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The Cost of Defence

ASPI Defence Budget Brief 2019–2020



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One hundred & five million, eight hundred & fifty-three thousand, five hundred & seventy-three dollars & seventy-seven cents per day



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Prepared by:
Dr Marcus Hellyer
Senior Analyst
Defence Economics

Cover graphic drawn by Geoff Pryor.
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Level 2, 40 Macquarie Street
Barton ACT 2600
Australia

Tel: + 61 (2) 6270 5100
Email: enquiries@aspi.org.au
Web: <https://www.aspi.org.au/>
Blog: <https://www.aspistrategist.org.au/>

Note on title:

The figure of \$105,853,573.77 represents one three-hundred-and-sixty-sixth of the consolidated Defence appropriation (including the Australian Signals Directorate) for 2019–20. This does not include funds appropriated to the Defence Housing Authority, nor those administered by Defence for military superannuation schemes and housing support services.

Contents

Executive Director's foreword	5
Executive summary	6
Defence in 10 tables	10
Chapter 1: The context	16
1.1 The strategic context	16
1.2 The 'fourth industrial revolution'	22
1.3 The economic context	24
Chapter 2: How much money is it?	27
2.1 This year's budget	27
2.2 The big three	31
2.3 What's the balance between personnel, capital and operating costs?	35
2.5 Comparisons	36
Chapter 3: Where does the money go?	38
3.1 How is the money divided up among groups and services?	38
3.2 Personnel	42
3.3 Capital	42
3.4 Operating and sustainment costs	47
3.6 Where's the money spent?	50
Chapter 4: How is Defence delivering?	52
4.1 Implementation of the First Principles Review of Defence	52
4.2 Defence's self-assessment for 2017–18	53
4.3 People	55
4.4 How is Defence going at delivering capability?	59
4.5 Key projects	62
Chapter 5: Shipbuilding stocktake	69
5.1 The Naval Shipbuilding Plan	69
5.2 Overview of the shipbuilding streams	70
5.3 Programmatic elements	77
5.4 What's it costing?	81
Chapter 6: How to hedge in maritime (and other) capability	85
6.1 Will the Naval Shipbuilding Plan deliver the required capability?	85
6.2 How to not to hedge	91
6.3 How to hedge	92
Chapter 7: After the election	95
7.1 Election issues	95
7.2 The post-election policy agenda	95
Appendix 1: Long-term tables	99

Appendix 2: Has the government met its defence funding commitments?	103
Appendix 3: Approved projects	106
Notes	111
About The Australian Strategic Policy Institute	116
Acronyms and abbreviations	117

Executive Director's foreword

This is ASPI's eighteenth annual *The cost of Defence*. When ASPI published the first edition, it started a tradition of printing the average daily defence spend on the cover. Back then, in 2002–03, it was a little under \$40 million per day. The defence budget has now passed \$100 million per day, as Geoff Pryor's wonderful cover cartoon notes.

That's a substantial increase. Even taking inflation into account, the defence budget has increased by 83% since 2002–03. There's no doubt that the increased funding has delivered an ADF that's much more capable than it was 18 years ago. But there's also no doubt that Australia is now facing a more challenging strategic environment than it was then.

The new government will face a range of difficult policy choices in order to navigate Australia safely through this environment. ASPI has proposed policy options for defence and security in its recent *Agenda for change 2019*. Whichever strategic policy choices the government makes, they will require funding and have implications for the defence budget, so it's important that we understand the current position of Defence's budget and the cost of the path that Defence has been following since the *2016 Defence White Paper*. *The cost of Defence* seeks to provide this understanding in a way that's accessible to anybody with an interest in Australia's security.

As has been the custom in the past, this year's edition explores particularly topical issues. This year we provide a progress report on the implementation of the Naval Shipbuilding Plan and consider whether a hedging strategy in navy capability is warranted.

Acknowledgements are due. Michael Shoebridge reviewed and commented on the draft. The unflappable Steve Clark has once again prepared it for publication. ASPI intern Rhys de Wilde assisted in analysing data and developing charts and tables.

ASPI was founded under a charter from the Minister for Defence to 'provide alternative sources of input to Government decision-making' and 'to help nourish public debate and understanding' of strategic and defence issues. We look forward to supporting the government, the Minister for Defence and the parliament by fulfilling that charter. *The cost of Defence* also contributes to both those ends.

So that it can fulfil its purpose, ASPI receives funding from the Department of Defence, which contributes a little under half of ASPI's overall funding. This is currently ten thousand, nine hundred and fifty-eight dollars and ninety cents (\$10,958.90) per day. Details can be found in our annual reports, which are tabled in parliament and available online.

Peter Jennings

Executive Director

Executive summary

Little has changed in the defence funding picture since last year. This year's budget continues to follow the trajectory of solid real annual increases set out in the *2016 Defence White Paper*. The consolidated defence budget (that is, the budget for the Department of Defence and the Australian Signals Directorate) reaches \$38.7 billion in 2019–20. Real growth is only 1.3%—the smallest increase under the Coalition government—and the budget has actually decreased slightly as a percentage of GDP (from 1.94% to 1.93%) because GDP has grown faster than the defence budget.

But those figures are a little misleading. Late in the previous financial year, \$620 million was moved forward into 2018–19 from 2019–20, making the former a little bigger and the latter a little smaller than planned. If that hadn't occurred, real growth would have been 4.6% and the budget would have been 1.96% of GDP. Ultimately, it makes no real difference to Defence which year it gets the money—it got it and has already spent it.

