
Defence White Paper 2016: Defence Science and Innovation

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The 2016 Defence White Paper,¹ and the associated 2016 Defence Industry Policy Statement,² give much prominence to the need for innovation. This initiative is to be welcomed, and is for three basic reasons. First, as we go further into the 'Age of Asia', Australia faces increased challenges in ensuring its national security and in promoting its broader interests; second, science and technology and their application to warfare continue to advance, often at breath-taking speed; and third, the Coalition Government is adopting policies that emphasise the criticality of innovation for Australia's prosperity across all facets of the country's economy.³

Strategic Context

From a defence perspective, the most important of these reasons is the emergence of more-demanding strategic circumstances, together with changes in Australia's strategic policies to meet these new challenges. The extent of the break of the new policies from the practice of recent years is perhaps debatable, but when seen with a perspective of a few decades, the policy changes are more significant. In brief, the government requires the Australian Defence Force (ADF) now to take a role that is more active in protecting and advancing Australia's interests in the region and globally.⁴ Consistent with this greater role will be an increase in the preparedness of at least selected elements of the ADF, although the extent of this increase is not clear.⁵

In discussing its policies and their consequences, the government sets out three Strategic Defence Interests, each with its associated Strategic Defence Objective.⁶ The first of these is the pursuit of "a secure, resilient Australia, with secure northern approaches and proximate sea lines of communication." The associated Objective is to be able to "Deter, deny and

¹ Department of Defence, *2016 Defence White Paper* (Canberra: Commonwealth of Australia, 2016).

² Department of Defence, *2016 Defence Industry Policy Statement* (Canberra: Commonwealth of Australia, 2016).

³ Department of the Prime Minister and Cabinet, *National Innovation and Science Agenda*, (Canberra: Commonwealth of Australia, 2015).

⁴ Department of Defence, *2016 Defence White Paper*, Chapter 3.

⁵ *Ibid.*, pp. 140, 141, and elsewhere.

⁶ *Ibid.*, pp. 68, 69.

defeat attacks on or threats to Australia and its national interests, and northern approaches.” The emphasis thus given to the defence of Australia represents strong continuity with previous statements of policy, including the observation that “there is no more than a remote chance of a military attack on Australian territory by another country”.⁷ Consistent with the continued importance of this Objective is the emphasis given to improving the defence infrastructure in northern Australia.⁸

Australia’s second Strategic Defence Interest is in “a secure nearer region ...”, with the Strategic Defence Objective of being able to “make *effective* [emphasis added] military contributions to support the security of maritime South East Asia and support the governments of [South Pacific countries]”. And in pursuit of Australia’s third Interest of “a stable Indo-Pacific region and a rules-based global order”, the Objective is to be able to “contribute military capabilities to coalition operations”; later text adds the qualifier that such contributions should be “meaningful”.⁹ For the purposes of guiding the development of the ADF, all three Objectives are equally weighted, although the differences in language used to describe each Objective strongly imply differences in priority, notwithstanding this equal weighting.¹⁰

It is important to note the departure from the past that the second and third Objectives represent. Many previous White Papers have emphasised that “there are limits to our defence capacity and influence”,¹¹ that an ADF developed for the defence of Australia would give the government of the day a sufficient set of options for contributing to operations further afield, and that any such contribution would be more valuable for its political than for its military significance. In contrast, the text and the more general tone of the 2016 Defence White Paper propose that now we can and should make important contributions to international stability, working with like-minded partners especially the United States. For example, the government’s policies recognise “the reality that Australia has the responsibility and the capability to respond to threats to the rules-based global order” (para 3.33), and in a similar vein, the White Paper also tells the reader that “Australia has the capability to make a difference in the world wherever our Strategic Defence Interests are engaged.” (para 1.24)

⁷ Ibid., p. 71, para 3.13 and elsewhere. What is missing, however, is any discussion of the timescales in which contingencies of differing levels of intensity and consequence might arise, although paragraph 2.5 (p. 40) implies a warning time for major contingencies of twenty years. Some readers will recall the incredulity that greeted the government’s conclusion in the 1970s that warning time for major assault would be as long as ten years.

⁸ Ibid., pp. 103, 104.

