Submission to Senate Foreign Affairs, Defence and Trade Legislation Committee Inquiry into the Performance of the Department of Defence in Supporting the Capability and Capacity of Australia's Defence Industry

Dr. Rob Bourke – 14 July 2023

Identification

This document is submitted in a private capacity. I am a former Economic Advisor in the Department of Defence ('Defence').

Key Points

- the current policy approach of Defence to industrial self-reliance can be strengthened on several fronts (Committee Terms of Reference a) support to Australia's defence industry in meeting the current and future needs of the Australian Defence Force)

- lessons learned from the previous policy covering Priority Industry Capabilities (PICs) and the current policy covering Sovereign Industrial Capability Priorities (SICPs) provide valuable insights into how a stronger policy can be achieved (Committee Terms of Reference d) assessment and response to the risks that interruptions to supply chains may present to the ready access to such inputs and the benefits of producing defence industry outputs in Australia)

- those insights point to two measures which might warrant further investigation and together may help to ensure the industrial support the Australian Defence Force (ADF) requires from domestic industry is available—one measure to improve the definition of relevant industrial capabilities, and the other to streamline the way in which their availability is initially monitored (Committee Terms of Reference f) design and implementation of programmes and initiatives that seek to improve Australian defence industry's capability and capacity).

Current policy challenges

After nearly five years, industry plans have been released for around half the areas of domestic industry providing capabilities considered by Defence to be critically important for military-strategic reasons. The areas without plans cover a significant proportion of Australian defence industry. Yet to be defined are the critical industrial capabilities (CICs) to hold in-country for naval shipbuilding, missile production, and the development of new technologies under AUKUS. Those capabilities stand at the forefront of Australia's current strategy for 'impactful projection' of military power.

For the industry plans which have been completed by Defence and identify industrial capabilities of critical importance, it's not easy to determine whether what the department needs ('demand') is available from Australian-based companies now and in the foreseeable future ('supply'). That makes it

difficult to assess whether an adequate level of industrial self-reliance has been achieved and to optimise Defence's industry support programs for workforce skilling, exports and innovation.

Core Concepts

The single most important lesson to emerge from recent attempts to introduce a policy for defence industrial self-reliance is that success is determined not so much by a policy's objectives but by the mechanics underpinning its implementation. The policy has never lacked for laudable aims—but invariably struggled to translate those into tangible outcomes.

The mechanics supporting the policy have three interdependent elements—industry capability definition, monitoring and intervention. To begin with, it's difficult to be sure the ADF has the industrial support it needs without a clear definition of the industrial capabilities most important to hold in Australia for military-strategic reasons.

In turn, reliable definition provides the basis for subsequently monitoring whether those capabilities are readily available from domestic sources based on a comparison of Defence demand and industry supply. A special effort is needed for monitoring given defence markets display most, if not all, of the 'pathologies' which can prevent efficient outcomes.[1]

Finally, without adequate monitoring effective and efficient forms of market intervention by Defence can prove elusive due to an incomplete understanding of where, when, why and by how much an industrial capability shortfall might emerge.

Policy Background

(a) Early approach

For roughly three decades prior to 2009 the government's policy for defence industry was guided by principles articulated in strategic reviews in 1976, 1987 and 1994.[2] The overarching objective of those reviews was industrial self-reliance rather than (complete) self-sufficiency.

That approach was based on: limiting Australia's dependence on overseas sources for materiel sustainment; focusing materiel design capacities on areas where Australia had special needs; and, concentrating domestic materiel manufacturing on areas where Australian industry was broadly competitive or where there were unique Defence requirements.

(b) PICs

Drawing on essentially the same principles, that approach was refined in 2009 when the government introduced the concept of PICs. Included as priorities were 12 industrial capabilities considered most important to retain in Australia for our national security. The precise criteria used for selection were not released publicly although the identify of each PIC was disclosed.[3]

The PICs represented a watershed in the development of policies for defence industrial self-reliance by being described in more detail than had applied in the past. From that, Defence was better placed to monitor relevant industrial capacity and to intervene in the market should a capability problem arise.

Comprehensive 'health checks' (i.e., detailed comparisons of Defence demand against domestic industry supply) were completed for 10 of the 12 PICs.[4] That process re-affirmed that the capabilities assigned priority status had been defined appropriately.

Health checks were guided by a structure-conduct-performance paradigm drawn from the economics literature on industrial organisation. Based on data collected using that paradigm, the department intervened in the market to support six 'at risk' areas of Australian industry.[5]

(c) SICPs

The PICs were superseded in 2016[6] by a new set of industrial capabilities centred on the concept of sovereignty.[7] All other factors being equal, a policy shift from priority to sovereignty implied a change in focus from capabilities Australia should possess to capabilities it must have. That in turn suggested a decline in the proportion of defence industry deemed to be of the highest military-strategic value—something below the 10%-20% of the industry estimated to be covered by PICs.

However, a shift to sovereignty also hinted at a stronger obligation on the part of Defence to pay whatever price premiums or costs for other forms of government assistance required to maintain the domestic industrial capabilities it needed should the industry fall short of achieving international competitiveness.

The precise definitions of SICPs emerged two years later.[8] However, rather than narrowing the range of industrial capabilities most important to the ADF, the new definitions moved in the opposite direction—the proportion of defence industry with sovereign status extended to what appeared to be 80% or more of Australia's defence industrial base.[9]

As part of that process, the PICs were rebadged rather than replaced. Expansion was driven primarily by extending the reach of the policy to include naval shipbuilding, military vehicle production, and materiel sustainment which the PICs had covered more selectively.

Policy expansion appears to have been driven in large part by two unique capability selection criteria. An industrial capability was sovereign if associated with a Defence project which was a 'priority within the Integrated Investment Program over the next three to five years' or 'due to its industrial complexity, Government priority or requirements across multiple capability programs, needed more dedicated monitoring, management, and support to meet Australia's defence needs'. [10]

(d) CICs

Defence moved shortly afterwards to what was, in effect, a revised policy for defence industrial self-reliance based on the narrower concept of criticality. Neither the rationale nor the criteria for deriving a set of CICs were disclosed. However, the move resulted in only a fraction of what was sovereign being considered critical. Health checks, encompassed in a series of industry plans, were subsequently completed covering the critical elements of 8 of the 14 SICPs—the last check being completed in December 2020.[11] Plans for the remaining six SICPs and their critical elements have yet to emerge. The management of Defence's Industry Capability Plan is earmarked for review by the Australian National Audit Office (ANAO) in 2023-24.[12]

The mechanics of implementation

Defence's approaches to PICs and SICPs recognised that to determine the availability of important industrial capabilities a 'proactive' strategy for monitoring their availability was needed. Attachment A discusses the relative advantages and disadvantages of proactive and reactive approaches to monitoring which are rarely covered in public debate despite their importance to policy implementation.

