphasis on the United Kingdom. The paper discusses the potential technological rift between the UK and its allies. Interoperability may, due to this rift, be jeopardized in future coalition operations because of allies' potential inability to adopt high-technology weapons systems with fully networked enabled capacity. The search for affordability of these new weapons systems, in the presence of cost escalation combined with constricted defence budgets forces countries to prioritize acquisitions. However, technology multipliers embedded in higher quality RMA-type weapons systems induce what might be termed a constructive disarmament, that is, quantity loss compensated by quality gains.

Matthews underlines four debates on the post-September 11, 2001 (9/11) world security. First, "terrorists should not be allowed to dictate where the 'war' would be fought, and as a result, doctrine changed from being reactive to proactive." ISTAR (intelligence, surveillance, target,

Thus, there may be a weak demand for what RMA has to offer. Moreover, its high costs and low scales of production rule out self-reliance and force international cooperation. The question arising is whether this loss of defence-industrial sovereignty matters any longer? Obviously, this question was pertinent to the UK, but not to Canada. In the 1950s, with the defence production-sharing agreements, Canada had already realized the irrelevance of the question. Matthews states that “Britain no longer

Spain the opportunity to negotiate a joint program between the US, Italy, and Spain for the development of the new Harrier variant. Spain entered the development from the outset. Curiously, the participating Spanish firms had the right incentives to maximize both the short- and long-term benefits for Spain from this collaborative project without any government involvement.

The third period of Spanish defence procurement policies covers the transition from Spain's involvement in international arms-development programs to joint ventures with European partners and others. The first was in aerospace when DaimlerChrysler and CASA created the new firm DASA-CASA (German and Spanish, respectively) which, in 1999, joined French Aerospatiale to form the European conglomerate EADS. The second involved the land armaments manufacturer, ENSB, who produced Leopard tanks under licence with their German producer Krauss-Maffei. After various negotiations, ENSB was sold to General Dynamics (GD) in 2000 despite the running contract with Krauss-Maffei, which was guaranteed by GD to continue for another few years.

Spanish procurement and DIB policies and the internationalization of the SDIB were fairly recent. Spain may thus "be compelled to provide a stream of domestic projects to sustain specific capabilities that may already exist in other countries. The involvement of foreign partners in Spanish defence production is directly supported by the domestic market." By contrast, CDIB is small but competitive, fundamentally due to its development as a subcontracting partner to internationally highly competitive US defence industries over half a century.

One Spanish example of interest to Canada could be Spain's involvement with EADS. It would be interesting to speculate, counterfactually, what would have happened if Canada had continued in its initial participation with the European joint venture Eurofighter rather than joining the US Joint Strike Fighter project.

CHAPTER TWO

Defence Procurement and Industry Development: Some Lessons from Australia

Stefan Markowski and Peter Hall

INTRODUCTION

Australia is a small open economy trading extensively in world goods and factor markets. Its size gives it little bargaining power in such markets, so for more than two decades, Australian governments have progressively dismantled tariff barriers and other impediments to trade. Traditionally, Australia has imported a significant proportion of its defence equipment, as well as defence-related intellectual property in the form of design and technical specifications. The purpose of defence procurement is, in principle, to provide the Australian Defence Force (ADF) with the weapons systems it needs, when required and at best value for the money. In practice, however, like most industrialized countries, Australia has also used defence procurement to foster industry development for national security objectives and to support broader economic goals such as innovation, technology diffusion, and new job creation.

Industry development objectives related to national security flow from Australia's policy of "self-reliance," which requires the ADF to defend the country without asking the country's allies for immediate military support. When the policy of self-reliance was first articulated 20 years ago, the domestic defence industry was seen as the fourth arm of Defence, that is, *strategically* essential for insurance reasons, to underpin the nation's security and provide it with a significant degree of autonomy. It was viewed as a producer of capital equipment (e.g., warships), spare

parts and consumables and the maintainer and repairer (especially battle-damage repairer) of most ADF weapons systems.

Since the Cold War and, in particular, since 9/11 (11 September 2001), the United States has drawn on its unique superpower status to adopt a much more interventionist policy. Australia, as a close ally, has aligned its defence policy with that of the US to include not only the core defence of the Australian continent and its maritime belt, but also participation in US-led coalition operations around the globe. Given this close relationship with the US, there is much less strategically-driven demand for *domestic industry* support as there is much less need for industrial self-reliance for reasons of national sovereignty.

The Australian Armed Forces spend over A$8 billion (US$5.7 billion at November 2003 exchange rates) annually on industrial goods and services (ASPI 2003*a*). Thus, irrespective of fourth arm national-security considerations, defence procurement as a major element in overall government procurement has the potential to play a key role in supporting overall industry development. This means there are associated broader economic implications when the Armed Forces seek *domestic* industry support for materiel supply.

Policy decisions in Australia must also take into account developments in *global* defence industry and technology. US industry dominates the world scene with its massive defence, and research and development (R&D) spending combined with a strong preference for self-sufficiency and protectionism in defence industry (Latham 2003). American defence firms increasingly dominate global defence markets; for example, the development of the Joint Strike Fighter.[1] While European industry could, in principle, pose a competitive challenge, Europe's defence market and R&D spending remain fragmented (James 2002). For Australia, this means increased dependence on US-made weapons systems and less opportunity for shopping around to make suppliers compete harder for the Australian defence dollar.

The growing international mobility of production inputs such as human, physical, and financial capital, offers more opportunities, but also creates problems for policymakers striving to develop a domestic defence industry. Complex new industrial facilities may be built relatively quickly by attracting foreign expertise and direct foreign investment, as demonstrated by the formation of the Australian Submarine Corporation (ASC) and the relatively short lead-time between the initial decision to build

submarines in Australia to the launching of the first Collins Class boat. However, the troubled existence of the ASC has also demonstrated that:

- the *formation* of new industry capability in a modern industrial economy is a much more complex operation than was first anticipated. This is because critical inputs (e.g., deep product and process design expertise) cannot be easily imported and in many cases can only be acquired *in situ* through learning by doing; that is, as know-how or tacit technological knowledge gained through experience; and
- the *sustainment* of such industry capabilities is difficult since, as the project nears completion, the challenge of the work declines, especially if there is no imminent prospect of follow-up work. There is then the likelihood of a rapid haemorrhage of human talent as the

governments may shape the development of defence-related industry capabilities.
- Next, we use the framework developed in the previous section to comment on Australia's many experiments with industry-involvement policies. Many other small, industrialized countries have faced the challenges of industry involvement in recent decades. Lessons are also drawn from the Australian experience.
- The conclusions follow.

RECENT HISTORY OF AUSTRALIAN DEFENCE INDUSTRY POLICY

Offsets-based Programs

The Australian Industry Participation Program (AIPP) was established in 1970, mainly as an offsets-based program. It aimed to provide work for and employment in Australian industry and develop new, defence-related industry capabilities by encouraging technology transfers from overseas contractors to domestic firms. Its implementation relied on the "best endeavours" of foreign contractors to identify opportunities for offsetting activities and in discharging offset obligations.

Following a major review in 1986, the Australian Industry Involvement (AII) program replaced the AIPP. AII placed obligations on foreign prime contractors to help establish sustainable, defence-related industry capabilities in Australia. Local content and offsets requirements involved direct technology transfers, training, R&D, and increased local involvement in design and development. Civil sectors of the national economy were to benefit through the subsequent diffusion of technological know-how and best industrial practice. The 1988 Australian Defence Offsets Program (ADOP) sought to sharpen the distinction between different forms of local content and offsets. Australian production was defined as direct, internationally competitive participation (with no cost premiums) by Australian industry in a defence equipment contract, and designated work was a further local content component — involving a cost premium. Defence offsets were additional to both types of local content requirements. The ADOP targeted new capabilities in defence industries to enhance Australia's ability to maintain and adapt military equipment, produce munitions and spare parts, and acquire technologies needed for the longer-terms needs of the Australian Defence Force (ADF) (Hall and Markowski

as demonstrated by exports from Australia (ibid.). In our view, local content requirements are implicit in the Bishop Rules and, though offsets are not mentioned explicitly, the "demonstrated independence of action from overseas parents" of Australian subsidiaries "through exports" could be interpreted as a requirement for buybacks or countertrade (Markowski and Hall 2004). The *1998 Defence Industry Strategic Policy Statement* (DISPS) formalized the Bishop Rules as a set of "Procure-

and acquire many important technologies from overseas" (ibid., 98). Specifically targeted industry capabilities include combat system software and support, data management and signal processing, C3I systems, system integration and repair, maintenance and upgrades of major weapons and platforms (ibid., 99-100). To develop/maintain these capabilities, the government seeks to:

- "capitalise on the potential of Australian industry to offer (technologically innovative) solutions by continuing to initiate and pursue high-technology projects," although "important parts of our technology development effort will remain based on existing designs, as were the ANZAC and Minehunter Coastal ships"; and
- "make greater use of (overseas) off-the-shelf purchases, especially where the additional capability from Australian-specific modifications does not justify the increased cost and risk. However, total reliance on the off-the-shelf purchases is neither achievable nor desirable" (ibid., 100).

The White Paper also notes that "Defence industry will not flourish within the Australian defence market alone, with its finite and uneven level of demand. Rather, sales to Defence should be the basis for capturing broader markets." Thus, "in short, Australian defence industry needs to be *competitive on an international basis*" (our italics) (ibid., 101). To achieve that, "the Government will shape the environment in which industry makes its decisions, but *will not intervene and shape the market through subsidies and preconceived solutions* (our italics). We will not limit ourselves to purchases from Australian industry, nor pay an unduly high premium for them" (ibid.). Like the 1998 DISPS before it, the White

ment to address the issue of sustaining key industry capabilities and re-

systems, 68 percent for electronic systems, 44 percent for land systems, and 70 percent for maritime systems (ANAO 2003, 69, Table 3).

JSF Collaborative Procurement

New challenges for the AII program are now being posed by the most recent acquisition plans. These involve technologically advanced weapons systems (e.g., replacements for F-111 and F/A-18 aircraft, new air warfare destroyers, new combat systems for the Collins class submarines) identified in the (rolling) *Defence Capability Plan*, which evolved from the 2000 White Paper and contains long-term projections of new equipment acquisitions. Technological change, especially that associated with the "digital revolution" and "network-enabled" battlespace technologies, has increased uncertainty. The new acquisitions are likely to involve a leap into US-dominated product technologies and may thus trigger a major restructuring of local defence-related industries (Markowski and Hall 2004). This is already evident from Australia's involvement, as a Level III (informed) Partner, in the Joint Strike Fighter (JSF) program, which is increasingly viewed as a template for many future Australian acquisitions. As we note elsewhere:

> In principle, traditional offsets and workshare arrangements are specifically excluded from the JSF program: all sub-contractors are expected to be internationally competitive ... While the rhetoric around Australian industry participation in the project sounds like the familiar rationale for AII (ANAO 2003, 50), the reality is that participation in the JSF supply chain

acquisitions through specialization and long-term supply arrangements. It is not well suited to achieving industry *development* objectives and lower-tier contractors are most likely to be engaged on a come-as-you-are basis. Nevertheless, government facilitation will be helpful, at least to inform smaller firms about opportunities for participating in the project and the best ways of marketing their capabilities. In Australia, as in Canada, an interdepartmental JSF Industry Advisory Council has been set up to assist firms in bidding for future work.