⁹ Ibid., p. 75.

¹⁰ Ibid., pp. 68-71.

¹¹ This particular quotation is from Department of Defence, *The Defence of Australia, 1987* (Canberra: Australian Government Publishing Service, 1987), p. 8. Further examples are to be found in Richard G. Brabin-Smith, *The Heartland of Australia’s Defence Policies*, Strategic and Defence Studies Centre Working Paper No. 396, April 2005.

The White Paper identifies six key drivers that will shape Australia's security environment. The key driver most relevant to this essay is "the pace of military modernisation and the development of more capable regional military forces, including more capable ballistic missile forces" (para 2.6). The White Paper observes that "the defence capability edge we have enjoyed in the wider region will significantly diminish" and that Australia's ability to maintain superiority in technology and capability over potential adversaries will become challenged.¹² A particular consequence will be the need to develop capabilities to protect Australia's forces when "deployed across large geographic areas, particularly in air and missile defence and anti-submarine warfare, and better link the ADF's individual capabilities to each other." (para 2.45) This recognition that it will become more difficult—and presumably expensive—for Australia to maintain a capability edge is realistic and important. There is no acknowledgement, however, that such difficulties might in some cases become so severe as to constrain the operations that the government might otherwise direct the ADF to undertake.

This, then, is the strategic context in which the White Paper puts forward its proposals to modernise and modestly to expand the ADF and other elements of the national defence effort. The program of modernisation and expansion occurs at a measured pace over the twenty-year period that the White Paper addresses, with completion of the expansion of the submarine force from six to twelve boats expected to take some thirty-five years or more.¹³ This absence of urgency suggests that the modernisation and expansion are in response to a general evolution in the security challenges that Australia faces rather than as a consequence of a specific and pressing concern.¹⁴ The focus on increasing Australia's maritime capabilities,¹⁵ together with ambitions for the Army that are more modest, represents a strong continuity with past policies.

¹² Ibid., p. 49, para 2.38. To emphasise the extent of change that we can expect over the next twenty years, the graphic on that page shows the assessment that by 2035, the United States and China will have reached comparable levels of defence spending, as will Australia and Indonesia.

¹³ The doubling of the size of the submarine fleet is the most significant example of force expansion, with the construction period expected to "extend into the late 2040s to 2050 timeframe" *ibid.*, p. 91, para 4.28.

¹⁴ If the concerns were more pressing, we would expect more elements of the ADF to be expanded (or expanded further), such as combat aircraft, and at a faster rate of expansion. For a short discussion of contingencies, warning time and force expansion, see Richard Brabin-Smith, 'Contingencies and Warning Time', *Centre of Gravity* series, no. 12 (Canberra: Strategic and Defence Studies Centre, Australian National University, October 2013).

¹⁵ Department of Defence, *2016 Defence White Paper*, p. 83.

Capability and Innovation

The White Paper dispels any doubts about the levels of capability appropriate for the ADF: these should be at the “highest levels”,¹⁶ and Defence will need to rely “on its access to high levels of capability and technology.” (para 4.97) This leads to a very important conclusion about sourcing: Australia will continue to rely heavily for its security on privileged access to capabilities developed by the United States. In the words of the White Paper, this access, and maintaining interoperability with the United States, are “central to maintaining the ADF’s potency”, with around 60 per cent of Australia’s acquisition spending being on equipment from the United States, including fighter and combat aircraft, naval combat systems and helicopters.¹⁷ Most of Australia’s other defence equipment is also imported but from elsewhere.

In summary, the vast majority of Australian defence equipment is imported either as equipment, systems or subsystems already built or assembled, or as designs to be built, assembled or integrated here. This means that most of the innovation that Defence needs to exploit is imported too. This leads in turn to the immediate question: *what are the areas in which Australian defence innovation should focus its efforts?* Given the constraints on Australia’s resources and the need to avoid duplicating the development of capability that we would be better off importing, the need to state what our priorities are is an imperative. Further, Australia has often learnt the hard way that attempts to ‘Australianise’ aspects of foreign designs can be a major cause of cost and schedule overruns.