However, the implementation strategy associated with SICPs differed from that of PICs in two important respects.

First, the PICs were selected solely for their military-strategic value. If what was prioritised also proved beneficial for Australia's economy, so much the better. But economic gain was not what drove the approach. For the SICPs the fact that health checks dealt only with the element of each sovereign capability considered critical—leaving the health of the capabilities which remained unspecified—suggested capabilities which were merely sovereign were being pursued primarily for economic reasons.

The criteria and skills required to identify and evaluate industrial capabilities sought mainly for their military-strategic value are entirely different to the criteria and skills required to identify and evaluate capabilities valued more for their potential economic impact.

Second, the PICs were eventually supported by a comprehensive assessment of Defence demand and industry supply. Attachment B describes how that was done including a comparison against relevant experience in the United States (US). Little, if any, information is available publicly on the mechanics involved.

By comparison, the health checks for CICs were proactive but lacked anywhere near the same level of assurance. For most of those checks, it's extraordinarily difficult to determine how much of a capability Defence requires or whether Australian defence industry is positioned to provide it—despite the critical nature of what's involved. Attachment C illustrates the problem using the CICs for military vehicles.

Some options for improvement

The challenge now faced by Defence in attempting to apply a policy for industrial self-reliance is essentially one of scale—there are too many industrial capabilities to define and monitor at least in detail. To reduce the administrative burden associated with implementing the policy, two options stand out which warrant further investigation.

(a) Better definition

The most obvious option is to adopt a more focussed set of selection criteria for industrial capabilities valued primarily for their military-strategic contribution. Under a more focussed approach, relevant capabilities might be those which: hold a pivotal position in the ADF's order of battle; are difficult to secure from overseas in the event of a deterioration in the nation's defence outlook; are unable to be stockpiled or otherwise amassed in sufficient quantities in Australia during periods of relative tranquillity; and, are costly and time consuming to establish in-country should the need arise. [13]

Based on those criteria, rationalising the number of sustainment capabilities might be helpful to achieve a workable policy outcome. That could occur in four steps. First, focussing on materiel most exposed to situations of confrontation or conflict. Second, for that materiel, determining whether sufficient time is available to rectify a sustainment problem to meet the ADF's operational requirements.[14] Third, where enough time exists to properly sustain the materiel most in need of attention, identifying the type of industrial capability required—maintenance, repair, modification, or upgrade. Fourth, ascertaining for each relevant aspect the labour skills exposed to a supply constraint, given the labour-intensive nature of most sustainment activities.

(b) Better monitoring

The difficulty with that option is that, even with a more focussed set of selection criteria, capabilities pursued mainly for their military-strategic value may still cover a significant proportion of defence industry—not as much as SICPs but more than PICs. If so, the administrative workload placed on Defence in relation to capability monitoring might stretch the department's capacity.

To address that issue a streamlined screening process could be introduced for initially distinguishing industrial capabilities in poor health from others. Capabilities at risk are likely to be those for which future Defence expenditure is uneven, the number of both existing and potential suppliers is small, and existing supplier performance is poor or deteriorating. Those capabilities could then be subject to more in-depth monitoring based on an analytic framework similar to that applied successfully to PICs.

Conclusions

Recent history indicates that a successful policy for defence industry self-reliance is one which: avoids open-ended criteria for defining domestic industrial capabilities of high military-strategic value; clearly distinguishes those capabilities from others valued more for their perceived economic benefits; and recognises definition must be accompanied by a proven system for capability monitoring.

On a positive note, none of Australia's current policy challenges seem insurmountable. If Defence can identify CICs for roughly half the areas of Australia's defence industry for which definitions are needed, the department should be able to complete what remains. And the successful monitoring of PICs is proof that in future an effective system can be developed and applied within Defence's complex organisational structure—provided its scale can be contained.

Solutions to the problem of scale might lie with a hybrid approach to applying a capability definition-monitoring-intervention paradigm. The primary objectives in that case are twofold. First, to better target the range of capabilities offering the most significant military-strategic benefits by refining the selection criteria. The second is to reduce the number of capabilities requiring in-depth forms of monitoring by creating a more effective method for initially screening capability health. Those measures should limit, though not eliminate, the additional administrative workload the department would face.

Given Australia's challenging strategic environment, the key issue now faced by Defence is not whether it can afford to implement an improved paradigm but whether it can afford not to. An impending review by the ANAO of the department's Industry Capability Plan should help to clarify the issues involved.

(Dr.) Rob Bourke, 14 July 2023

Attachment A

The Mechanics of Capability Monitoring

Reactive monitoring

The process

A reactive approach to monitoring the health on an industrial capability like that currently used for CICs starts with Defence defining at the time supply contracts are created which capabilities must be available in-country, how much is required and when it's needed.

Next, the department's procurement managers undertake their normal day-to-day oversight of contracts. Periodic independent audits of contractually agreed targets for Australian industry content and other aspects of performance in relation to capabilities are then conducted, as part of the department's Australian Industrial Capability (AIC), Projects of Concern, and Company Scorecards programs.

Data gathering from those processes is supplemented by whatever knowledge the department can draw from its own surveys of defence manufacturers, associated supply chain mapping, and higher-level forms of consultation between the department and industry. And companies can at any time self-report any difficulties they might experience. Those firms should have an incentive to notify Defence of a supply problem, given the promise of government assistance if their advice proves correct.

From all that, a reliable picture of the heath of high value industrial capabilities should be available and the principal managerial requirement placed on the department from a proactive system of monitoring is to undertake itself or delegate to others higher-level reviews of whether its procurement policies and industry assistance programs are performing satisfactorily—something that already occurs on a routine basis. Consequently, a policy for industrial self-reliance requires no special administrative measures.