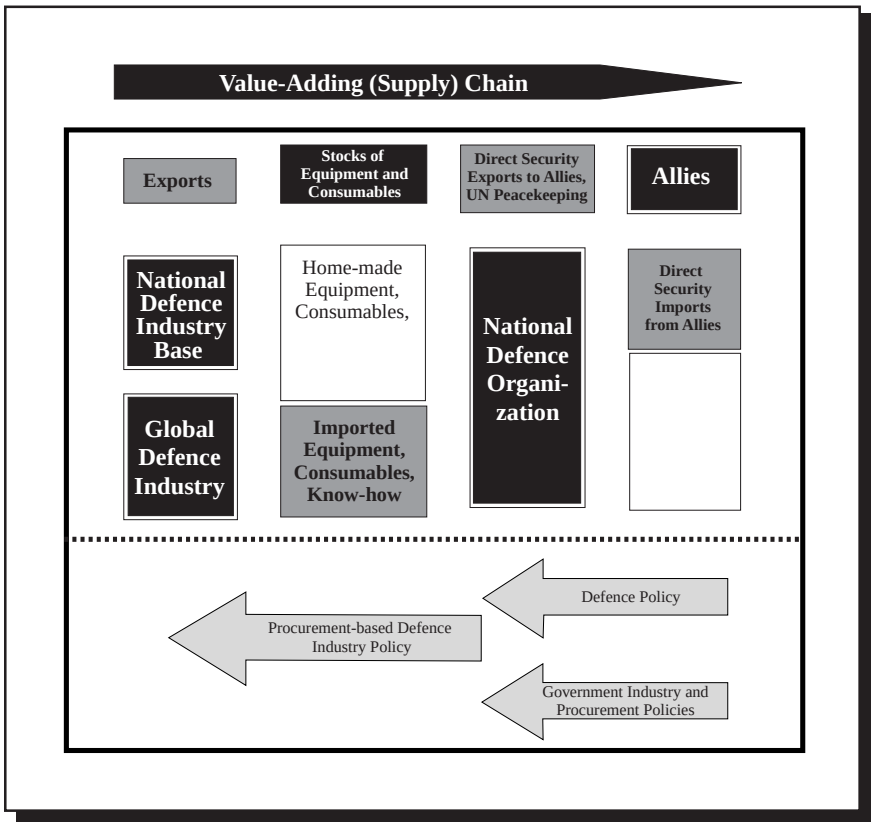
In sum, looking at the current situation, we are inclined to argue that, in the 30-year history of defence industry policy-making in Aus-

and consumables. Figure 1 depicts a stylized model of that part of the Defence value-adding chain that deals with the acquisition of equipment, consumables, and equipment-related services. Its purpose is to highlight choices that are available to governments determining the volume and scope of national security production. The figure suggests a significant number of interesting features in the defence value chain.

Much public debate about the influence of defence procurement on local industry implicitly begs the prior question of whether and when it makes sense to buy in-country in the first place. In Figure 1, arrows pointing from left to right indicate the flow of goods and services through the defence value-adding, or supply, chain. The final products of national security maintenance, war-making and peace-keeping, may be imported directly from allies or created on the basis of goods and services generated in-country or themselves imported. But this is merely a statement outlining the set of logical possibilities. It says nothing about what determines the magnitude of direct imports of security from allies as opposed to domestic provision. Neither does it say anything about why the ratio of domestically produced, NBID-sourced goods to imports from global defence industry is high or low or changing. Yet, clearly, the scope for procurement to influence domestic industry development is influenced by: (i) the extent of dependence on allies, rather than the national defence organization; (ii) the level of national defence procurement demand from local industry; and (iii) the propensity to source defence inputs overseas.[5]

To understand the relative magnitudes of supply flows in the defence value-adding chain for any country, we must first look at the high

Figure 1
Defence Value-Adding Chain



Whether orders for defence goods are sourced locally or overseas depends partly on high-level defence-strategic decisions and partly on economic aspects of policy. In relation to strategy, some defence systems and their associated production systems in the supply chain may be regarded as so essential to national defence that they must be maintained in-country. This is the security or fourth-arm-of-defence argument for investing in and maintaining a local defence industry. It is a strategic decision whether to have such industry or not, though economic arguments

whatever investment, employment, innovation and trade then occur as a result may be viewed as industry development under conditions of competitive supply, but not activity that government has had deliberately decided to prompt and promote.

If these outcomes differ from what is regarded as desirable by other arms of government or what is politically marketable, there are likely to

cost than those usually calculated in the premia governments have been prepared to pay in the past. If local production meant failure to achieve

much to import from the allies it must then decide what industry capability is needed in-country by way of support, such as, for defence strategic reasons.

Another important dimension of the defence supply chain concerns the extent of vertical integration between the arms supplier/producer and the arms buyer/user. In western democracies, government agencies such as the NDO make most final defence products but buy most of their inputs, in particular weapons systems and consumables. The government must determine, however, whether military personnel are to be largely conscripted or hired through labour markets, and whether intermediate inputs such as military equipment and consumables are to be produced in-house, by public servants in government-owned facilities, or purchased from external suppliers. Further, publicly owned industrial entities can be corporatized into quasi-independent cost centres selling their outputs to Defence. In Figure 1, The NDIB is separate from the NDO and it is assumed that the latter buys goods and services from the former.[8]

The Production of National Security

The NDO produces defence outputs, such as combat force projection or peacekeeping operations, and uses inputs such as human resources, capital equipment, and consumables to achieve its national security objectives subject to resource constraints imposed by the government. The use of inputs other than equipment and consumables (defence materiel) is not shown in the figure. Some defence outputs may be exported in the form of Defence's contribution to coalition/alliance-based military operations, UN peacekeeping and -enforcement operations, and so on (e.g., Australia's contribution to the UN-led peacekeeping and -enforcement operations in East Timor and participation in the US-led intervention in Iraq). Similarly, a country need not produce all the national security it requires: some of it may be "imported" directly through international alliances (e.g., Australia's alliance with the US).

While there are export markets for some defence services, for example, a country may get paid for its contribution to peacekeeping operations (and some developing countries export mercenary services), alliances such as that between Australia and the US involve non-market exchange, where promises of mutual assistance are bartered on an equality of sacrifice basis.[9] Thus, alliances determine how much local capability is required and also, for interoperability reasons, what sort of capability. A

key national security decision is to determine how much defence is to be produced in-country and how much imported from allies.

Economists normally describe the sort of transformation of inputs into outputs that occurs within the NDO box in terms of the production function (Hildebrandt 1999). However, the defence-production function is quite different from conventional economic models of input-output transformation. This is for two reasons. First, only a very narrow range of observable defence outputs is actually produced in peacetime (e.g., functions of state, border surveillance, and deterrence). Most defence outputs are not observable; they are contingent on the occurrence of particular military emergencies, which vary from low-level threats to global war. That is, they are not produced until certain military contingencies occur. (To simplify, we distinguish between two extremes: peacetime, when a bare minimum of defence output is actually produced, and wartime when all output potential is fully utilized.) Second, defence outputs are difficult to measure even in wartime. Deterrence in peacetime is hard to identify and hence measure; but even combat-related outputs are hard to evaluate with confidence.

It is the government's responsibility to determine the range of outputs that the NDO should have the capability to produce under different threat scenarios and to provide it with sufficient financial resources and institutional support to allow it to form these capabilities, that is, to acquire human and physical assets and the associated warfighting know-how that could be deployed in response to threats to national sovereignty)-0.2(c(grT

scale to that of Canada (US$7.5 billion) and Spain (US$7.1 billion), but the proportion of its defence budget spent on procurement is higher (Canada 13 percent and Spain 14 percent).

Defence Outputs

Since the production of defence outputs, shown as the "Final Products" box in Figure 1, is contingent on actual threats to national security, most of these outputs are not observable and measurable in peacetime. Defence outputs also involve a high degree of "publicness," with deterrence (ability to deter threats to national security) and military intelligence as two real-life examples of a pure public good.[10] Due to their publicness, these outputs are not sold in the market. Thus, even when defence outputs are observed and measured, their contribution to national wealth cannot be valued directly by reference to market prices.[11] There are no price signals from the general public as final customer to indicate their preferences for one type of defence capability over another; such choices are made on their behalf by the government. However, in Australia, the release of the last Defence White Paper (Australia. DoD 2000*a*) was preceded by extensive public consultations and a marketing exercise to sell the government's defence policy to the general public.

Despite these measurement and valuation difficulties, the Australian government buys outputs from Defence to achieve desired national security outcomes. A budgetary framework of outcomes and outputs was introduced in Australia in 1999 and applies to all government agencies (ASPI 2003*a*). The purpose of this quasi-transactional framework is to provide a basis for setting targets for agencies and measuring their performance and it reflects the general philosophy of engendering responsibility for resource allocation in public agencies. The government acts as an agent for the public at large in commissioning deliverables (outputs) from agency providers and paying prices for them. Agencies, such as Defence, are to be assessed in terms of "what they do" (output volume and structure) and "what they achieve" (outcomes).[12] However, there is little indication of what is to be achieved under outcomes other than to contribute to "the defence of Australia and its interests" (ASPI 2003*b*, 42). Also, output is a misnomer as it refers to broadly defined capability elements, for example, the "capability for major surface combatant operations" (ibid., 6, Table 1.2.1.).[13] Similarly, output prices reflect the cost of formation and

sustainment of these capability elements rather than the value of potential deliverables to the taxpayer.

The output-outcome budgetary framework deals with the short-term provision and sustainment of capability, essentially with capabilities in being and human elements of new capability formation, that is, recruitment and training of defence personnel. Its key purpose is "to provide a basis for setting targets and measuring performance" (ibid., 7). The acquisition of new equipment, upgrades, facilities and non-military capital items comes under the capital budget.[14] However, substantial cash can be diverted to the capital budget from "within the price of outputs" (ASPI 2003*b*, 47).[15] In addition, the government provides an annual injection of equity (a *de facto* balancing item to achieve the target level of capital spending) and revenues from asset disposals may also be channelled to the capital budget. Under this resource-management framework, equipment (broadly defined) as an element of capability is acquired separately from other capability elements (e.g., human resources, logistic support, complementary capabilities). This fragmentation of new capability formation is one of the key problems undermining the efficient working of the procurement system (see below).

Defence Output Capability

In peacetime, given the contingent nature of most defence outputs, Defence is primarily engaged in the formation of capability to deter and counter threats. The peacetime production capability of the NDO is only partly utilized as it is also tasked with the development of surge capability to increase its operational tempo (production rate) when certain contingencies materialize. In the transactional relationship between the government and Defence, output and capability outcomes provide a highly aggregate description of Defence capabilities. "In effect, the White Paper created a

supposed to oversee the whole area of capability formation and management. However, there is no single point of accountability "to provide better integration of the capability definition and assessment process and to ensure that it maintains a joint warfare focus" (ibid., iv), and "the involvement of a number of committees in the management of the capability definition and assessment process has served to further diffuse the accountability and authority for capability decisions" (ibid., 10).

Not surprisingly, the 2003 government review tasked to examine the mechanics of defence procurement observed that most problems originate in Defence upstream of DMO:

> Our review has led to the conclusion that poor project definition, analysis and planning, before tenders have been sought from industry, are one of the causes that contribute to failures, such as cost over-runs, schedule delays, and reduced capability of the delivered platforms and systems. The principal reason is that the current process of capability definition and assessment has generally lacked rigour and discipline. Often there has been an inadequate understanding of technology risks and whole-of-life costs and too great a focus on presenting specific platform solutions to government in advance of a more complete understanding of a joint approach to overcoming the identified capability gap. In short, the process has not given government a reasoned and fully investigated set of options on which to make informed investment decisions (ibid., 9-10).

Major capability enhancements must be endorsed by the government, either by the Cabinet (large projects) or the Defence Minister. This process involves a two-pass system of government approvals. At the first pass, the government should be presented with functional options to meet an identified capability gap, including the indicative schedule and lifecycle cost. The outcome of this stage is government approval for Defence to proceed to more detailed evaluation of options, including technological solutions. At the second pass, detailed options are evaluated and the government gives (or declines to give) its approval for Defence to proceed to tender for the agreed solution. The (annually updated) Defence Capability Plan provides a list of government-approved capability enhancements.[16]

Defence Inputs

Weapons Systems

In this paper, we are particularly interested in one type of input into national security production — the *weapons systems*. We define a weapons system as:

> a composite of equipment employed as an entity to accomplish a military mission (such as destroying enemy installations, identifying hostile aircraft, protecting advancing infantry or surveilling territory). Each weapons system provides a range of capabilities, which are of military value in and of themselves and in their interaction with other systems and resources ... considered as a product, weapons systems are *distinguished* (our italics) by the substantial technical difficulties that are involved in their conception, development and production. These difficulties reflect partly the sheer technical complexity of the systems and partly the very long periods of time involved in their planning and use cycle (Ergas 2003, 2-3).