The setting of priorities for Australian defence innovation thus requires careful judgement. This dilemma is not new, as the Coalition’s 2000 Defence White Paper reminded us: on the one hand, important capabilities “will remain based on existing, proven technology designs”, and there will be “greater use of off-the-shelf purchases, especially where the additional capability from Australian-specific modifications does not justify the increased cost and risk.” On the other hand, “total reliance on off-the-shelf purchases is neither achievable nor desirable,” as it “would risk our forces having inferior technology in key areas”.¹⁸

¹⁶ Ibid., p. 83, para 4.2. This is less of a departure from past policy and practice than might be imagined, especially for maritime forces. Today’s maritime forces and those planned before this most recent White Paper already represent a high level of capability.

¹⁷ Ibid., pp. 121-22, para 5.21. The White Paper also comments that, without the US Alliance, the cost of developing high-end capabilities “would be beyond Australia’s capacity”. It is interesting to note a similar sentiment in the 1976 Defence White Paper: “having enduring and close relationships with large and advanced countries, Australia is able to avoid the crippling cost of developing most of its own military equipment.” Department of Defence, *Australian Defence* (Canberra: Australian Government Publishing Service, 1976), p. 48.

¹⁸ Department of Defence, *Defence 2000: Our Future Defence Force* (Canberra: Commonwealth of Australia, 2000), p. 100.

Defence Policy for Industry

Priorities for innovation cannot be divorced from priorities for industry capabilities, so before exploring innovation further, it is necessary first to touch on industry matters.

Reform of Defence, its acquisition processes and its relationships with industry are matters to which governments turn time and again. The First Principles Review, commissioned by the Coalition Government, is the latest in a long line of such examinations.¹⁹ Implementation of that Review's recommendations has meant extensive changes to Defence's internal organisation and governance arrangements, including, in the context of this essay, the processes that relate to industry policy.

A major feature of the new governance arrangements will be the Centre for Defence Industry Capability (CDIC), to be "co-led by private sector industry and Defence through an advisory board."²⁰ An important responsibility of this new arrangement will be to apply the new Sovereign Industrial Capability Assessment Framework to decisions on priorities for industry capabilities. The government is developing this Framework to identify "the sovereign industrial capabilities that develop and support our ADF capabilities."²¹ The end result of applying this framework will be a Defence Industrial Capability Plan.

At one level, this is most encouraging and timely. However, such description of the Framework as there is in the Defence Industry Policy Statement suggests that much work remains to be done on it, although the indications so far are promising.²² There is even less on what the Defence Industrial Capability Plan is expected to contain. There is nothing wrong in reporting work still in progress but the incompleteness and ambition are reminiscent of the Priority Industry Capabilities (PICs) introduced in the 2009 Defence White Paper,²³ expanded a year or so later to include the idea of Strategic

¹⁹ Department of Defence, *First Principles Review, Creating One Defence* (the 'Peever Review') (Canberra: Department of Defence, 2015).

²⁰ Department of Defence, *2016 Defence Industry Policy Statement*, p. 15. Since publication of the White Paper, the government has announced that the CDIC will be headquartered in Adelaide. Prime Minister, Minister for Defence, and Minister for Industry, Innovation and Science, 'The Centre for Defence Industry Capability', Media Release, 8 March 2016.

²¹ Department of Defence, *2016 Defence Industry Policy Statement*, p. 23. It is not clear but perhaps the CDIC will also have a role in developing the Sovereign Industrial Capability Assessment Framework as well as in applying it, although the major role in developing it would properly belong to Defence itself. The CDIC invites comparison with the former Defence (Industry) Committee, chaired by an experienced and distinguished representative from private industry for most of its existence, and chaired by the Minister for Defence in its later years.

²² *Ibid.*, p. 24. There is a set of indicative criteria, including "independence of action," which are intended to form the basis for the Strategic Industry Capability Assessment Framework.

²³ Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030* (Canberra: Commonwealth of Australia, 2009), p. 128.

Industry Capabilities (SICs).²⁴ The PICs and SICs have now been set aside in favour of the new concept of Sovereign Industrial Capabilities, as mentioned above, presumably because they turned out to be of little practical use. In the absence of a well-developed and robust Sovereign Industry Capability Assessment Framework, a persuasive set of Sovereign Industry Capabilities and the Defence Industrial Capability Plan, the task of developing priorities for innovation will prove that much more difficult.