The pros

The case in favour of proactive monitoring is supported by a range of factors. Perhaps the most obvious is that at the point of project commencement a broad measure of any price premium necessary to ensure the availability of high value industrial capabilities should be known and can be built into the supply contract. At that stage, it should also be possible to gain some idea of other forms of industry assistance suppliers might require to satisfy their contractual obligations, including assistance for innovation, workforce skilling and exporting. Taken together, those measures may be sufficient to prevent many or even most capability shortfalls.

High value capabilities tend to be narrowly based and relate in large part to innovation. Although some forms of innovation will originate and evolve solely within companies many could take place with the involvement of Defence's own science and technology organisation over which the department has a high degree of insight and control. Although there is clearly a need to monitor what occurs within that organisation, the level of transparency tends to be significant through existing budgetary and other reporting mechanisms—obviating the need for complex forms of additional oversight.

Within industry four aspects of market structure naturally support high value industrial capabilities and bolster the case for what amounts to a 'light-handed' monitoring regime.

First, materiel sustainment—which now constitutes perhaps the single largest source of industrial capabilities deemed most important—is subject to reasonably predictable levels of demand and a high degree of natural protection from import competition by virtue of Australia's distance from other major defence manufacturing nations. It can draw more readily than many forms of defence manufacturing on resources from commercial sectors of the economy.

Second, at least some aspects of modern warfare will be short and decisive, suggesting the reach of any domestic requirement to build and sustain materiel could be lower than it appears. That should reduce the risk of inadequate supply and the need for close monitoring.

Third, companies of all types—including small-to-medium sized enterprises—often have access to significant levels of incoming foreign investment and resourcing through overseas ownership which can help overcome the limitations of 'shallow' domestic markets.

Fourth, Defence can exercise whatever monopsony (i.e., single buyer) power it has to encourage supplier companies to behave and perform appropriately.

From all those factors, the probability of a substantial number of capabilities experiencing serious health concerns is likely to be low. It should resemble a bell shape probability function or 'normal' distribution. At one extreme is a small number of capabilities in clearly robust health which require little, if any, monitoring. In the middle are most capabilities whose health is reasonable and require only a modicum of scrutiny. At the other extreme is a smaller number of capabilities whose health is at risk and require a more extensive form of analysis.

Those measures together suggest the ADF can be reasonably assured of the domestic industrial support it needs at any given point in time. As a result, there is no need for the department to engage in a comprehensive or in-depth form of industry surveillance for all industrial capabilities of high military-strategic value. Detailed monitoring is only necessary for a small number of important capabilities which routine reporting identifies are experiencing difficulties—limiting the need to engage in the kinds of economic analysis Defence is perhaps least equipped to conduct.

The cons

The case against that line of argument starts with the likelihood that dealing with materiel projects individually as they pass through the various stages of Defence's procurement process overlooks situations where a single industrial capability straddles several materiel projects which may emerge at different times and whose collective impact will influence the economic health of suppliers. It also suggests projects which have already been approved and may extend for years or even decades may not be monitored in the short-medium term. In the absence of interim measures, coverage could be incomplete until the materiel is replaced.

Even if routine forms of project oversight can identify deviations from a contractually agreed plan for industrial self-reliance, they may not necessarily reveal its cause(s) or point to suitable remedies. In that regard, periodic audits of procurement project performance are backward-looking, when a forward-looking approach is necessary given the time it can take to reverse the fortunes of ailing

companies holding capabilities the ADF values most. In the world of capability intervention, remedies are rarely instantaneous. The same can be said for the results from routine industry surveys and forms of supply-chain mapping which tend to focus on what's already occurred, not what's likely to happen in future.

There are just as many structural features of defence industry which work against the availability of capabilities as there are which promote their health. The former include the prevalence of natural monopoly (i.e., situations where the market is too small to accommodate more than one company at any given time), significant barriers to market entry, a heavy reliance of many materiel manufacturers and sustainers on workload from Defence, a high level of dependence on specialised inputs in short supply, relatively 'inelastic' demand for materiel—meaning Defence may have few options to delay or even cancel its requirements in response to difficulties it might face with supplier companies including unexpected increases in the costs of projects—and the high risks associated with innovation.

General measures of industry assistance—including those for innovation, exports and workforce skilling—are relatively blunt instruments for achieving a specific capability outcome. Attempting to apply them at the commencement of materiel projects risks selecting from a range of options before the full nature of a capability problem may be apparent.

For a reactive approach to monitoring to function, those general assistance measures must give preference to industrial capabilities of the highest military-strategic value. That requires quarantining a portion of funding within and across assistance programs and then allocating the designated amounts based on a reasonably detailed understanding of the health of each important industrial capability. It's difficult to target Defence's suite of industry assistance measures without that understanding.

For all those reasons, a reactive approach to monitoring relies ultimately on companies self-reporting any capability problems. But existing contractors supporting those capabilities may not fully appreciate the department's expenditure plans and priorities. And companies not currently supplying to Defence may not be aware of their role as potentially important suppliers.

Failure to deliver an important capability may have less of an impact on some companies, especially those with diversified business interests, than it could on the ADF. Asymmetric costs of that kind can reduce the incentive for companies to report difficulties. A reluctance to report may also arise if companies feel it would jeopardise their prospects for securing other work with the department, especially if they rely heavily on Defence orders. Late or incomplete reporting by industry may arise if companies overestimate their ability to contain a supply problem. And, if Defence is not notified of a problem until it's become acute the department could be limited in its response to unpalatable forms of intervention.

Finally, under a reactive approach to monitoring, Defence may ultimately be required to draw much of its information on the availability of capabilities from industry through broad consultative forums. Those arrangements rarely provide scope for discussion of a technical nature with military and commercial sensitivities. The result can be a stalemate: the department seeking insight into issues of broader public policy and industry (quite legitimately) offering information geared to its own private interests. In that

situation, the outcomes of consultation can condense to a list of actions industry would like government to take, without much insight into the cause, effect, costs and benefits of the capability issues involved.

Proactive monitoring

The process

A proactive or purpose-built monitoring system like that used for PICs is quite different. The essence of that system is subjecting every industrial capability deemed important to close investigation. [15] The system is progressed in the following steps.