The latter part of the statement needs to be qualified, though. First, technological complexity and associated design and production problems are a distinguishing characteristic of only those weapons systems that are very large and/or developed at the cutting edge of technological capability (e.g., B2 bombers, nuclear aircraft carriers and submarines, network-enabled battlefield management systems). The global defence industry produces a wide range of weapons systems from simple rifles to the most complex warfare equipment used in missile defence or in space warfare. The most complex weapons systems may indeed be distinguished from less complex products by the technical difficulties involved in their design, development, production, and deployment. They may also be more complex than many civil systems such as global telecommunications networks, nuclear power stations, or new towns. But the complexity of the latter should not be underestimated.[17]

Second, technical difficulties associated with the development of very large and complex systems on the leading edge of technological know-how are unique foe wr5nguy also be more

problems (e.g., combat-system integration) have had more to do with the management and politics of the submarine procurement process than the technological challenges of building conventional submarines in Australia (see McIntosh and Prescott 1999).

Third, as Ergas (2003) notes, the military utility of most weapons systems depends on their performance relative to the systems used by adversaries. Competition between alternative products is more performance- than price-related. However, this is also true of many civil products, for example, high fashion or luxury sports cars. The distinguishing characteristic of weapons systems is not necessarily their technical complexity or relative performance characteristics but the contingent nature of their deployment. Like most large complex systems, civil and military, weapons systems are "experience goods," to use another economic term. Learning from experience that comes with use is often critical to their design and system development and integration may continue well into the system's in-service life.[18] However, most complex civil systems tend to be put into use upon completion. Thus, it is possible to learn from their application. By contrast, many large military systems cannot be tested in anger, as it were, unless there are military emergencies that justify their deployment. In some cases (e.g., strategic nuclear weapons), a system's value lies in its deterrence capability and its actual battlefield effectiveness may never be known.

In this environment, military equipment buyers make their acquisition decisions under considerable uncertainty about the true productive potential (relative battlefield performance) of their acquisitions and NDOs investing in battlefield capabilities often do not know the true potential of their acquisitions until they have the opportunity to test them in warfighting conditions. Given the innovative nature of warfare with its relentless search for the enemy's vulnerabilities, peacetime testing of many weapons systems will always be an inferior substitute for their wartime application. Further, it is only during conflicts that weapons countermeasures, developed by potential adversaries, but concealed in peacetime, are finally revealed. Thus, it is the lack of opportunities for learning through experience that distinguishes complex military systems from their civil counterparts. Arguably, *inexperience* goods may be a more applicable description of such products.

Fourth, it is difficult to determine how much value military equipment and other inputs add to defence output. In part, this is due to

uncertainties about the nature of military technology that might be applied by potential adversaries and, thus, the relative performance of different weapons systems. In part though, this is because the armed forces do not sell their services, even when they are tangible enough to measure and evaluate. This often leads military equipment to be over-engineered.[19] The propensity to over-engineer defence products is also a part of the broader culture that permeates defence organizations, which favour the endless additions of bells and whistles to weapons systems (gold-plating being a part of this tendency) and to customize them to meet unique user requirements. The Australianization of military equipment is one of the key reasons for cost over-runs and schedule slippages (Kinnaird 2003).

Fifth, the development and production of complex weapons systems may require long lead times, often of several years. With long delivery times and fast changing technologies, products often become technologically obsolete by the time they are delivered. To maintain technological currency and enhance the relative performance characteristics of their weapons systems, NDOs often change their requirements and technical specifications throughout the development and sometimes production phases — adding to cost and delivery slippages. Weapons systems, especially platforms, also tend to be long-lived (e.g., still operational B-52s were first deployed by the US as strategic bombers in 1955). Faced with technology-driven competition for battlefield superiority but constrained by budgets, the military often extends the life of systems to wait before they leapfrog into the next vintage of technology. Thus, new product and battlefield technologies compete not only against those available to potential adversaries, but also against potential modifications to (legacy) systems in use. The through-life modification and enhancement of military systems to retain their relative performance edge is another aspect of technological competition.

Global Defence Industry

Small economies such as Australia import a large part of their defence materiel and, as an alternative to domestic procurement, the NDO may source its equipment and consumables from overseas producers (shown in Figure 1 as Global Defence Industry). The global industry is normally capable of providing substitutes for most (but not all) products made in-country.

Over the past 25 years, the global defence industry has gone through a period of intense upheaval. Well into the 1970s, most industrialized nations maintained broadly-based defence industries capable of supplying a significant proportion of their defence materiel requirements from domestic sources. The US and large military powers such as the UK or France often supported several sources of domestic supply. Disarmament in the 1990s resulted in the large-scale downsizing of defence industries with global employment declining by half and a particularly marked decline in Eastern Europe and the European Union. The largest defence firms have also changed their profile from specialized equipment manufacturers (e.g., fighter aircraft or submarine builders) to conglomerates producing a range of defence systems (e.g., Lockheed Martin, BAE Systems) or taking a broad-spectrum approach combining military and civil product lines (e.g., Boeing, EADS). The broadly-based conglomerates have become known as *system integrators*. Some of these companies (BAE Systems) originated in the upstream defence electronics sector and have integrated downstream into platform assembly, such as aircraft manufacture and shipbuilding.

European firms dominate their home markets.[22] The market power of systems integrators is very considerable in their home markets and in the relevant market segments. Competition in the area of new large systems

ADM. These include Lockheed Martin Australia, the local subsidiary of the world's largest defence company (but with a small footprint in Australia) and companies such as Telstra or Ericsson which, although primarily large civil businesses, have also been involved in defence-related work. The ADM survey provides detailed information on companies' current workloads and areas of interest (and/or "projects being bid").

The proclaimed "areas of interest" are, we would argue, a good description of what companies wish to market as their defence-related functional capabilities in Australia. These vary from platform assembly, in particular naval craft and land vehicles, to system integration and engineering, software development and support, project management as well as manufacture of components and the provision of through-life support.[25] It might be argued that it is a measure of the strength of the Australian NDIB that so many firms are confident enough to offer such a wide range of competencies.[26] However, in many cases, proclaiming an area of interest and a willingness to rise to the challenge should not be confused with actual ability to supply. For many firms, their defence-related technological experience, in contra-distinction to their willingness to take on new challenges, may be rather limited.

Table 1 shows the distribution of annual turnover totals for Australian firms listed in the ADM survey — where firms have made such figures available. The table shows that some 50 percent of disclosed defence-related turnover is concentrated in the four largest defence contractors, of which two (BAE Systems Australia and Raytheon Australia) are subsidiaries of large overseas companies, one is part-owned by an overseas company (ADI Limited, half-owned by the French Thales), and one, Tenix Defence, is an Australian privately-owned firm. Excluding the two garrison support and maintenance contractors (Spotless Group and Serco Sodexho), the top 15 of the ADM'

Table 1
Australian Defence Contractors, ADM 2002 List

Distribution by Defence-related Turnover[a]					
Turnover Size Group ($million)	*No. of Firms in the Group (number)*	*% of Firms (%)*	*Group Turnover ($million)*	*Proportion of all Turnover (%)*	*Average Turnover ($million)*[b]
250 +	4	7	1,833	49	458
125 – 249.9	4	7	657	17	164
62.5 – 124.9	3	5	253	7	84
31.5 – 62.4	15	25	710	19	47
15.7 – 31.4	5	8	107	3	21
7.9 – 15.6	14	24	155	4	11
3.9 –					

> market). This primacy of bilateral governance, and hence of "voice" relative to "exit" as the means of controlling performance and outcomes, is made all the more important but also more difficult by (1) the need for each party to incur substantial costs that are specific to the program at issue and non-recoverable outside that program and (2) the sheer length of times for which the parties are effectively "locked in" to each other and hence for which the relationship must last (Ergas 2003, 8).

The significance of bilateral monopoly needs to be qualified, though. It is at this point that a distinction is drawn between competition for the initial supply contract (Ergas refers to this as competition for the market) and the subsequent contestability of the relationship between the supplier and the buyer (competition in the market, termed by Ergas).

The bilateral-monopoly outcome is perhaps inevitable in the case of the most complex, network-enabled weapons systems procured by the US.[28] However, a degree of contestability applies even to these acquisitions. As the example of JSF has shown, it is possible to have a competition for the design between two very large providers and sometimes more.[29] Once the winner of the competition for the system is decided and the contract awarded, that firm's market power increases considerably (winner takes all). Subsequently, the seller and the buyer are locked into a long-term relationship where switching suppliers and thus the attendant exit cost may be prohibitive for the buyer. Nevertheless, competition *in* the market may continue at lower tiers of supply where, arguably most technological innovation occurs.[30] There is even more scope for competing through-life support services even if the design authority and much intellectual property stays with the prime contractor or original equipment manufacturers. As weapons systems become less complex, there is more scope for both for-the-market and in-the-market competition.

Smaller countries such as Australia may source their equipment in competitive international markets and, at the very least, secure the benefits of for-the-market competition.[31] Not surprisingly, Australia sources most of its weapons system designs from overseas. However, for-the-market competition for detailed system development and production tends to be restricted by government preferences for local sourcing. This simply means that domestic residence of the product supplier is added to the usual price-performance-schedule requirement, which either forces overseas

governments paying price premia for locally sourced defence goods.[34] These premia may be defended on the grounds of national security, but are often also justified on general economic grounds, that is, in terms of job creation, support for regional economic development, or preserving and stimulating "leading" economic sectors. In practice, arguments like these often, on closer analysis, turn out to have more political than economic content.[35] How much and what industry capability is formed in-country is thus as often determined by political considerations as by strategic or economic ones.

When defence supplies involve a high degree of innovation, the market power of the supplier may be reinforced through its superior knowledge of the specific product and process technologies used. As in many technology-intensive industries, there is growing asymmetry of knowledge between the buyer and the seller, which the seller, with its superior know-how, may use to its own commercial advantage. This problem is recognized in economic literature as moral hazard in the supply of technology-intensive products (for discussion, see Ergas 2003). However, if moral hazard threatened to significantly reduce the efficiency of the supply chain, the buyer could seek remedy in options such as: vertical integration in production (the government factory solution); the use of consulting engineers to complement in-house expertise; partnering arrangements involving the "embedding" of the buyer's personnel in the seller's business, and so on.

Also, if the relationship between the buyer and the seller takes the form of bilateral monopoly and, more generally, when the buyer through its preference for local content endows the producer/seller with a high degree of monopoly power, it is advantageous for the seller to invest in capabilities that increase the seller's leverage vis-à-vis the buyer. This can be achieved through long-term partnering arrangements, although these

particular, to protect their capability investments to sustain their core productive assets through cycles of temporary spending cuts. These, to use Ergas' description, reduce "the scope for spending programs to be 'locked in'" and make the government as a buyer "not fully capable of entering

originated in the United States and the United Kingdom and focused on issues largely specific to these countries. However, the portability of the US and British experience is limited. Countries such as Australia, Canada, The Netherlands, Sweden, and Switzerland face more benign security environments and, thus, have more choice in shaping their national security value-chain. They can rely more on direct imports of national security from large and powerful allies and can integrate more freely into the global division of labour through imports of equipment and consumables.

USING DEFENCE PROCUREMENT TO FOSTER INDUSTRY DEVELOPMENT

To use defence procurement to support domestic industry development, Defence must decide, given the defence budget and equipment requirements, which goods and services to source in-country and which to import. Key questions are thus what domestic industry development outcomes could be achieved through in-country defence procurement and which of these should be targeted?

There are two components of demand for domestically produced defence goods and services. First, there are products that Defence believes for its own strategic reasons must be sourced from domestic suppliers. These are strategic necessities or "domestic must-haves." Second, there are products that Defence is equally happy — from a strategic perspective — to source domestically or abroad. In the latter case, the preference for in-country sourcing is based on socio-economic objectives.