Innovation and Science

The White Paper's approach to innovation is also encouraging, albeit it too is as yet incomplete. There will be two streams for the funding of innovation: one to be managed through the Defence Innovation Hub, focusing on the immediate and shorter term, and the Next Generation Technologies Fund (NGTF), focusing on the longer term.

The Innovation Hub program is not given a name in the White Paper or the Defence Industry Policy Statement, so for convenience this article will call it the Defence Innovation Hub Fund (DIHF). The DIHF will be funded to the tune of \$640 million over the forward decade; this money will come from the redirection of existing innovation programs, such as the Capability Technology Demonstrator (CTD) program and the Rapid Prototyping Development and Evaluation (RPDE) program, which will now be managed in an integrated way through the Innovation Hub.²⁵ An important aspect of the DIHF will be its consideration of urgent operationally-driven requirements,²⁶ the criticality of which can only have been reinforced by the ADF's operational deployments over the past fifteen years or more. The Innovation Hub will be coordinated by Defence's Strategic Policy and Intelligence Group, although what this means in practice is not elaborated. The Defence Industry Policy Statement is also silent on what the priorities for the DIHF will be and how in practice they will be applied. This is a serious omission.²⁷

²⁴ Department of Defence, *Building Defence Capability: A Policy for a Smarter and More Agile Defence Industry Base* (Canberra: Commonwealth of Australia, 2010), pp. 38, 39. As its name implies, this document was just as committed as the 2016 Defence Industry Policy Statement about setting clear priorities, establishing a stronger Defence-industry relationship, seeking opportunities for growth, and building skills, innovation and productivity.

²⁵ Department of Defence, *2016 Defence Industry Policy Statement*, p. 71. The \$640m includes \$3m per year for the Defence Materials Technology Centre, which will be kept separate, at least until it is reviewed in 2018-19.

²⁶ *Ibid.*, p. 35.

²⁷ *Ibid.*, pp. 30, 31, 34. Much of the text describing the Innovation Hub is written in a style which implies there is much yet still to be done. An illustration (p. 31) is a sentence which reads: "This new approach will involve rigorous governance and oversight of funding recommendations, linking innovation investment to capability priorities." This kind of writing within the 'machinery of government' is usually a good indicator that the issue has not been thought through. Page 71, in the document's Attachment A, acknowledges that the detailed design of the Innovation Hub is yet to be completed.

The purpose of the Next Generation Technologies Fund will be to “enable Defence to better position itself to respond to strategic challenges, retain a technology ‘edge’ against adversaries and provide game-changing Defence technologies for the future.”²⁸ It will get funding of about \$730 million over the next decade. This is new money and not just a re-allocation of part of the existing funding of the Defence Science and Technology (DST) Group. The DST Group will take the lead in this program, and will collaborate with other players, nationally and internationally. The Fund will address the future scientific challenges and opportunities that our broader national security interests will face, not just those relating to Defence.²⁹ Building on work already done by the DST Group in identifying future challenges and opportunities, the Defence Industry Policy Statement sets out an initial set of transformational technology areas of particular interest: integrated intelligence, surveillance and reconnaissance; space capabilities; enhanced human performance; medical countermeasure products; multidisciplinary material sciences; quantum technologies; trusted autonomous systems; cyber; and advanced sensors, hypersonics, and directed energy capabilities.³⁰ Intuitively, this set of focus areas commands respect. Governance oversight will be provided by the Defence Investment Committee, through a “rigorous but agile process” which is not elaborated further.³¹ It is anticipated that successful projects funded by the NGTF would be candidates for transition to funding under the DIHF.

To facilitate engagement between Defence and other potential contributors to innovation in Australia, there will in addition be the Defence Innovation Portal. This will be established within the CDIC. It is intended to provide a key communication bridge between Defence, industry and academia, with a particular focus on small and medium enterprises.³²

Making the New Arrangements Work

The new arrangements, discussed above, form an important initiative that needs to succeed. As the White Paper has identified, Australia’s strategic circumstances are becoming more demanding, not less, and science itself continues to advance, thus compounding both the challenges and the opportunities for Australia’s security. But earlier attempts at reform, especially of acquisition- and industry-related matters, have met with such limited success over the decades as to lead to yet further attempts to get

²⁸ Ibid., pp.31, 32.