The Defence materiel projects likely to have a significant bearing on the health of a capability are identified. The budget data bases for those projects are then investigated to identify the sub-categories of departmental expenditure which align to each capability. From that data, an expected level and pattern of demand is derived, paying particular attention to any sharp increases or decreases ('valleys of death') in expenditure that might occur over the short-medium term.

Data is then extracted from Defence's contract databases to identify the companies currently participating in relevant projects and from the department's tender databases to identify companies that have recently, but unsuccessfully, bid for project work and may therefore be among the most likely potential market entrants and therefore sources of support for the ADF and existing suppliers encounter difficulties.

Drawing on that combination of demand and supply data, individual interviews are conducted. Defence project managers are approached to obtain a closer understanding of exactly what the ADF requires from industry including any qualifications that might apply to demand estimates and existing measures of industry performance. Current and potential suppliers are then contacted individually to gauge their capacity, predominantly in a prime-contractor role.

Through a process of one-on-one interviews, those suppliers are first informed of Defence's future demand (with appropriate regard to matters of confidentiality) and then asked to respond based on a detailed set of questions relating to supply-side market factors. A controlled form of demand information disclosure helps to avoid the obvious problem of companies struggling to grasp Defence's requirements if given little indication of what those might be.

Based on interview data, a report on the availability of the capability is then prepared. Where the likelihood of a significant capability shortfall is identified, a further round of analysis is undertaken to verify preliminary results and, if necessary, identify options for intervention including their comparative costs and benefits. Those options are first discussed with Defence's capability owners and other relevant areas within government before being raised with the companies involved, to reach a consensus solution.

Details of the outcome from all the above steps are likely to remain confidential given the inherently sensitive nature of the defence and commercial matters discussed. Nonetheless, a suitably structured summary of capability health might be released given the public interest issues involved.

The pros and cons

A proactive approach to capability monitoring addresses each of the problems associated with a reactive strategy. It rests on the notions that: the availability of capabilities important to hold in-country for national defence should not be a matter of certainty not speculation; no amount of theorising can ultimately predict when, where, why or by how much capability shortfalls will arise; and, if the approach places a greater administrative burden on Defence, the costs involved would need to extraordinary large not to be justified given the military-strategic consequences of a capability shortfall.[16]

Nonetheless, the approach has its challenges.

Problems start with the fact that narrowing the range of materiel projects relevant to a single industrial capability requires a close understanding of the department's procurement plans and priorities. And even if relevant projects can be readily identified—probably through discussion with senior procurement managers in the air, sea, land, and electronic materiel domains within the department—data bases for those projects are normally structured to meet the need for high-level financial reporting rather than micro-economic analysis on which capability monitoring depends.

Individual capabilities often account for a small fraction of overall activity and expenditure within materiel projects, and their patterns of demand can be quite distinct. That means dissecting project financial records to pinpoint the relevant line items or creating a separate set of estimates from scratch—something which relies on close cooperation across the department.

Cooperation is also needed to identify from Defence contract and tender databases the companies already within the market or best placed to enter—although most of the relevant data should be readily accessible from existing departmental resources. However, those databases may deal only with actual and potential prime contractors, leaving project supply chains largely untouched. And as the analysis of supply moves from current to potential suppliers, capability health checking becomes less certain as the need to investigate takes Defence outside the aspects of industry for which it can normally rely on its own records.

For companies other than those already under contract with Defence, commonly available sources of external data may lack a clear description of the capabilities each potential market participant holds, their past performance on similar types of activity, and the cost and other constraints they may encounter. Those factors highlight that simply identifying the name of a potential supplier, through some form of high-level industry survey or related form of supply-chain mapping, may go only a small way to providing Defence with the information it needs. Adding to the limitations of both those methods of data collection is companies self-nominating as a capability provider in surveys before perhaps fully appreciating the differences between operating in commercial and military environments or the nature of individual Defence projects.

Direct contact with companies under a proactive system of monitoring provides an obvious solution. But companies of all kinds may predicate their ability to deliver capabilities on the expectation (sometimes unstated) of future breakthroughs in supply. To accept claims of impending success by companies ideally requires evidence of a recent history of positive performance and/or plausible development strategies for the future.

One of the difficulties associated with implementing a proactive system is having ready access to sufficient funds to intervene in the event of a capability shortfall. The budgets for neither Defence

materiel projects nor assistance schemes for industry normally incorporate enough contingency to deal with an urgent need for intervention on a significant scale. And the department's budget rules and regulations do not usually allow underspends in one area to be readily diverted to another. In both cases, attracting sufficient funds for intervention can require Ministerial and even Cabinet approval which could extend well beyond the time needed to respond to a capability problem. Consequently, a pool of reserve funding for intervention—which may or may not be used—is required.

Finally, because the structure and timing of Defence materiel projects can change significantly over their lives and the viability of companies can shift under the influence of a myriad of factors—often in a manner that is difficult, if not impossible, to predict—a proactive system of monitoring applied on any scale requires frequent updates. That implies the ultimate responsibility within Defence for monitoring should rest with the owners of important capabilities. Those people are mostly within the ADF or manage supply contracts in the civilian-controlled procurement arm of the department.

However, delegation on a significant scale has its complications. Monitoring may be assigned to personnel with limited training and experience in economic analysis. Those people may view their role more in terms of delivering a fully functional item of materiel to the ADF to cost and schedule than securing the economic health of industry. In the absence of a common framework for that analysis and a centralised point within Defence for final quality control, the depth and accuracy of monitoring may vary so much that ranking capabilities according to the need for further investigation and possible intervention becomes unworkable. Capability owners may claim, with some justification, that if assigned the new task of capability monitoring they should be provided with additional resources.

Attachment B

Priority Industry Capabilities

Definition

The descriptions of each PIC were useful and relevant. However, they still required fine tuning before being applied—meaning that an additional step in capability definition was sometimes needed before Defence could progress to the stage of capability monitoring.

Many, though not all definitions, provided limited guidance in relation to the specific technologies or products those capabilities should encompass or the quantity of the capabilities required. Nor did they specify the period over which capabilities needed to be available or the degree to which research, development and design needed to be linked to materiel production, assembly and testing to yield a technically and economically feasible outcome. To create a seamless link from capability definition and monitoring refining the definition was required.