Strategic Considerations

Strategically motivated materiel requirements extend beyond normal performance-price-schedule considerations to stipulate the in-country residence of the supplier and in-country location of key production/support capabilities. As noted earlier, this approach has the potential to vest domestic suppliers with considerable market power which they can use to

justify strategic import substitution, must be weighed against the likelihood of domestic inefficiencies in peacetime.

As domestic sourcing for strategic reasons increases, the scope for developing related domestic industry capabilities within and beyond the NDIB also increases. On the other hand, strategically mandated local production is very likely to result in market distortions, that is, less efficient producers would be encouraged to set up shop to supply Defence. In general, when activities are diverted from international to local suppliers (import substitution), additional costs (cost premia) are likely to be incurred. These may be small, when domestic producers are reasonably internationally competitive, or potentially very large if they are not. This is particularly likely to be a problem for small economies with a modest procurement budget, such as Australia, where there are very limited opportunities for achieving scale-related cost efficiencies.

Economic Considerations

The second group of products are those which Defence has no strategic reason to procure domestically. In this case, the selection of suppliers is determined by economic considerations and the extent to which industry development outcomes occur will depend on the procurement

and consumables, Defence (or the government) should perform four tests that would demonstrate that:

1. The desirable industry outcome cannot be achieved anyway through "normal," best-value-for-money procurement; that is, desirable industry capabilities would not normally be available in the absence of intervention (*desirability test*).
2. It is feasible to achieve these industry outcomes through industry-focused defence procurement (*feasibility test*).
3. The industry-focused defence procurement is superior to other forms of intervention (*efficiency test*).
4. The Defence Procurement Agency, or any other government entity entrusted with policy implementation, is the best vehicle for achieving the desirable outcome (*effectiveness test*).

Industry-related Procurement Strategies

In terms of industry-related procurement strategies, Defence may operate in the dimensions of location of supply (home versus overseas) and potential impacts on local capability, trading both off against final cost and schedule. At one polar extreme, it might seek solely to achieve "best value for money" (i.e., the best price-performance-schedule combination), irrespective of the location of suppliers and without any explicit aim to promote domestic industry development. We refer to this approach as the best value for money *(laissez-faire)* strategy. As an alternative extreme, Defence may be required as a matter of general government policy to give support to specified domestic industry suppliers, or even a specific supplier. We call this approach the buy-local strategy. Value for money here is not a decisive consideration. This strategy may be applied to support: (i) the NDIB; (ii) government-specified domestic industry sectors (IT, shipping), activities (exports, R&D), or individual organizations (national airline); and (iii) domestic industry or the national economy overall.

Between these extremes, Defence procurement objectives may explicitly include domestic industry assistance, and claims on foreign inputs acquired on preferential terms through offsets schemes which, in some cases, may offer industry-development outcomes. Here, value for money will continue to be sought, but subject to additional constraints and requirements. We refer to this approach as the best value for money with import substitution strategy, as it involves demands for offsetting

local industry commitments from foreign contractors. Again, this strategy may be applied to support all or specified components of the domestic economy.

A fourth approach, international workshare and collaborative arrangements, constitutes what we refer to as the buy-multinational strategy. Such an approach aims to enhance the participation of local suppliers in the global supply chains of multinational prime contractors. It includes: (i) agreed workshare arrangements (the Eurofighter project); (ii) best endeavours industry-participation agreements (the Joint Strike Fighter project); and (iii) multinational agency-mediated industry participation (OCCAR). The discussion is summarized in the first column of Table 2.

Delivery Mechanisms

In the second column of the table, we outline some of the procurement-delivery mechanisms that could be used to implement industry-related procurement strategies.

To define its procurement strategy options, Defence must determine who is eligible to supply it and how choices are to be made between different sources of supply.

Eligibility to supply. When the procurement strategies described above come to be implemented, an initial decision must be made defining the eligibility of potential suppliers to be selected to undertake work for Defence.

It is clear that a strategy of pure *laissez-faire*, value for money would render eligible any supplier in the world technologically and organizationally capable of undertaking the work. (Political constraints may, however, apply to firms in countries regarded as unfriendly.) The same open eligibility criteria would be applied when offsetting local industry commitments were sought from foreign contractors. The two remaining cases require more discussion.

In the case of multinational procurement, eligibility is defined by the legal and political arrangements underpinning the relevant cost-share and/or workshare or participation agreements. Normally, such agreements would constrain work to be undertaken at sites located within the geographical boundaries of the participating nations. Ambiguities might potentially arise, however, if production were located within the participating nation, but ownership was held partly or wholly in the hands of companies located elsewhere.

Table 2
Procurement Strategies, Delivery Mechanisms and Industry Development Outcomes

Industry-related Procurement Strategies	*Procurement Delivery Mechanisms*	*Expected Domestic Industry Development Outcomes*
Buy local to support:	domestic open tenders	expanded/retained NDIB capabilities, including knowledge-related management and organizational capabilities
National defence industry base (NDIB)	administrative selection	
Government-specified domestic • **industry sectors** (IT, shipping); or • **activities** (exports, R&D); or • **individual organizations** (national airline)		expanded/retained national industry capability in targeted sectors/ activities/organizations, including knowledge-related, management and organizational capabilities capability development elsewhere in the economy from additional demand, technology transfers/spillovers, etc.
Domestic industry/national economy at large		job creation, foreign exchange.
Buy multinational to support local industry or economy through:	government-to-government cost-share and workshare agreements	expanded/retained NDIB capabilities, including knowledge-related, management and organizational capabilities
• **agreed workshare arrangements** (e.g., Eurofighter) • **best endeavours industry participation agreements** (e.g., JSF) • **multinational agency-mediated industry participation**	government-to-government JSF-style collaborative agreements national participation in a multi-national procurement agency (membership of OCCAR)	capability development elsewhere in the economy from additional demand, technology transfers/spillovers, etc.

... continued

Table 2 (Continued)

Industry-related Procurement Strategies	*Procurement Delivery Mechanisms*	*Expected Domestic Industry Development Outcomes*
Best value for money with import substitutions to support: **National defence industry base (NDIB)** **Government-specified domestic** • **industry sectors** (IT); or • **activities** (exports, R&D); or • **individual organizations** (national airline) **Domestic industry/national economy at large**	open tender with domestic preference margins for internationally uncompetitive domestic suppliers (overseas firm price handicap of 20%) open tender with local content (value) target • best endeavours • mandatory (40%) • two envelope solicitation open tender with direct offset requirement for foreign primes • best endeavours • mandatory • two envelope solicitation open tender with indirect offset requirement for foreign primes • best endeavours • mandatory • two envelope solicitation	expanded/retained NDIB capabilities, including knowledge-related, management and organizational capabilities expanded/retained national industry capability in targeted sectors/activities/organizations, including knowledge-related, management and organizational capabilities capability development elsewhere in the economy from additional demand, technology transfers/spillovers, etc. job creation, foreign exchange.
Best value for money (*laissez-faire*)	international open (possible local content preference if tie)	expanded/retained national industry capability in world competitive (national) industry sectors capability development elsewhere in the economy from additional demand, technology transfers/spillovers, etc.

Source: Markowski and Hall (2003).

of view of linking procurement to industry development, competitive tendering has the additional and crucial advantage that it allows governments to collect and evaluate information about alternative suppliers and their potential to build and maintain desired capabilities. This argument applies to all procurement strategies, though may be restricted in its application in some sorts of multinational workshare arrangements. It is an important argument because defence contracts are typically complex and choice criteria multidimensional.

In relation to industry development, information under the buy-local strategy is required, for example, on firms' capability-building potential, especially within the NDIB. Also needed is an information base sufficiently robust to allow assessments to be made of potential benefits to the rest of the economy.

Several mechanisms are available to implement value-for-money strategies where industry development goals are also at stake. First, domestic preference margins may be brought into play when assessing bids from an open competitive tender. This approach allows governments to place a handicap (say, for example, of 20 percent) on overseas firms' prices — tilting the playing field in favour of local firms that would otherwise be uncompetitive.[38] The challenge for governments is to determine the appropriate size of the preference margin. In principle, it should equal the additional social value generated from local industry participation and development compared with the benefits derived from buying from the most competitive overseas supplier. Information on this difference is rarely available.

Second, local content requirements may be placed on all bidders with a competitive bew ofe

proportion of the related procurement. Offsets demands may be mandatory or informal, negotiated on a case-by-case basis by the NDO (Markowski and Hall 2004).

Industry Outcomes

Finally, we consider the domestic industry-development outcomes that might be expected from defence procurement. All involve enhanced capability, desirable for strategic reasons, in the NDIB; capability enhancements valuable for economic reasons in targeted sectors and industry more generally from which Defence buys; and benefits beyond these sectors arising from technology spillovers and induced demand. (Other broader potential economic benefits may relate to government budgetary outcomes, the balance of payments and the exchange rate.) Enhanced capability may include both higher employment (if there is underemployment) and a broadening and deepening of human capital through training and on-the-job learning. Enhanced capability may also include

Buy-local strategy. Until the early 1980s, the buy-local strategy was used for certain products (e.g., shipbuilding, vehicle assembly) for strategic and general economic reasons. This was very much in keeping with

- a buy-local with partnering arrangements and long-term demand-management strategy — supporting strategically important Australian industry where fluctuations in demand cause peaks and troughs in capacity utilization and threaten to undermine long-term capability formation. An example of this strategy is the proposed (war-) shipbuilding plan (Australia. DoD 2002); and
- buy-multinational strategy — seeking to secure Australian industry participation in long-term multinational defence projects (e.g., Australia's participation in the JSF project).

In the absence of further evidence, the present eclectic procurement strategy is about as mature as it could be in terms of achieving an appropriate balance between the often conflicting objectives of national security and industry development. The challenge is in its application and management, and in knowing precisely why and when a particular procurement option is to be selected (Kinnaird 2003). The ultimate challenge for Defence is the ability to strike an optimal balance between stable

government factories and shipyards and transfer non-core logistic support services to industry under the Commercial Support Program (CSP). The CSP reflects a sophisticated methodology for the competitive tendering of defence service requirements. Over the past few years leasing and the purchase of asset services have been used to replace asset acquisition.

To enhance the efficiency of contracting, cost-plus contracts were followed by fixed-price contracts and, more recently, by incentive contracting. Progressive (evolutionary) contracting has also been added to the menu of contracting options. Collaborative rather than adversarial forms of contract management, including partnering arrangements with contractors, have been encouraged and are increasingly being used.

Local preference margins were supplemented by best-endeavours offset requirements, which were replaced by mandatory offset demands. The mandatory scheme was subsequently replaced by local-content requirements set in contracts. This allowed Defence to target particular AII outcomes rather than seek broadly specified compensatory arrangements.

By the late 1990s, it was apparent that the strategy of seeking local content in contracts had been more successful than the mandatory offsets scheme. Nevertheless, it was also apparent that further development and sustainment of defence-related industry depended on the availability of domestic defence work. And industry often worried that Defence took a somewhat erratic approach to long-term new capability formation and the associated demands for new equipment. Defence-capability planning was said not to have paid enough attention to local industry's ability to sustain its production capabilities and invest in new ones. Better demand management and partnering with industry have since become a mantra of defence industry policy (Australia. DoD 1998; DoD 2002).

To improve demand management, significant efforts have been made to involve industry in Defence-capability planning. Consolidation of acquisitions and through-life logistic support within the DMO were justified in terms of cradle-to-grave management of weapons systems. Nevertheless, the DMO has frequently been criticized for poor procurement (project) management, cost overruns, schedule slippages, and product quality degradation.[39] At the time of writing, another government report has recommended the consolidation of defence-capability management in the main organizational structure of Defence with the DMO responsible for acquisitions (Kinnaird 2003).

Over the years, Australia has experimented with more procurement-delivery mechanisms than most other countries. By and large, Defence has been in the forefront of seeking to achieve, if not set, global standards in this area.