²⁹ A separate statement is planned on Science and Innovation for National Security. Ibid., p. 38.

³⁰ Ibid., p. 72.

³¹ Ibid., p. 32 and elsewhere. The First Principles Review recommended that the Defence Investment Committee be chaired by the Vice-Chief of the Defence Force, with membership comprising the Associate Secretary, Deputy Secretary for Policy and Intelligence, Chief Financial Officer, Service Chiefs, and Deputy Secretary for Capability Acquisition and Sustainment. Department of Defence, *First Principles Review*, pp. 27, 28.

³² Department of Defence, *2016 Defence Industry Policy Statement*, p. 37.

them right. This leads to the obvious question: *What steps might be needed to help ensure success this time round?*

The Defence Industry Policy Statement observes that “the increasing pace of geopolitical, economic and technological change means it is critical that Defence ensure it has access to the best innovation Australia has to offer.”³³ This, however, is only part of the story and the lesser part at that. As discussed earlier, Australia will continue to source the vast majority of its defence equipment from overseas, especially at the high-technology end of the spectrum. So, of more importance is Australia’s continued access to the innovation of friends and allies. This does not mean that there is no room for Australian innovation, but priorities for this need to be set and argued from within the broader picture, especially for the DIHF.

A start would be to say that there will be occasions where Australia’s needs are so different from those of other nations that we need to develop our own solutions (the Jindalee radar is a good example here). Or where there are security sensitivities which mean we would not want to share with others or even close allies would not want to share with us (aspects of signature management and electronic warfare have been relevant here). Or where Australia has hit on such a good idea that it would be indefensible not to take it further (a good example is the phased array radar technology developed by CEA Technologies Pty Ltd). Another theme is the further development of important equipment (such as key weapons and sensors), in collaboration with the source country, once it has entered Australian service (examples include the Mk 48 torpedo and the ASRAAM missile).³⁴ Further indication of priorities should be able to be gleaned from the guidelines of the existing programs, such as the CTDs, being absorbed into the DIHF.

In brief, critical work on priorities is still outstanding, and without a robust and persuasive set of criteria the DIHF would only struggle. Because Australia will continue to import most of its defence innovation, and because of the hard-won experience with the costs and difficulties of trying to Australianise aspects of foreign designs, it will be as important to give as clear a statement of what is not a priority—and which will not be funded—as it will to say what is a priority and is a good candidate for financial support. This would save a lot of nugatory work, unnecessary expense, and disappointment and consequent poisoning of relationships between Defence and innovators.

To be fair, the development of priorities for industry and for innovation is very difficult: if it were not so, these issues would have been resolved years ago. But the problems are deeper than that: responsibility for the handling of

³³ Ibid., p. 29.

³⁴ These ideas are not new. I used them as guiding principles when I was the Chief Defence Scientist in the 1990s. In addition, the sharing of Australian scientific investigations with friends and allies in areas in which they are also working will often lead to generous and highly productive access to their work.

these issues has not always been given to the right areas of Defence—or to the right individuals. And too often the issues have been seen from an industry perspective rather than through a policy prism. The establishment in December 2015 of the Defence Industry Policy Division within Defence's Strategic Policy and Intelligence Group is therefore a welcome step.³⁵

This arrangement has the potential to give the priorities for innovation a robustness and authority which would otherwise be missing. The fact remains, however, that getting people with the right mixture of aptitude and experience for this kind of work is a challenge, and the ability to draw on a wide range of expertise will prove critical.³⁶ It will require sustained high-level attention and management if, once again, success is not to prove elusive and the effort of no avail.