For example, the PIC for Electronic Warfare (EW) specified that Australia should hold in-country the capacity for 'selective strategic product development...'. But it did not indicate the relative emphasis which should be placed on EW's electronic support, electronic protection and electronic attack aspects. Nor did it specify the degree of importance Australia should assign to the radio frequency, infrared, electro-optical and ultraviolet facets of electronic warfare technologies. How development efforts for EW should be divided between in the air, sea and land domains was left open, as were the materiel projects most relevant to its current and future development. The pace at which development should occur was unspecified.

Moreover, little guidance was provided by the EW PIC on the degree to which development should draw on private and public sector collaboration or the kinds of funding government should assign to the development task. Finally, there was no mention of whether products consisted of research development and design alone, the assembly of EW components for materiel or entire materiel packages. Without data on all those factors, reliable decisions in relating to the availability of the PIC were difficult to make. That data could only be obtained through a regime for detailed capability definition and monitoring.

Monitoring

Early attempts to measure the health of each PIC appear to have been based on a higher-level analysis. That included a list of relevant Defence projects and their aggregate levels of expenditure to reflect ADF demand. To indicate industry's capacity to supply, the department seems to have relied on existing prime contractor company numbers alone. However, that approach proved inadequate to support potentially complex and costly decisions in relation to intervention to address capability shortfalls.

Recognising those points and after a long delay, Defence reorganised its resources with the aim of undertaking more detailed proactive health checks. Drawing primarily on internal economic expertise, a small amount of external technical input in areas like electronic warfare, acoustics and systems integration, and a common reporting framework, the department succeeded in producing comprehensive reports covering the health of 10 of the 12 PICs. Reports for the two remaining PICs—for

high end and systems-of-systems integration and anti-tampering—were postponed due to Defence being unable, at that stage, to reliably prescribe the department's requirements. A summary of findings for each PIC was released publicly.

To check the health of PICs in an effective manner, Defence appears to have adopted and adapted a traditional industry structure-conduct-performance (SCP) paradigm drawn from the economics literature of industrial organisation.[17]

At the core of industry structure are levels and patterns of Defence demand, the number and size of established companies, barriers to upward mobility by smaller established players, and prospects for new companies to enter and exit the market. Next comes the prevalence of natural monopoly, the nature of vertical contractual relationships between Defence, primes and their suppliers, the degree of company dependence on Defence workload, and prospects for companies to diversify into other defence and commercial markets including exports.

The paradigm normally goes on to examine: the potential for bottlenecks in supply occasioned by shortages of inputs like skilled labour; scope for future advances in product and production technologies including the potential for spillovers (i.e., new knowledge a defence project generates that helps to improve productivity in other areas of the economy); recent history in relation to market/company growth and innovation; the degree of company reliance on government support; and, company receptiveness to different types of government programs for industry designed specifically by Defence to sustain workload, enhance labour skills, develop export markets and promote indigenous research, development and design (RD&D).[18]

Where a PIC was defined in terms of a technology whose evolution occurred principally within the public sector, a variant of the SCP framework may have been required. If so, PIC health may have been assessed by examining whether the relevant organisation had a clear, relevant, and cost-effective research strategy, well trained technical staff, adequate infrastructure and budget funding, and appropriate links to other research institutions and to industry.

In the case of PICs, it seems any checklist used to elicit information from companies was supplemented by a separate survey of industry conducted by Defence. That survey, whose results were released publicly in a condensed form, covered the largest 50 Australian-based contractors for capital materiel projects to the department.

Reverse engineering the results obtained and published suggest the survey sought details of company ownership, total sales over recent years (broken down annually into defence, commercial and export categories), total profit on sales over recent years, proportion of sales directed to the Australian supply chain, current projects for Defence, departmental projects of future interest to the company, current employment by skills category, current research, development and design expenditure by technology, current and future export interests, and current and expected sources of supply constraint. Data from the survey appears to have helped to establish a company profile, onto which the SCP checklist was superimposed, to investigate PIC availability.

Although the full PIC health reports from those steps were confidential, unclassified summaries were released publicly. From those, it appears Defence intervened in the market in six[19] out of the 10 PICs for which departmental requirements placed on industry could be reasonably assessed. Notably,

intervention was achieved despite a number of limitations in the way the PIC program was structured, including: the absence of separate budget which allowed Defence to intervene quickly in the event of a capability shortfall; the lack of an organisational structure within Defence which clearly assigned the ownership of PICs; and, an underestimation of the analytic skills required by Defence to take the policy from concept to conception.

Publicly available data suggests those interventions took three different forms. Defence project expenditure was brought forward or otherwise progressed to avoid gaps in industry workload (Combat Clothing, High Frequency Radar, Phased Array Radars, Acoustic Technologies and Infantry Weapons). A clear preference was extended to PIC-supporting companies competing for defence industry assistance grants in the areas of innovation, skilling, or export market development (Electronic Warfare and Remote Weapons Stations). And Defence altered its internal procurement processes and procedures to benefit industry (Dry Docking and Common User Facilities and the In-Service Support of the Collins Combat System). Added to all that, Defence sought to clarify its requirements in relation to the PICs for High-End and Systems-of-Systems Integration and Anti-Tampering, with the aim of giving industry a clearer understanding of the department's enduring needs.

However, the task of monitoring then appears to have faltered again. The problem in that case was possibly that although comprehensive reports of the health of capabilities had initially been completed, it was difficult for the single area within the department responsible for production to maintain their currency. With so many Defence projects and industry suppliers needing to be monitored (even though the PICs were tightly defined), constant adjustments to maintain the reliability of data became too difficult for one area of the bureaucracy alone—in that case the industry policy area—to process.

For reasons which are still unclear, the option of resolving that problem by delegating health check updates to capability owners and project managers across Defence—based on a common reporting framework to provide consistency of outcomes and drawing on the extensive information initial health checks already provided—appears not to have been pursued. As a result, detailed monitoring ceased, the health checks fell into disrepair and the relevance of the PICs was lost.

Lessons

From the department's experience with PIC health checking five lessons stood out.

First, the fate of industry was often determined by factors which were not visible to Defence in its routine interactions with companies, even from day-to-day exchanges between departmental capability owners, contract managers and materiel suppliers. A special effort was needed to draw reliable conclusions in relation to PIC availability.