Industry-Development Outcomes

Australia's NDIB enables it to consider a significant degree of self-reliance, an essentially strategic matter. Early in the 1990s, Defence identified several industry capabilities that were critical to ADF self-reliance: C3I, IT, surveillance, weapons platforms, weapons systems, munitions, and logistics support (Dibb 1992). There is a broad commitment to maintaining these capabilities in-country, although, as the example of shipbuilding shows, it is not clear which of these capabilities are really strategic in-country "must haves" and which belong to the "nice-to-have" category.[40] Extensive lists of specific capabilities have been published (e.g., Australia. DoD 2000*b*) but given the level of Australian procurement expenditure and poor export prospects it is difficult to judge which of the capabilities listed as strategically important can be effectively supported in-country at the cutting edge of technology. As the experience of Sweden indicates, it is difficult for a small economy to maintain a broad range of technological competencies across a wide range of air-, land-, and sea-related industry capabilities.

Broader benefits of the in-country production of weapons systems have often been claimed in Australia, but the only systematic attempt to validate this claim are the two Tasman Economics studies (2000, 2002). For example, it is argued that the ANZAC ship projects increased Australian GDP by between $200 and $5,000 million per year over the 15-year construction phase and created some 7,750 full-time equivalent jobs (Tasman Economics 2000). For this to be regarded as net benefit to Australia, it is necessary to assume that no cost premia are associated with the project relative to alternative imports and that, as the only alternative to in-country sourcing of the frigates, the ships would have been fully imported from overseas. Many such "what-if scenarios" can be chosen to demonstrate a much smaller value of the project to the Australian economy. The essential point, however, is this. If no cost premia are involved, it is generally advantageous to procure weapons systems in-country. This broadens the Australian manufacturing base and may result in some technological spillovers and skill transfers to other industries. While the existence

of such benefits has been claimed, and some supporting evidence has been provided by the two Tasman studies, little is known about long-term impact of in-country defence procurement on human capital formation and use elsewhere in the economy.

The experience of the Collins Class submarine project has been very important in re-focusing recent thinking on the management of defence supply-chains. System integration is increasingly the domain of multinational defence contractors such as Raytheon, Lockheed Martin or BAE Systems. Other areas of prime service provision are more open to domestic companies, although not necessarily those specializing in defence production. While a high degree of dedication is likely to continue in platform building and weapons systems manufacture, there is more room for using civil prime contractors as supply-chain managers and risk-takers in defence procurement.

Claims of the beneficial impact of defence procurement on jobs are also predicated on no cost premia being involved in local sourcing. Job creation in an industry that is capital- and knowledge-intensive is very costly and skilled labour must be competed away from other industries. There are many other industries where new jobs can be formed more cheaply. However, if some defence-related products can be produced in-country as cost effectively as overseas, it is generally advantageous to source them domestically to create jobs in Australia rather than overseas.

Export potential as noted above, is the least credible reason for supporting the in-country sourcing of defence products. Because of the mercantilist nature of the international arms trade, even world competitive suppliers in countries such as Australia stand little chance of being able to export successfully from their home base. Australia has rarely exported much in the defence-related area, despite intensive policy discussion in the past. At best, exports of design and intellectual property may be possible when products successfully developed in Australia are manufac-

CONCLUDING COMMENTS

As noted above, Australia has experimented with a wide range of industry-oriented procurement policies. The small but quite versatile NDIB that has emerged over the past 20 years has delivered a number of weapons systems to the ADF. These have ranged from locally assembled and part-manufactured small arms and land vehicles, to part-assembly of F-18s, to "built-to-(modified)-print" frigates and minehunters and highly Australianized conventional submarines. While measures of local content at sub-assembly and component level are unsatisfactory, at least half of the delivered value appears to have been added in-country. With the exception of the Collins Class submarines, which have experienced various teething problems (McIntosh and Prescott 1999), the ADF appears to be quite satisfied with the quality of deliverables. There has been considerable dissatisfaction, though, with cost overruns and schedule slippages. These had more to do with the procurement process per se and a large part of the blame has been attributed to the DMO and its predecessors (Kinnaird 2003). To a non-economist, all this may appear to be an unqualified technological and industrial achievement, for which a succession of AII policies should take credit. As economists, we share the ANAO reservations about the AII program.

First, it is not at all clear to what extent the in-country NDIB capabilities are es-w2.4(aiuld809D0.0615 the bw[.ra anddustriam)r(9ov)1ts to17 T1.1

could be compensated by exports and dual civil-defence technologies or that some magic wand of demand management can bridge the gap between grossly inflated supply expectations and actual defence requirements. Also, too little is known about cost premia associated with the strategic in-country sourcing of defence materiel. Given the difficulties of obtaining relevant benchmarking evidence, such premia are inherently difficult to calculate.

All these strategic ambiguities have created considerable dissatisfaction in industry, which has rightly argued that new investment and capacity retention decisions cannot be made unless there are unambiguous signals from Defence as to what products are to be sourced in-country for strategic and broader economic reasons. The confusion created by the unwillingness of Defence to nominate a small but sustainable stock of strategic NDIB capabilities has been further compounded by political "pork barrelling," especially in relation to strategic directions for the shipbuilding sub-sector (see ASPI 2002). As noted earlier, attempts in the 2000 White Paper to focus NDIB capability formation in a small number of sub-sectors was largely contradicted by Defence's (the 1960s style) sectoral plans. At the time of writing, the confusion continues and it is hard to disagree with ANAO that "it is not practicable for Defence to demonstrate whether, over the many years of its existence, the AII program has been making real progress, or is losing ground, in seeking to meet its objectives" (ANAO 2003, 14).

We agree with Kinnaird's (2003) diagnosis that it is the lack of clear lines of authority and accountability in Defence output management that has made it difficult for Defence to focus and manage its materiel acquisitions. We would add that it is precisely for that reason that Defence has failed to identify the strategic capabilities it requires in the NDIB. At present, responsibility for AII is vested in the DMO together with the rest of procurement management. However, the identification of strategically necessary industry capabilities is a matter of upstream capability planning and management. These fourth-arm-of-Defence industry capabilities are strategic because they are complementary to the military capabilities deemed essential for Australia's defence. Thus, they should be identified and managed by the same people who are responsible for the formation of new military capabilities within Defence. Investment in such capabilities should be highly selective and subject to strict government approval processes: they are likely to result in future subsidies either as cost premia

for in-country sourcing or "retainers" in the form of extra work directed to nominated firms, restructuring packages, and so on. The onus should be on Defence to demonstrate why a particular in-country capability is critical to the nation's defence and what cost premia are associated with its formation and sustainment in Australia.

Second, when defence procurement is used to support in-country industry for broader economic reasons, government's decisions should be underpinned by cost-benefit analyses performed by government agencies other than Defence. Such studies should determine sectoral (e.g., IT)

systems purchases, prospects for significant arms exports from Australia are negligible. That said, initiatives such as the JSF project and the increased interoperability between the ADF and the US military may create new opportunities for exports. It is easier to identify niche market opportunities and take advantage of the leverage provided by defence

For the Minehunter Coastal project, "representatives from the Department of Defence contacted in the course of this study did not indicate that the Department paid a premium" (Tasman Economics 2002, 73). As we noted elsewhere, Defence itself calculated that the cost premium paid for local industry participation in the assembly of F/A-18 aircraft in the late 1980s amounted to 29 percent

An additional outcome outside this framework covers Defence superannuation payments and housing support services for current and retired defence personnel (ASPI 2003*a*, 31, Table 2.2.2.).

[14] The capital budget derives its goals from(the unclassified version of) the Defence Capability Plan, which is a ten-year rolling projection of major (over A$20 million) capital investment projects in weapons systems, which are underpinned by the government's long-term, in-principle funding commitment. However, only some of these projects have received specific approval to proceed to acquisition stage. The so-called Green Book provides the rolling, five-year projection of approved and unapproved capital facility projects. Minor capital equipment (less than A$20 million), repairable items, software, and so on are also included in the capital budget (ASPI 2003*b*).

[15] This is because the price of outputs is based on the accrual expenses incurred in their provision, that is, money for depreciation of equipment (non-cash expense) and net growth in liabilities (ASPI 2003*b*).

[16] The first public version of the plan for 2001 to 2010 was promulgated in the wake of the last defence White Paper (Australia. DoD 2000*a*). The 2001 version of the plan contains many projects that have not been rigorously assessed prior to their listing and have not been approved to proceed to procurement. The most recent update has been released, but it appears that it still suffers from the lack of transparency as to why certain capabilities are needed (e.g., main battle tanks) and their exact status in terms of government commitment to proceed and fund their acquisition.

[17] Civil systems of considerable complexity in Australia, such as the provision of telecommunications and transport infrastructure for the Sydney Olympic Games 2000, were completed successfully, in reasonable time, and at reasonable cost. The construction of oil and gas extraction platforms and the associated networks of pipelines, transport vessels, and trans-shipment facilities present technical problems by no means less challenging than those associated with the building of frigates or minehunters to overseas designs. Many of these civil systems must also operate in some of the most inhospitable physical environments on the planet and, thus, their ruggedness and reliability are not very different from those expected of military systems.

[18] On the other hand, since production and use experience are cumulative, the progressive deepening of technological know-how reduces the cost of system modification and change over time. Countries such as Australia, which embark on one-off, in-country production of small batches of complex equipment using imported technological know-how (e.g., Collins Class submarines), incur large and irretrievable (sunk) learning costs.

[19] Historically, there has also been a tendency to produce defence products using production processes and facilities dedicated to military production. This works against product standardization and the use of dual (military-civil) technologies and so also against the achievement of economies of scale in production.

[20] This is not surprising considering the cost of the integrated weapons system. Faltas (1986) estimated the warship (as a weapons system) cost breakdown to be: float 12 percent; fight 70 percent; and move 18 percent.

[21] Arguably, the only firms capable of producing network-enabled "systems of systems" are the largest US companies. BAE Systems, Thales, and EADS are the second division of large system integrators, together with the second division of the largest US companies, and they are gradually evolving from platform-based to broader network-centred production. Boeing and EADS are primarily civil aircraft manufacturers. In 2000, Boeing obtained 60 percent of its revenue from sales of commercial aircraft and EADS 59 percent (Hartley and Sandler 2003). Unlike their US competitors, European companies have not got

employment) tend to be aggregated and do not always differentiate between military and civil activities. This applies to firms (IT, telecommunications) that use dual technologies so that few company resources are dedicated to defence work. Most firms in the ADM sample have disclosed their total employment data but only a small minority have revealed their defence-related employment.

[25] Most broadly, these functional capabilities can be summarized as:

- command, control, communications and intelligence (C3I) systems
- data capture and information management, surveillance and reconnaissance systems
- electronic warfare
- naval systems and platform integration, test, support, modification and overhaul
- land system and platform integration, test, support, modification and overhaul
- air system and platform integration, test, support, modification and overhaul
- systems engineering, modelling and simulation
- manufacturing of sub-systems (for ships and land vehicles) and components (for naval vessels, land vehicles, weapons systems and aircraft)
- explosive ordnance systems and chemicals
- electro optics
- engineering consulting, system architecture development and design
-

[28] For US defence manufacturers, the domestic market is the dominant source of revenue and their export performance is largely underpinned by their sales to

(Markowski and Hall 2003). For example, studies of aerospace have shown that nations often paid substantial premia for local preference; for example, Belgium, Netherlands, Denmark, and Norway incurred a cost penalty of 34 percent for their involvement in a F-16 co-production program (Hartley 1995). To these examples may be added that of F/A-18 local industry participation in Canada, Spain and Australia. Australia's Department of Defence calculated cost premia here as 11 percent for Canada, 13 percent for Spain, and 29 percent for Australia (Australia. DoD 1994).

[33] The buying power of a small country NDO is likely to be limited in global arms markets, although a small buyer may still be able to strike a bargain when the seller of equipment is keen to obtain additional business.

[34] Defence, as the manager of the defence supply chain, must therefore recognize that investments in local industry capability imply sacrifice of opportunities to buy at lower cost in the open market. For reasonably standard types of equipment and consumables, where scale- and scope-related efficiencies (economies) result in declining average cost, "direct imports of existing equipment produced on a large-scale (e.g., US F-16 aircraft) are likely to be the least-cost solution (say index of 100), with co-production and collaboration being costlier (say, index of 130) and independence being the costliest option (say, index of 150+)" (Hartley and Sandler 2003, 376).