The Defence Industry Policy Statement is correct in identifying the need for cultural change if the new approach to innovation is to work.³⁷ One of the cultural barriers to be overcome is what has been, at least in previous years, a strong predisposition within Defence to belittle Australian innovations and to prefer always to buy from overseas. This is a tricky area as, indeed, Australia should and does buy much from offshore, but the cultural opposition to Australian innovation has often gone far beyond this. The Defence Industry Policy Statement is right also to identify the need for a culture which accepts that risk and innovation go hand in hand, and which does not automatically punish lack of success as 'failure'. Such an approach would end up favouring only that innovation which led to small and incremental change and would stifle anything that was imaginative and potentially far-reaching or game-changing. There is also the challenge to industry—to the branch offices of the large foreign-owned multinationals in Australia and especially to the indigenous small and medium enterprises—to seize the opportunities that the new innovation arrangements offer.

Science and Warfare

Perhaps the most important challenge, at least within Defence, is to continue to recognise the criticality of high-quality science and engineering to a

³⁵ The responsibilities of Defence Industry Policy Division include the "implementation of the government's approach to defence industry policy and creation of a strategy-led program of industry engagement and innovation." <www.defence.gov.au/SPI/> [Accessed 16 March 2016].

³⁶ The early management arrangements for the Capability Technology Demonstrators (CTDs) illustrate this problem. The CTDs emerged as an idea of the DST Group in 1996 and were subsequently supported by the 1997 Defence Efficiency Review (*Future Directions for the Management of Australia's Defence, Report of the Defence Efficiency Review* (Canberra: Commonwealth of Australia, 1997), p. 39). To avoid any suggestion that the DST Group would use the CTD program unfairly to advance its own interests, I insisted that a central policy division be given the responsibility for managing the CTDs, including making competitive assessments for funding. However, experience eventually showed that this division did not have the subject matter expertise adequately to discharge the responsibility, with the consequence that this responsibility was transferred to the DST Group.

³⁷ Department of Defence, *2016 Defence Industry Policy Statement*, p. 35.

modern defence force and that you cannot have good science and engineering without having good scientists and engineers. And as Australia's strategic circumstances become more demanding, so the need for good science and engineering will become yet more important. Communication between policy generalists and subject matter experts, especially in the sciences, can at times be difficult if not unproductive, and both sides of this dialogue need to make the effort to understand each other. Yet there is a particular onus on those on the policy side of the discussion to make an extra effort, as it is their area of Defence which has the greater say in the development and interpretation of policy and the allocation of resources. Perhaps the test of this is yet to come: will the arbiters of policy for innovation be gatekeepers, preferring to exercise the power to say *no*, or will they be facilitators, working with subject matter experts to get to an imaginative and agreed way ahead?

Science and warfare have gone hand in hand not just for centuries but for millennia, and the 2016 Defence White Paper does recognise this, up to a point. Yet there is little discussion of science or the central position of the DST Group: in the White Paper there are but two references to the DST Group,³⁸ while discussion of science is confined to a single paragraph in the Defence Industry Policy Statement in the two pages that its main text devotes to the NGTF, where the potential areas of research mentioned earlier are listed.³⁹

What should we read into this? Previous Defence White Papers have said much more about the DST Group, and it is surprising that more is not included this time round. The DST Group has been the principal source of the more important contributions to Australian defence innovation over decades but the reader could be forgiven for not picking this up from the White Paper and the Defence Industry Policy Statement. Perhaps this is just a matter of drafting style and therefore not of importance. On the other hand, if it is a symptom of a reluctance or inability to come to terms with the importance of science and scientists, and how they need to work, either within Defence or in industry, then the implementation of the government's plans for innovation will be made more difficult if not impossible. If so, the government's ambitions for innovation, and the science behind it, no matter how laudable, will remain but a dream.

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³⁸ Department of Defence, *2016 Defence White Paper*, p. 112 para 4.111, which mentions the expectation that the DST Group will expand its national and international partnerships, and para 4.113, which mentions the DST Group's role in leading the next generation technologies program. However, the DST Group does get more visibility in the Defence Industry Policy Statement.

³⁹ Department of Defence, *2016 Defence Industry Policy Statement*, p. 32. There is also a page or so at its Attachment A which summarises the arrangements for the NGTF and which repeats the potential areas for scientific research (pp. 72 and 73, the very end of the document).

his time in the Department of Defence he held all the senior defence policy positions, including Deputy Secretary for Strategic Policy, and was also the Chief Defence Scientist.
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