Second, that picture was of limited value without a thorough understanding of Defence's demand. Although defining the nature of the requirements the department placed on industry appears to have been more challenging than it first appeared given the sheer number of projects involved and the structure of the department's financial reporting systems, it was still required. That was probably because industry would struggle to assess its own position without a reliable indication of the department's needs.

Third, the development of a priority capability—especially intervention to overcome a supply problem—probably required a trade-off between availability and price whose dimensions could only be determined through a relatively thorough form of industrial analysis.

Fourth, it may have been difficult to structure Defence's programs for industry skilling, exporting and innovation without a reasonably detailed understanding of the economic health of industrial capabilities vital to national security. Without that understanding, an optimal allocation of funding between the various programs would have been largely subjective. And because each program was typically oversubscribed, in the sense of the total value of the requests for funding from industry being well above program budgets, some way of rationing assistance based first and foremost on military-strategic benefit was necessary. Detailed forms of capability health checking were the only way optimal program outcomes could be achieved.

Fifth, progressing the more expensive forms of intervention like price premiums might require forging a consensus between a disparate range of stakeholders—some of whom may have been inconvenienced by a development strategy and therefore amenable to change only if presented with a convincing business case. In that situation, 'once over lightly' and 'take my word for it' may not have been sufficient to garner support from interested parties, including the government's central agencies of Treasury, Finance and Prime Minister and Cabinet.

Corresponding US experience

By and large, the case for what appears to be a PIC-like approach to capability monitoring is supported by an historical comparison of Australia's approach against corresponding experience in the US although international comparisons can be difficult to make. Of Australia's Five Eyes partners, Canada had explored the issues surrounding the development of indigenous defence industry capabilities at the time PICs were operational.[20] But only the United States (US) appears to have considered the issue in detail through its Sector-by-Sector, Tier-by-Tier (S2T2) methodology.[21]

Australia and the US differed in important respects. Compared to Australia, the US sought to achieve a high degree of defence industrial self-reliance, to a point approaching self-sufficiency. That included major weapons platform assembly. It was less dependent on international trade in armaments to achieve its national security objectives—making the 'strategic leverage' aspect of defence industry development a lower policy priority for the US than for a much smaller country like Australia.

US demand for materiel was so large that the exploitation of economies of scale in research, development, design, production, assembly, and testing were easier (though still not easy) to achieve. That suggested fewer instances in the US where defence industrial capabilities important to hold in-country would be under threat for scale-related reasons than Australia might face. And as a large and diversified but relatively closed economy at the forefront of international technological development, the US could arguably absorb the costs of protecting its defence industry with fewer adverse effects than a small open economy like Australia where a more nuanced approach to industry assistance was necessary.

US supply chains were far deeper than those of Australia, pointing to the need for more expansive forms of capability monitoring. And budget sequestration, in which funding for Department of Defense ('Defense') capital materiel projects in the US relied in many cases on annual renewals—compared to

Australia's capacity to commit to longer term budget outlays—made the progress of materiel projects in the US less certain and industrial supply more complex to manage.

Nonetheless, there were still strong similarities between the two countries. Limited budget funding relative to the defence responsibilities each country discharged necessitated identifying areas of the industrial base important to retain in-country for reasons of national security. Not every capability was affordable, even for an economic superpower, and a close examination of the costs and benefits involved was therefore required. There was no point to identifying those capabilities if their availability could not be measured reliably given the intrinsically imperfect nature of defence markets. And routine forms of materiel project administration were not sufficient to yield the information needed for industrial self-reliance to be measured reliably—a proactive form of capability monitoring was required. Finally, measurement had little value unless backed by the willingness and ability of government to intervene should a capability problem arise.[22]

S2T2 was based on two criteria, 'criticality' and 'fragility'.[23] Criticality referred to industrial capabilities difficult to replace if disrupted or lost. It corresponded broadly to PIC definition in Australia. Fragility covered the robustness of current and potential US suppliers' ability to support the war fighter. That corresponded broadly to Australia's system for PIC health checking. In essence, definition under PICs and criticality under S2T2 were focused on the military importance of capabilities and whether alternatives were available. Monitoring under PICs and fragility under S2T2 were both concentrated on an analysis of availability.

By 2013, the criteria used by the US for each criterion had been reduced to what would become an enduring list. The criteria for criticality covered: how unique the materiel supported by an industrial capability was to Defense and the availability of alternatives. However, it also extended to three issues which, *prima facie*, were perhaps associated more closely with fragility. Those were Defense's materiel's design requirements, industry's requirements for skilled labour and production infrastructure, and the time needed for industrial capabilities to be reconstituted if lost or depleted.[24]

For existing suppliers of critical capabilities, the US criteria for fragility included Defense's levels and patterns of demand and the financial strength of companies. For the broader market, including potential suppliers, fragility was determined with reference to the number and abilities of the companies involved and their dependence on foreign inputs to production reflected in the US industrial content of projects.

Applying the concepts of criticality and fragility in the US commenced with annual overviews by Defense of activity within the aircraft, electronics, ground vehicles, materials, munitions and missiles, shipbuilding, and space areas of US defence industry. That took place in two steps.[25]

First, Defense subject matter experts examined each of the critically and fragility criteria, supported by data drawn from their own knowledge, industry surveys conducted by the department, and statistical data collected by other US government agencies. Those assessments were still reasonably detailed but performed without an exhaustive investigation of every issue based on detailed discussions with industry.

From that, 'at-risk areas or critical issues important to the defense industrial base' where identified. Initial screening of that kind reflected an early lesson from S2T2: most areas of the industrial base were not fragile or critical, so quickly identifying and removing those areas without the need for exhaustive examination was a 'tremendous efficiency'.[26] The second step focused on industrial capabilities initially identified as being in poor health, for which a 'deep dive' of capability health was undertaken.

Citing concerns in relation to business and other 'sensitivities', the precise identities of the capabilities deemed by Defense to be critical were not revealed publicly. However, early independent analysis suggested the following: 'precision weapons, including missiles for both strike and defense; low-signature platforms such as stealthy air vehicles, both manned and unmanned; nuclear submarines; global intelligence, surveillance and reconnaissance (ISR), including reconnaissance satellites, global positioning systems and unmanned aerial vehicles; integrated battle networks that married ISR with robust command, control and communications (C3); the skills, procedures, tools and organizations for dominating the electromagnetic spectrum, including network attack, network defense and cryptologic skills; and, large-scale system and network-architecture integration'.[27]

Similarly, any detailed market analysis associated with each critical capability's fragility was not publicly available including the results of deep dives. However, annual reports by Defense to the US Congress, presented patterns and trends often in considerable detail.