[35] Another economic rationale for paying price premia (i.e., a price for local production in excess of the world low price) might be to use them, for example, to make local defence producers undertake development and production work in-country, generating technology (knowledge) spillovers of benefit

[37] This threat of latent competition from global suppliers may provide enough contestability in the domestic market to dissuade sole-source suppliers from abusing their market power even after the contract is signed and Defence has already incurred significant sunk (irretrievable) costs.

[38] A competitive bidding process is valuable here for signalling the disparities between local and international efficiency levels, and possibly the sources of local inefficiency.

[39] Such criticisms have also been directed at the British Procurement Agency (and its predecessor the Procurement Executive). Similarly, the US machinery of defence procurement has long been criticized for cost overruns, gold plating of systems purchased by the military, schedule slippages, and so on.

[40] In shipbuilding, the largest defence sector in Australia, there has been little synergy between ship manufacture and assembly and ship repair and maintenance (ASPI 2002). Since the cost premia associated with import substitution in surface warship building in Australia have been modest or insignificant (Tasman Economics 2000, 2002), building surface warships such as patrol boats, minehunters or frigates in Australia to adapted foreign designs appears to be economically advantageous relative to outright imports of such vessels. A different picture has emerged from the Collins Class Submarine project, where significant cost premia are likely to be incurred over the next few years to bring the boats into full operational capability and to maintain their currency as advanced strategic weapons systems over time (McIntosh and Prescott 1999). At the time of writing, future prospects for this industry sub-sector are rather uncertain.

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CHAPTER THREE

Smart Management of Smart Weapons

Ron Matthews

MANAGING THE REVOLUTIONS….

The defence environment has changed dramatically since the end of the Cold War. The stability of the strategic stand-off between two nuclear superpowers has given way to the uncertainty of asymmetrical warfare, and this uncertainty was heightened by the cataclysmic events of 9/11 (11 September 2001). The West's reaction to the emerging global threat of guerrilla attacks was to intensify investment in the so-called Revolution in Military Affairs (RMA), a concept recently re-labelled by the Americans as transformational warfare. Policy emphasis has begun to move away from platform-centric planning toward a fully networked enabled capability. This system-of-systems approach to warfare highlights the role of "smart" stand-off, laser-guided munitions, C4ISR systems, and armed forces that are light, mobile, rapid, flexible, and adaptable. Denial of the battle-space to the enemy also requires heavy-lift aircraft, lighter, more mobile tanks, Remote Piloted Vehicles, such as the US predator, and special forces. However, development and procurement of these new force structures and capabilities will not come cheaply.

The economic burden that transformational warfare places on the structure and value of defence budgets is significant. The pressures are two-fold. First, the RMA demands force restructuring, and invariably this must occur within the existing defence budget. Second, the contemporary RMA is impacting at a time when a conflict between superpowers is unlikely. For most countries the benign international environment will tighten the screw on defence spending so as to release government finance for the competing requirements of, for instance, health, education, and transport. Whilst Britain, France and, particularly, the United States

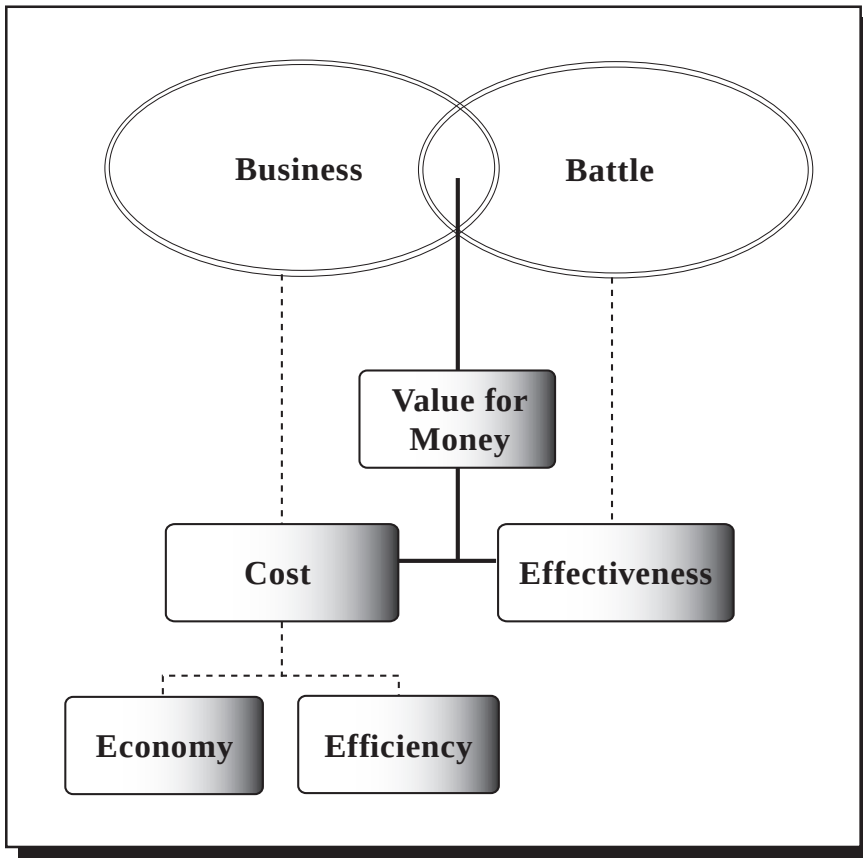
have recently been increasing defence expenditure this will not be sustainable in the long run. Cost escalation of high-technology weapons systems combined with pressure to reduce endemic public finance deficits will ensure that the defence community will be squeezed from both ends of the income-expenditure spectrum.

Almost inevitably, therefore, the present RMA operates under conditions of financial stringency. Thus, although the technical imperative of acquiring battle-winning weapons systems is crucial, of equal importance is the management imperative; the need to manage scarce defence resources in a cost-effective manner. The policy goal has to be "affordability," because in its absence, transformational warfare will not be viable. What is required, then, is a parallel revolution in business affairs (RBA). Defence ministries around the globe have initiated RBA-type policies, but the UK Ministry of Defence (MoD) is probably at the helm. Its aim is clear, to maximize value-for-money (VFM). The MoD has pioneered numerous "smart management" initiatives over the last decade, and these provide a basis for identification, analysis, and reflection of the key strands of defence-related transformational management. The purpose of this paper is thus to evaluate UK MoD policy, profiling the progress achieved in improving the management of defence resources, particularly with regard to the acquisition process. However, to set this evaluation into context,

systems (but as the second Gulf conflict has evidenced, Apache helicopters and C130 heavy-lift aircraft are not invulnerable to relatively low-tech ground fire from insurgents). The search for affordability has thus been prioritized by the UK MoD along with other defence ministries to effect policies designed to achieve "more bang for the buck," or alternatively, the "same bang but for less bucks."

Figure 1 symbolizes VFM as the outcome of integrating the business and battle spaces. The progressive overlay of these two spaces reflect

Figure 1
Integrating the Business and Battle Spaces



the commercialization of defence. In the defence context this means the pursuit of two different but interrelated goals: economy and efficiency. Policies aimed at achieving economy are concentrated in the acquisition and logistics fields, while policies aimed at promoting efficiency tend to

BATTLE SPACE OR SECURITY SPACE?

Events such as the 9/11 Al-Qaeda attack on New York's twin towers, the ongoing insurgency in Iraq, and the proliferation of asymmetrical threats, have forced global defence ministries to reassess both the structure of acquisition budgets and the doctrine employed to defeat the insurgency threat. There are several important threads to this debate.

First, 9/11 represented a premeditated attack on American life and property located in the United States. In every respect it was a wake-up call for the US (and European) policymakers that homeland security was threatened. The US and Britain determined that the terrorists should not be allowed to dictate where the "war" would be fought, and as a result, doctrine changed from being reactive to proactive. The insurgents would be hunted down at source and eliminated. In support of this military posture, ISTAR (intelligence, surveillance, target, acquisition and reconnaissance) became critical. However, it was a capability that failed in the 2003 Iraq war. Contrary to the intelligence community's predictions, weapons of mass destruction have not been found. The flawed intelligence caused considerable embarrassment to the political leadership of the US and Britain, acting to undermine the pretext for the attack on Iraq and the removal of Saddam Hussein's government.

The second aspect of the growing security debate is also tied to the Iraqi conflict. Significantly, whilst the initial "shock and awe" war waged by the coalition and principally US forces against Iraq was hugely successful in achieving its military objectives, the "peace" has been something else entirely. The ensuing insurgency has proved to be nasty, prolonged

an important consideration, it may be a lower policy priority than creating

These security threats are far removed from the RMA, and whilst the stand-off, precision-guided weapons of the latter do represent the conduct of future war, the non-state threats of, for instance, conflict goods, often acting as the financial source for insurgency and terrorism, must also be addressed. Accordingly, operational research staffs will increasingly be obliged to use scenario analysis to influence acquisition policy in ways designed to meet lower-order threats posed by asymmetrical conflict.

MANAGING THE "BUSINESS" OF ACQUISITION

Acquisition Strategy

Acquisition policy in the twenty-first century is a complicated and challenging endeavour. Since the end of the Cold War, the driving force has been cost reduction and affordability as a means of achieving VFM. The commercialization of defence has been accompanied by liberalization pressures impacting on the wider civil economy. As a consequence, there has been an inevitable spillover of business ethos into the defence domain, not least because commercial-off-the-shelf (COTS) technologies are increasingly to be found in RMA-type weapons systems. Liberalization, globalization, and competitiveness have become pervasive forces impacting on the global economy. The World Trade Organization (WTO), in particular, has been the engine driving the opening-up of markets and accelerating the search for ever-greater levels of competitiveness. An important component of the RMA, then, has been globalization; the attendant defence-related market pressures leading inevitably to a more focused process of defence globalization. Seizing every opportunity for cost reduction, defence companies have promoted international industrial integration policies, including the development of international supply chains, technology transfer through offsets, licensed production, and international collaboration, consortia, and strategic alliances. Figure 2 demonstrates the acquisition strategies open to policymakers at different stages in the defence-industrial process.

Countries possessing minimal defence-industrial capacity will be obliged to import weapon systems from offshore vendors. However, over time, as capacity is put into place, licensed production will deepen defence-industrial capability through local production of simple components and sub-assemblies. For some countries, such as Spain, the process

Figure 2
Procurement Strategy

of building up relevant engineering skills and a defence-industrial infrastructure, will continue through participation in international arms-collaboration agreements (Molas-Gallart 1992). These can be distinguished from licensed production because they require R&D and not just production; in other words, cradle-to-grave development and production of the weapons system. The final stage in the defence-industrial process is the most difficult to achieve. This has regard to self-reliance, traditionally the goal of defence industrializing countries.

The contemporary policy emphasis on affordability indicates that traditional acquisition strategy is no longer relevant. The prevalence of extremely high costs and low scales of production in the development and production of complex RMA weapons systems means that increasing numbers of countries are unable to afford self-sufficiency. Thus, defence globalization is forcing a reverse process, whereby self-reliance is no longer the goal, with acquisition instead geared toward international cooperation and, increasingly, outright purchase. Collaborative projects, for example, Europe's Typhoon, and consortia ventures, such as the Joint Strike Fighter (F-35), have the twin attraction of member countries enjoying R&D costs and higher economies of scale from the unification of

markets. The lowest cost-acquisition option is arguably the global consortia model. It allows the purchase of relatively cheap off-the-shelf weapons systems from, principally, the US, eliminating the excessive opportunity costs associated with countries pursuing national acquisition strategies. However, although this model carries the benefits of a more refined international division of labour, including lower cost and enhanced product quality, the downside is the erosion of local defence-industrial sovereignty caused by increased dependence on offshore vendors. The question, however, is whether this loss of defence-industrial sovereignty any longer matters? Future (transformational) warfare is expected to be a quick and decisive exercise. It will incorporate a coalition doctrinal approach, justifying further cooperation in the development of weapons systems as self-reliance becomes less and less an affordable option.

The quest for affordability means that Britain no longer seeks to maintain a national capacity for combat aircraft, and is likely to relinquish capacity in land systems over the next decade. Moreover, economic logic suggests that warship production will also likely succumb in the longer term to regional or international acquisition solutions. A complementary facet of such international industrial integration (I^3) is the development of multinational defence companies. BAE Systems, for example, is a global defence business. As little as 20 percent of its turnover is now accounted for by Britain's MoD; its workforce is increasingly located overseas, and the majority of its shares are now foreign-owned. The British government's position on the dilution of the country's defence-industrial base is one of studied ambivalence. Geoff Hoon, Minister of State for Defence, aptly reflected this position when he stated in 2003 that BAE Systems is not a British company. This view was linked to Britain's changed defence-industrial policy position, highlighting the importance attached to location rather than ownership. In other words, jobs, investment, income-generation, and export potential are valued more highly than national ownership of defence undertakings. This is an explicit recognition of the globalization process reshaping the UK defence landscape. Yet, weapons are not like refrigerators. "Footloose" multinational companies are owned by global shareholders rather than by the local taxpayer. Multinational defence companies have no conception of nationhood or national security, for them profit drives location. Thus, in a fiercely competitive and increasingly borderless international economic and financial system, investment mobility in the commercial sector is acceptable. However, in

the defence context, short-term economic expediency may increase long-term strategic vulnerability.

Defence globalization is changing conventional acquisition strategy in several ways. Figure 3 offers a simplified model of the forces at work, where I^3 symbolizes the inexorable process of defence globalization. Four drivers can be identified.

First, there is the ongoing consolidation of defence industry. This

of Lockheed Martin, Raytheon and Boeing have been established to better exploit local industrial participation opportunities.

The second globalization driver is outsourcing. This represents an overspill of developments in the commercial sector, particularly the creation of international supply-chain networks. In the past, outsourcing has occurred in the national context, but in the future, it will likely be global. In the search to maximize shareholder value, defence businesses are pursuing horizontal and vertical integration strategies. The need is market-driven: to develop a corporate presence in growing markets across the globe, to leverage highly expensive joint R&D investments, and to secure cost-reduction possibilities. Global outsourcing in the main will impact on defence company's lower-order technological activities. By contrast, the higher value-added operations will remain in-house. In this regard, it is probably no exaggeration to state that the world's leading defence-industrial companies will seek to raise their corporate profiles in research, design, development, project management, and systems integration. What little manufacturing presence remains will be focused predominantly on the production of leading-edge, high value-added technologies.

Defence offsets represent the third driver of defence globalization. Offsets have been sustained over the last two decades by the continuation of an international buyers'

this is not to state that transition to a cooperative acquisition strategy will be easy. The principal challenge in the future, as now, will be the equity of workshare. Presently, *juste retour* in the collaborative model is generally now agreed to be an inefficient mechanism for allocating work amongst partner countries. Whilst this method equitably shares work-input on the basis of output-offtake, it suffers the malady of a non-optimal international division of labour. Equally, the alternative global consortia model, requiring that workshare be based on the competitiveness of member countries' national industry has meant that the majority of work has been captured by highly efficient US and UK defence contractors, leaving minimal work for smaller country participants.

These drivers of defence globalization will have a powerful impact on the future shape of the global defence industry, but, equally, acquisition strategy will play a critical role in influencing the long-term development of domestic defence-industrial structures. The nature of these changes will impact on the breadth and, indeed, depth of defence-industrial capability, the extent of product or process specialization, and the intensity and level of engagement in regional and global weapons development and production programs. It is likely that future strategic alliances will be driven by the market. Radical acquisition solutions are probable,

project responsibility during the in-service and disposal phase. Customer two operates the equipment to achieve military effect, but will also have contributed to defining the operational requirement during earlier phases of the CADMID cycle. Additionally, DLO provides in-service support,

of overall procurement had by 2003/04 reached £50 billion higher than initial budget estimates (NAO 2004). Aside from the continuing inability to achieve faster and cheaper acquisition, two worrying developments emerge from the NAO report. First, there now appears to be little difference between new and inherited programs. Strikingly, the NAO report argues that this split "is no longer a relevant distinction because, as analysis shows, many so-called 'smart' projects have failed to apply smart acquisition principles consistently" (Spiegel 2004*a*). Second, the project displaying the biggest cost increase is the F-35 Joint Strike Fighter, supposedly the latest and best example of an RMA-RBA program. An additional concern is that a number of recent high-value acquisition projects, such as the Apache and Chinook helicopter programs, have suffered from weak integration in the separate but linked lines of development. This has obliged the MoD to modify its mantra to now emphasize more effective integration in project management.[6]

COSTS OF COMPETITION

Competitive tendering is an important element of Britain's "smart" defence management model, yet there is growing concern over the nugatory costs of competition. The MoD's policy of competitive tendering has led to cost savings of up to £1 billion per year or a collective 10 percent saving, but as with the savings attributable to smart acquisition and Lean Logistics, doubt has been expressed over the veracity of such figures (Kirkpatrick 2000, 14). Schofield, for instance, is unconvinced, arguing that neither the claims for savings nor their relationship with competition can be adequately tested (Schofield 1995, 148). Calculating the benefits of competition is even more challenging if the costs of competition are factored into the equation. The costs are several. First, the competitive tendering process often delays the decision to award a contract. The original Bowman contract, for example, is a classic case of the "illogicality"

Systems for funding their respective bids and £40 million allocated for the MoD scrutiny process (Odell and Eaglesham 2003). Moreover, the bidding process is ongoing and the build-date continues to slip.

Smart acquisition often does not appear so smart. The challenges facing policymakers in achieving faster, cheaper, better, and more effectively integrated acquisitions seem unique to the defence sector, change little over time, and are common to all countries.

CONCLUSION

This paper has sought to identify, explain, and analyze the major features of the RMA-RBA debate. It has offered a methodology for studying the current policy of integrating the business and battle spaces in the pursuit of value-for-money in the management of scarce defence resources. Cost-effectiveness has been evaluated from both the economic and strategic perspectives. This has facilitated a greater awareness of contemporary defence market conditions set against the contextual backdrop of the changing nature of security threats. The analysis has raised more questions than answers. However, two judgements can be made: defence and economics are becoming more, rather than less, entwined with the passage of time and, the RMA will heighten the need for more economic and efficient defence acquisition. This goal, however, looks to be as elusive in the future as it has been in the past.

[5] See analysis of the UK National Audit Office, *Major Projects Report 2004* (Spiegel 2004*b*).

[6] Apache helicopters have been licence-built at the Westland Yeovil plant, but are being put into storage for two years because insufficient pilots have been trained to fly them (Comptroller and Auditor General 2002). Also note that a fleet of Chinook helicopters costing the RAF £250 million cannot fly because the supplier, Boeing, refuses to supply software codes to validate the avionics system and flight controls. See Harrison (2005).

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CHAPTER FOUR

Spain: A Shifting Approach to Defence Procurement and Industrial Policy

Jordi Molas-Gallart

from the initial focus on offsets, the preferred approaches to deal with foreign suppliers changed in an attempt to extract better conditions and adapt to shifting circumstances. All through this period, however, a main policy goal remained the pursuit of compensations from the foreign suppliers that would allow Spanish firms to upgrade their technological capabilities and thus strengthen the Spanish defence-industrial base. That the main policy approaches kept shifting while the objectives remained stable suggests that policy outcomes felt short of delivering the technological results that had initially been expected.

THE 1980s: FOCUSING ON OFFSETS

When Spain signed the F-18 offset agreement, the Spanish defence industry was mainly state-owned, fragmented into many small plants, loss-making, and technologically backward in comparison to its European neighbours. A structure of national leaders had evolved, by which aerospace production was dominated by the aerospace firm, Construcciones Aeronáuticas, S.A. (CASA), the shipbuilder Bazán, and land-armaments manufacturer Empresa Nacional Santa Bárbara (ENSB). In this way, each of the branches was aligned with a main state-owned manufacturer.

The F-18 offset agreement was seen as a tool to develop domestic technological capabilities, particularly in the defence-related industries. The contract, signed after protracted negotiations in July 1984, limited the amount of indirect commercial offsets in the program and established

would represent new business for Spain as a whole, or merely substitute already existing commercial flows. In cases of technology transfer it had to assess the economic value assigned to the transaction.

McDonnell Douglas flooded the Offset Management Office with thousands of offset project proposals, many of them very small. During the ten-year life of the offset program, 7,759 proposals were submitted, out of which the Office rejected 1,190. Despite the very large number of proposals and projects, by the end of the ten-year period the program had not achieved the targets set up in the contract. Following the contractual provisions, a three-year "grace period" was negotiated. This process revealed that the Spanish negotiators had learnt from the experience and were changing their priorities when dealing with foreign sellers of advanced defence technologies.

Although the main interest of the Spanish administrators was to obtain advanced technologies and capabilities through technology transfers and defence-related offsets, by the end of the program the value of these transactions was small in comparison to the indirect commercial offsets. For instance, defence-related offsets (including direct offsets) accounted for only 28 percent of total program value. The Offset Management Office had to deal with thousands of projects and project applications, out of which only a few were substantial and even fewer involved any form of technology transfer or learning. This is not to say that the program did not have any beneficial effects; there were, in fact, cases of Spanish firms building areas of expertise which they would use on new programs and would become part of their technological portfolio. One of the best-known cases is, perhaps, the work on simulators that the Spanish electronics firm CESELSA carried out within the offset program. The firm, now merged within the Spanish electronics conglomerate INDRA, continued to work on simulators over the following years and has built a significant capacity that allows it to contribute to international programs and develop its own systems.

Yet, overall, Spanish insiders to the program felt that the very large overhead associated with the management of such a large and complex program was not in line with the marginal benefits obtained from a very large number of projects. In the future, programs would have to become more focused.

A problem that Spain had faced in the early 1980s when negotiating the F-18 deal was the limited capacity of the domestic industry to deal

with the demands of contracts directly linked to the program. Partly as a response to this lack of capability, the Spanish government started to involve domestic firms in defence research and development (R&D) programs. From the mid-1980s, Spanish defence R&D rose from negligible levels to almost 30 percent of government *total* R&D expenditure in 1991. This was part of an effort to bring the defence-industrial base up to the "European level" and to involve it in European arms development and production programs, which Spain was able now to access for the first time in history. Most of this new R&D investment was placed in European collaborative projects, and mainly in the then-European Fighter Aircraft, which by the early 1990s accounted for more than 60 percent of all Spanish defence R&D investment.

The firms that benefited most from these investments were largely the same as those that had received most of the F-18 direct offsets value: the main state-owned aerospace firm and the public and private electronics firms. Throughout the 1980s, the Spanish government saw the military demand as a source of technological development incentives in key, high-technology sectors of the economy. The tools of support, however, were shifting away from the large offset agreement that had dominated the mid-1980s.

THE 1990s: FROM OFFSETS TO INTERNATIONAL COLLABORATION

When the time came to negotiate the three year grace period to the F-18 offset program, the Spanish defence-industrial and political landscapes bore little similarity with those of ten years earlier. Spanish firms were starting to gain some experience with international collaboration, the domestic political situation had stabilized, and Spain was now an active member of NATO and the European Union. If anything, Spain was struggling to keep up with a large number of international arms-development programs that had entered in the late 1980s and early 1990s, when almost every European arms-development program that was launched had a Spanish partner.

With the benefit of hindsight, the F-18 offset program had proved unwieldy to administer, dealing with too broad a portfolio of projects, lacking (from the Spanish point of view) a clear strategic vision, and which, ultimately, failed to deliver on its contractual commitments. The

negotiations for the grace period turned out to be tough. It was no longer left to the US firms to present proposals to be approved by the Spanish management: the composition of this last batch of offsets was to be agreed *ex ante*. The Spanish negotiators now had a clear idea of what they wanted: direct offsets linked to the maintenance and support of the F-18 fighters. In this approach, the monetary value of the transaction was less important than its content and indirect offsets were, by and large, abandoned.