Relative to Australia's approach to identifying PICs, several aspects of the US approach under S2T2 stand out. First and foremost, like Australia, the US rejected the notion that the availability of important defence industrial capabilities could be guaranteed through a reactive or 'set and forget' approach to planning. As with PICs in Australia, proactive measures for identifying a likely capability shortfall were needed, based on a reasonably detailed assessment of capability demand and supply. The former included measures of demand for a single capability which spanned multiple materiel projects. For supply, it extended well beyond a simple indication of the number of companies involved.

In both countries, even the initial process of screening to help reduce the number of capabilities requiring the most detailed analysis extended well beyond what routine forms of supply chain mapping and even broadly-based surveys of defence industry could provide. For reasons of practicality, analysis had a relatively short time horizon.[28]

Second, in Australia's case, health checking of all PICs was perhaps more akin to a US 'deep-dive'. That could have reflected several factors: Australia's defence industrial base was tiny compared to that of the US, making industrial supply inherently more fragile and 'deep dives' more important to undertake; and, unlike the US where the whole-of government collection of data relevant to defence industry appeared extensive, the data on defence industry collected by areas of the Australian government other than Defence was strictly limited. However, like the US, Australia appears to have experienced more difficulty in assessing the RD&D aspects of industrial self-reliance than its aspects relating to materiel assembly.

Third, in certain respects, the US approach extended beyond the approach that applied in Australia to PICs. For example, in the US the financial outlook of current suppliers—a measure of industry performance—was integral to the analysis of fragility. In Australia, the analysis of PICs sought to

infer the financial strength of companies from the structure of the market in which they operated rather than directly from financial records.

And fourth, Australia's approach appears to have concentrated more heavily than the approach of the US on the potential for new players to enter defence markets—probably reflecting Australia's far smaller industrial base.[29] [30]

Attachment C

CIC Health Checking - Military Vehicles

The SICP industry plan for Land Combat and Protected Vehicles and Technology Upgrades helps to illustrate the problems experienced by Defence in attempting to gauge the health of critical industrial capabilities.[31]

Sovereignty in relation to land combat vehicles was defined by Defence to include 'broad Australian industry involvement in the delivery of the new vehicles'.[32] Within the sovereignty umbrella, the relevant industry plan singles out four capabilities of critical importance—design, development and industrialisation of survivability and signature reduction material technologies and processes, vehicle and combat system integration, vehicle and system upgrades, and vehicle sustainment. The plan goes on to identify the following Defence projects as relevant to those capabilities—Land 400 Phase 2, Land 400 Phase 3, Land 907 Phase 2, Land 8160 Phase 1, Land 8116, Land 121 Phase 3B/5B, Land 121 Phase 4.

However, in terms of demand, no indication is provided in the plan of the proportion of the SICP contributed by the CICs, what proportion of each relevant Defence project is relevant or likely to be relevant to each CIC, and the pattern of future demand from each critical capability. In short, it's unclear how much of each critical capability Defence will need and when it will be needed.

On the supply side the plan does not identify the number of companies currently supporting each CIC, even in a prime contractor role. Instead, numbers are provided for the SICP in its entirety. It's therefore difficult to understand the structure of the industry supporting each CIC even in the most rudimentary terms, including how dependent Defence might be on a small number of existing suppliers and how far critical capabilities might extend beyond the private sector to include public sector participation.

The plan attempts to identify the number of existing suppliers to Defence and the number of companies who might potentially enter the market to support the CICs, using two sources of data.

One source is a departmental survey of defence industry. However, data from that survey is not broken down by critical capability—presumably because the survey was designed and conducted before the CICs were defined. The other source is Australian Bureau of Statistics (ABS) data for four areas of Australian industry—motor vehicle and motor vehicle part manufacturing, fabricated metal product manufacturing, automotive repair and maintenance, and polymer product manufacturing. But whether categories are aligned to each CIC is not explained in the plan. It seems unlikely a close alignment existed given ABS data is based on relatively broadly defined 'industries' while CICs are based on relatively tightly defined 'markets'.

Finally, the plan provides limited insight into the additional supply factors which might affect the ability of Australian industry to support each CIC. That's partly because the analysis is at a high level and limited to the SICP in aggregate with no details provided for the individual CICs within.

The above factors help to explain why the plan did not offer a conclusion in relation to whether Australian industry was positioned to adequately support the ADF with critically important capabilities now or in the foreseeable future. The document highlights the difference between analysis which simply lists a general set of actions which Defence might take to assist defence industry and analysis which pinpoints the state of a given industrial capability.

.Endnotes

[1] Henry Ergas and Flavio Menezes, 'The Economics of Buying Complex Weapons', *Agenda*, 11 (3), 2004, 242-264, online. Also see Productivity Commission, 'Box 1 Sources of Market Failure' in *Submission to the Competition Policy Review*, June 2014, 5, online, Carlos Marti Sempere, 'A Review of Market Failures in the Defence Industry', *Defence and Peace Economics*, 31(6), 642-658, 2020, online, Stefan Markowksi, Peter Hall and Robert Wylie (eds.), 'Buyer-seller interaction in defence procurement' in *Defence Procurement and Industry Policy: A Small Country Perspective'*, Routledge, London, 2009, 115-152, online, Trevor Taylor, 'Defence Procurement: Overcoming Challenges and Managing Expectations' in Ron Mathews (ed.), *The Political Economy of Defence*, Cranfield University, 19 April 2019, 258-283, online.

[2] Department of Defence (DoD), *Australian Defence*, Canberra, 1976, 50-54, online, *The Defence of Australia*, Canberra 1987, 75-89, online, *Defending Australia – Defence White Paper*, Canberra, 1994, 113-124, online.

[3] The PICs included Electronic Warfare, High Frequency and Phased Array Radars, 'High End' System and 'System of Systems' Integration, Through-life and Real Time Support of Mission and Safety Critical Software, Anti-Tampering Capabilities, Signature Management, In-service Support of Collins Combat System, Acoustic Technologies and Systems, Ship Dry Docking Facilities and Common User Facilities, Selected Ballistic Munitions and Explosives, Infantry Weapons and Remote Weapons Stations, and Combat Clothing and Personal Equipment.