Spanish arms-acquisition programs had shifted their balance in favour of international collaborative arrangements. Here the Spanish partners had an early say in the configuration of the system to be developed and could negotiate workshares and areas of activity from a stronger position than that available to just a buyer of weapons systems. Even when the only avenue open was that of a purchase (rather than a joint development) the way the operation was built changed significantly. For instance, in the early 1990s the Spanish armed forces bought eight Harriers and modernized 12 Harriers AV-8B they had in service. This time, the operation was structured as a joint program between the US, Italy, and Spain for the development of the new Harrier variant. The difference with an offset contract is stark. As a joint development program the Spanish industry was involved from the earliest stages of the project, following a division of tasks agreed to a large extent *before* the contract was signed. Theoretically such "collaborative" agreements would allow Spanish firms to interact more closely with their foreign senior partners. Even more important, there was no need for an independent agency to micro-manage the program, unlike offset programs where each project had to be approved. The main responsibility for project management shifted to the participating firms, who are naturally interested in maximizing the benefits (both short and long term) that can be derived from the collaborative program.

International collaboration was not, however, devoid of problems. During the late 1980s and 1990s, Spain entered a myriad of collaborative projects, most of them European. Many of these projects were cancelled as one or more of the participating countries were not ready to make the growing and long-term commitments that were necessary when the projects moved from the early development phases to the more costly stages of engineering and production. The rates of failure and the costs of participation were only two of the problems that international collaborative projects presented. In Spain it was also feared that the role of Spanish

partners, it was hoped, would help link Spanish manufacturers to the international defence-industrial base and provide a more stable basis on which to develop its technological capabilities. Yet, attracting foreign investors to the traditionally loss-making, state-owned military-related companies was not to be an easy task and would have to be underwritten by a portfolio of ongoing contracts assuring a minimum level of activity.

The first deal to be agreed involved the aerospace firm CASA. In June 1999, the Spanish Ministry of Industry and DaimlerChrysler Aerospace agreed a deal by which a new firm, DASA-CASA, was created and the public sector holding that had until then controlled CASA (SEPI)

ENSB and how the winning company would support its future were an integral part of the negotiation; yet the purchase of the tank and the sale of the company were two clearly distinct operations. Although Kraus Maffei won the first part of the contest facing the opposition of the General Dynamics offering, ENSB was sold to General Dynamics four years later. During the protracted negotiations, the government had changed, and General Dynamics offered better economic terms to the new administration. Crucially, General Dynamics committed not to close any of ENSB's surviving plants for a five-year period. Kraus Maffei, a smaller firm suffering financial constraints, opted for a tougher position aimed at streamlining ENSB into a profitable business as soon as possible. General

difficulties. General Dynamics may find that the domestic Spanish defence market is not providing the opportunities it expected and tensions may emerge if, in the medium term, ENSB cannot yield a reasonable return to its new owners. As discussed above, foreign investments in Spanish defence firms in the 1960s and 1970s showed that, in the absence of a continuing stream of programs, and therefore business, the involvement of foreign partners can be a fleeting affair.

ANY LESSONS?

In the 1990s, the Offsets Management Office changed its name to Industrial Co-operation Management Office. This change is symptomatic of the broader shift in the approach to the procurement of defence systems in international markets, and also shows that the experience gained through the management of the F-18 offset program was valuable in future negotiations. The continuity in this organization is remarkable. Today, the Office is part of the state-owned defence systems engineering firm ISDEFE, and continues to advise on international defence-industrial deals, and negotiate industrial agreements on behalf of the Ministry of Defence. Its director has remained in his post for some 20 years and the physical location of its offices (in the ground floor of an unassuming block of flats in the centre of Madrid) has also remained the same. This continuity in some of the managerial offices linked to international procurement has ensured learning based on the accumulative experience of many different projects.

Spanish policies have tried to adapt and learn from each new set of procurement programs. The response to the heavy management overhead and dispersion of large offset programs, was to increase their focus on direct offsets targeting maintenance and support and to move, whenever possible, to other forms of international acquisition. International arms-development programs are, however, costly to run and often vulnerable to changes in the political and strategic priorities of the participating countries. International mergers and acquisitions can provide a more structural link to foreign partners and integrate the domestic industries within international production networks. Yet, if the defence authorities wish to retain and improve specific technological capabilities, they may be compelled to provide a stream of domestic projects to sustain specific capabilities that may already exist in other countries. The involvement of foreign

partners in Spanish defence production is directly supported by the domestic market. Probably it is not a coincidence that the privatization effort has been accompanied by large procurement programs (Leopard for the Army; and EF-2000 for the Air Force) benefiting the privatized core defence systems manufacturers (ENSB and CASA). On top of the large financial investments that have been necessary to return these firms to the firm financial footing demanded by private investors, these procurement programs are providing a book of orders for their products.

NOTE

[1] Rolls Royce's 49-percent share in the newly created aero-engine components manufacturer ITP is the best-known case.

PANEL II

Notes

Australia – highly confused, economically detrimental defence procurement initiative so that the pursuit of economic benefit is a waste of time

United Kingdom – British approach emphasizes military capability while balancing time, performance, and cost and are thus not in favour of budgeting to save cost over capability

Spain – mate defence output with increasing domestic industry in order to move from a high level of offsets to foreign investment

Statement – Jack Treddenick

- Defence industry has to be preserved for meeting a national emergency (can't rely on allies completely)
- Spend defence dollars for economic benefit
- Defence spending can infuse technology growth to the overall economy
- *Must* be re-thought; let defence industry grow instead of protecting it with artificial policies
- The ability to produce kit is reliant upon an established DIB, through protection, this must be reversed
- The lag in civil development hindering defence R&D; therefore the civil industry must be supported to stimulate growth
- Economic benefit uses performance, cost time (big three) which has doubled the complexity of defence spending leading to a reduction in the initial three; therefore economic benefit should be made subservient to the real goals of defence procurement
- Decisions must be simplified in order to meet the threat over economic and regional concerns
- Defence acquisition must be commercialized versus using public bodies, including DND as ministerial motives limit decisions and slow the process
- Value = Capability (for money)

Statement – Senator Kenny

- As a politician, seems to be an inordinate effort made by lobbyists during acquisition process – public relations aspect

- These aspects are common in big business in the decision-making process
- Anomalies emerge when these aspects are ignored
- The effects of the unseen aspects of business dealing

Statement – Rick Worcroff

- Lobbying in defence procurement is prevalent

Statement – Jane Cochran

- Decisions in context of democratic institutions
- Elected have direct responsibilities to link defence decisions to society; concerns outside policy framework
- Political nature of decision-making is a factor and thus a question over mandate
- What else are we getting out of this? Multipliers? Efficiency of resource allocation? Market imperfection?
- Defence economies are separate from business industry

Question – David Fransen

- Marketplace driving force of Industry Canada, not a competitor
- Regional development is a form of tariff
- Are we to be universally disarming? Is there a transition process?

Answer – Stefan Markowski

- Influence of market imperfections due to the unilateral power of the US
- Australia has option to "shop-around" or focus on local-content policy which creates market imperfection of bilateral monopoly in the domestic market
- Must have a good reason to do this – what is it?
- Critical over how these objective have been set up — what are we achieving?
- Tendency to contradict ourselves due to a lack of underlying philosophy
- Disparity between academic theory and practice
- For example, fixed exchanin p a o etwT0hp3de

- Must give industry a set series of outputs and allow it to develop the needed inputs
- Difficulties for other small nations who can't utilize the US as we can
- Despite loss, national security must be maintained as it is not a measurable asset, but it is vital

Question – Bob Walker

- Canadian experience with international procurement not positive — what has been the UK experience?

Answer – Ron Matthews

- Can't ensure success of collaborative works, can only use to try and reduce costs
- Too small in scale to assume individual production
- Must ensure compatible designs
- Historical collaboration with the continent to seek cost-effective systems
- Influence of politics; must move to integrated/harmonious relationship to avoid future wars
- EUROfighter 20-year program; need is lost while being way over budget
- May save in R&D due to split-cost, but capability is lost
- What is the degree of trade-off?
- Feasibility fveloping individually; better for defence capability yet more costly
- Whole DIB in private hands

Question – Jane Cochran

- How effective is this? for example, EUROBUS

Answer – Ron Matthews

- It works well; unified approach to decision-making
- Inevitable move to transition for a European Industrial Base
- Move to most efficient supplier from "just-return" policy
- Unified procurement is the future; will have inevitable delays

Reply by Jack Treddenick to Question from Doug Dempster

- Essential issue is de-politicizing procurement, not bringing it into WTO or NATO
- No agreement for procurement, but there must be development (EU rationalization)
- National concerns may be subverted [he feels little hope]
- Within each country, should do their best to de-politicize – will probably never happen
- Influence of economic benefits is wrong but profound
- Industrial benefits, shared theology; markets understand better than bureaucrats
- Resources that aren't being fully employed, therefore transitions aren't beneficial
- Our trade balance is strong
- Canadian industry does not need to be sheltered, it is capable of competing
- Multiplier effect is limited (1.2), thus can't be used as a support for defence spending; due to this loss, must ensure get greatest capability
- Offsets: public feels they are getting it free – economists feel spending too much
- Conflict: developing domestic industry to support procurement

Question – Patty O'Donnel

- Exaggerate the importance of economic benefit, but not mutually exclusive with capability
- Infrastructure is worth investment; too focused on political distortions
- The negative aspects of politics don't outweigh the value of regional development

Answer – Ron Matthews

- Offsets are cost-driven there, more purchase from US (cheaper than re-developing)
- Seeking compensation based on competition, not multipliers
- Worth of offsets based on whether recipient country has the absorptive capacity to make use of it

Question – To Stefan Markowski regarding Leopard Tanks

Answer – Stefan Markowski

- When will a main battle tank be required to defend Australia? Or to be deployed?
- How can you employ them due to the distance?
- Where is the threat? Any nation able to launch an invasion of Australia (or Canada) would be wealthy enough to defeat us
- The asymmetrical threat of today will not be stopped by Leopard tanks
- Can't confuse US policy with small nations – we must be junior partners to this superpower
- Don't need kit just because others have it
- Thus, when you develop capabilities, you must define the need for it; it must be clear
- The final output must be the foundation

Question – To all by Ernest Gillman regarding US position on military emphasis

Answer – Ron Matthews

- Should be fearful the UK will become a subcontractor to the US – this is wrong, we already are
- US have scale advantage (cost-saving) and the massive DIB
- Must be linked with the US, difference becomes what level/tier contributor
- Concern over intellectual property rights

- Generalizations are easy; the details are key, yet often overlooked as difficult to manage (to understand the political balance)

Supplemental Points from OCdt Heath Robson (III) 23236 (the rest of our points were the same)

Treddenick's main point:
Convinced that defence acquisition be taken away from politicians, DND, and its commercial culture. It should not be a public culture; he wants a department of procurement set up, and cultural change and/or revolution where value is defined as military capability. He believes economic benefits from acquisition are also futile.

Stefan – to Jane Cochran's statement

- Market imperfections in context of defence economics were influenced by the US because of their status as a large supplier
- A small country like Australia has choice – they can shop around
- Critical of the way objectives are set up; confusing strategic and economic objectives
- Due to the fixed exchange rates, Australia is not protecting failing industries as we are with the frigates
- Have to decide what you want as inputs and what you want from industry
- Wants to have people to hold responsible, and wants people to remember that industry demand is derived demand

Ron Matthews

- In the UK, the whole industrial base is in private hands
- Based on specialization and thus always procure goods from most efficient supplier
- More than just a return policy as it is in Spain
- We're moving toward a unified procurement process in Europe

Jack Treddenick

- Essential issue is de-politicizing procurement
- Industrial benefits from sustaining economic benefits

- Talking about economic benefits of trying to achieve fuller employment resources in Canada, but we don't have an unemployment problem so feels no benefit
- Feels our industry is one of the most robust in the world and thus does not need protection.
- Problem with offsets – in contract there is X, but "Joe public" thinks we're getting free stuff while company is saying Canadians are paying too much.

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