[4] The remaining two were not completed only because Defence had yet to establish its requirements.

[5] Useful background on the PIC experience can be found in Craig Stone, *Prioritizing Defence Industry Capabilities: Lessons for Canada from Australia*, Canadian Defence and Foreign Affairs Institute, Calgary, January 2014, online.

[6] DoD, *Defence Industry Policy Statement*, Canberra, 2016, online.

[7] DoD, *Defence Industry Policy Statement*, 23-24. As noted in the statement: 'Defence envisages that the number of sovereign industrial capabilities will be small, properly targeted and managed.'

[8] DoD, *Defence Industrial Capability Plan*, Canberra, 2018, 36-41, online.

[9] The SICPs include Combat clothing survivability and signature reduction technologies, Munitions and small arms research, design, development and manufacture, Land combat and protected vehicles and technology upgrades, Aerospace platform deeper maintenance and structural integrity, Collins class submarine maintenance and technology upgrade, Continuous shipbuilding program (including rolling submarine acquisition), Enhanced active phased array and passive radar capability, Advanced signal processing capability, Surveillance and intelligence, Test, evaluation, certification and systems assurance, Robotics, autonomous systems, and artificial intelligence, Precision guided munitions, hypersonic weapons, and integrated air and missile defence systems, Space, and Information warfare and cyber capabilities.

[10] DoD, *Fact Sheet Sovereign Industrial Capability Priorities,* current, online.

[11] DoD*, Sovereign Industrial Capability Priorities - Implementation and Industry Plans*, current, online.

[12] Australian National Audit Office (ANAO), *Management of the Defence Industry Capability Plan*, Potential Performance Audit, online.

[13] There seems no reason why a new set of selection criteria can't be released publicly given the criteria for sovereign capabilities have already been disclosed along with the identity of each CIC for which implementation and development plans have been prepared.

[14] For an example of how that might apply to naval shipbuilding see Andrew Davies, Henry Ergas and Mark Thomson, *Should Australia build warships? An economic and strategic analysis,* discussion paper, ASPI, Canberra, April 2012, online.

[15] The US Congress has recently advocated a similar approach by noted the aim when it comes to industrial self-reliance is for the Department of Defense 'to be able to "trust but verify" with its own tools'. United States House Armed Services Committee, *Report of the Defense Critical Supply Chain Task Force*, Washington D.C., 22 July 2021, 14, online.

[16] In addition, the close understanding of capabilities which detailed monitoring provides may assist a policy for industrial self-reliance to progress with fewer distractions.

[17] For a description of the framework see Peter Asch, *Industrial Organization and Antitrust Policy*, Wiley, New York, 1983, online, Frederick M. Scherer, *Industrial Market Structure and Economics Performance*, Rand McNally, New York, 1970, online, and Douglas F. Greer, *Industrial Organization and Public Policy, McMillan, New York, 1980,* online.

[18] That assistance was embodied in a range of programs for which companies supporting PICs were eligible, including Skilling Australia's Defence Industry (SADI), Industry Skilling Program Enhancement (ISPE), Global Supply Chains (GSC) and associated New Air Combat Capability Industry Support (NACCIS), the Defence Export Unit (DEU), Capability Technology Demonstrator (CTD) and Defence Industry Realisation Fund (DIRF), and Priority Industry Capability Development Fund (PICDF). However, the budgets for all those programs was relatively modest. And, except for PICDF, PICs were not guaranteed a fixed proportion of funding. Consequently, other forms of government intervention — like altering the timing of equipment projects or paying a price premium to secure domestic supply — appear to have played a more important role in securing domestic supply.

[19] Combat Clothing, Electronic Warfare, High Frequency Radar and Phased Array Radars, Acoustic Technologies, Infantry Weapons and Remote Weapons Stations and Dry Docking and Common User Facilities.

[20] Details of relevant Canadian thinking are contained in *Canada First - Leveraging Defence Procurement Through Key Industrial Capabilities,* A Report of the Special Adviser to the Minister of Public Works and Government Services, Quebec, February 2013, online.

[21] Department of Defense, *Instruction Number 5000.60*, 18 July 2014, online and *Annual Industrial Capabilities Report to Congress for 2013,* September 2016, online.

[22] National Defense Industrial Association, *Top Issues 2014*, 5, online.

[23] Department of Defense, *Annual Industrial Capabilities Report to Congress for 2013,* 9.

[24] How much of US defense industry met the criteria for criticality under S2T2 is difficult to determine.

[25] Department of Defense, *Annual Industrial Capabilities Report to Congress for 2013,* 10.

[26] Department of Defense, *Annual Industrial Capabilities Report to Congress for 2013,* 10.

[27] Barry D. Watts, *Sustaining the US Defense Industrial Base as a Strategic Asset*, Backgrounder, Centre for Strategic and Budgetary Analysis, September 2013, 14-15, online.

[28] Nancy Y. Moore et al., *Findings from Existing Data on the Department of Defense Industrial Base*, RAND Corporation, 2014, 2, online and Joe Gould, 'Trump administration shelves plans to survey defense firms', *Defense News*, 21 December 2017, online.

[29] During the initial stages of S2T2, industrial capabilities were assessed against each criteria for criticality and fragility by being assigned a scalable value. That appears to have involved measuring responses on the basis of High, Medium or Low or 1 to 5. That suggested the existence of a minimum total score or 'quantitative threshold' across all criteria for a capability to be accepted as important to retain in country and in reasonable health. Australia did not apply similar measures to its various PIC criteria.

[30] For the full selection of S2T2 reports see Assistant Secretary of Defense for Industry Base Policy, Resources, Department of Defense, Washington D.C., current, online. For more on S2T2 see Charles Simmins, 'Defense Department Maps Contractors by Sector and Tier', *Clearance Jobs*, 29 November 2011, online and Geoff Adams et.al., *Spring 2016 Industry Study: Final Report Weapons: Fragility in the United States Weapons Industry*, National Defense University, 2016, online.

[31] DoD*, Sovereign Industrial Capability Priorities - Implementation and Industry Plans*.

[32] DoD, Sovereign Industrial Capability Priorities *Fact Sheet.*