The real story is that the government so far has delivered on its White Paper funding commitments. The White Paper presented a 10-year fixed funding line that would not vary as GDP fluctuated up and down. We're now four years into that decade. Once we take all variations into account (such as adjustments due to foreign exchange rates and supplementation for operations), the \$143.2 billion in funding Defence has received over those four years is within 1% of the White Paper funding line. Granted, Defence has had to fit more things into that envelope; it doesn't seem to have received additional funding to cover its contribution to the Pacific Step-up announced by the government last year, for example. But it's rare that Defence has had such funding certainty.

The other key issue to note is that the defence budget, at least for planning purposes, has already moved well beyond 2% of GDP. According to the Portfolio Budget Statements (PBS), the budget will hit that milestone in 2020–21, meeting the government's White Paper commitment. But after that the budget continues to grow, hitting almost 2.2% by the end of the forward estimates. In essence, the White Paper funding line and a 2% of GDP funding line diverge significantly. The difference is substantial, reaching \$5 billion a year and totalling over \$22 billion for the remainder of the decade after 2020–21. That gap is even bigger if GDP fails to grow at 2¾% or at 3% from 2021–22 as forecast in the budget papers.

During the 2019 election campaign, the government reaffirmed its commitment to restoring the budget to 2% of GDP, but it was silent on whether it was committed to the White Paper funding line. The forward estimates figures in the PBS suggest it is. But if it isn't, Defence will have a major headache, as any move back towards 2% will entail large reductions and deferrals to planned capability.

Much of the increased funding is planned to flow into capital acquisitions. Indeed, for Defence to have any chance of delivering the significantly larger and more capable—and therefore significantly more expensive—future force outlined in the White Paper, that must happen. On paper, the capital budget grows very strongly, hitting 39% of the total budget by the end of the forward estimates. According to the White Paper's funding

Defence budget 2019–20	
Defence (with Australian Signals Directorate) funding, 2019–20:	\$38.7 billion
Share of GDP:	1.93%
Real growth on prior year:	1.3%
Defence Department (without Australian Signals Directorate) funding, 2019–20:	\$37.8 billion
Expenditure shares	
Investment:	\$11.8 billion (31.1%)
Personnel:	\$12.3 billion (32.5%)
Operating:	\$13.8 billion (36.4%)
Cost of operations	
Afghanistan and Middle East:	\$644.3 million
Border protection:	\$59.3 million
Key budget measures	
\$600 million brought forward from 2019–20 into 2018–19.	

model, it stays there for the rest of the White Paper decade. That would deliver a massive increase in which the capital budget alone reaches \$19 billion by the end of the forward estimates and nearly \$23 billion by the end of the decade. Since 2013–14, when the Coalition came to power, that's real growth of 155% and 185%.

Will it happen? Prognostication is a risky art, but there are a few reasons to be cautious about counting chickens. There are some heroic annual leaps built into the capital budget in the forward estimates, for example, of 19% in real terms in 2020–21 and 15.5% 2021–22. Yet it can be hard to spend money. We noted last year that Defence was underspending against the White Paper's capital predictions, and that trend has continued. The shortfall now totals over \$5 billion since the White Paper, and probably only a third of that at most is due to foreign exchange adjustments.

Despite a rapid increase in capital as a percentage of the total defence budget early in the Coalition's term, since the White Paper it's hovered stubbornly around 30%. It is, however, difficult to assess the precise situation as neither the Defence PBS nor the annual report give data on actual achievement in the capital and sustainment programs. Rectifying this information gap should be straightforward and would strengthen transparency.

Moreover, as Defence increases capital spending, it is likely to need to increase sustainment spending in order to use the new equipment as well as personnel spending in order to crew it. We also noted last year that sustainment spending was exceeding predictions by roughly the same amount that capital was underspending. That trend has continued this year.

The rise in operating costs can be seen in the increase in the Chief Information Officer Group's suppliers budget. This covers much of the cost of running the ICT backbone that allows the networked force to function. It's an enabler that's absolutely vital to capability. Since 2008–09, it's grown by 148% in real terms while the Defence budget has only grown by 36%. It's not just the cost of capital acquisitions that's rising much faster than inflation.

The personnel picture also suggests there are some deep challenges in the plan. The White Paper put the ADF on a trajectory from 58,000 personnel to 62,400. That's only an 8% increase to cover the constantly increasing complexity of the Defence organisation and its component parts. Nevertheless, the ADF hasn't been able to achieve even the modest White Paper increases. Overall, it's only increased by 600 actual people against a target of around 1,730 over the period since the White Paper. If increasing capital spending quickly is hard, increasing ADF numbers seems even harder. It looks like that is starting to hurt—HMAS *Perth* will be up on blocks for two years after its latest upgrade for want of a crew.

In short, there may well be structural factors that will hinder Defence in achieving the capital spending predicted in the PBS and White Paper. Sustaining capital spending at around 40% of the total budget might just not be achievable.

It's possible that the lack of any updates to the Integrated Investment Plan (IIP) since the White Paper was released in early 2016 is due to Defence and the government grappling with the eternal problem of how to make everything fit the funding envelope. Rather than silence, there needs to be a better conversation between government, Defence, industry and the public. Rather than depicting the IIP as carved in stone, all stakeholders need to regard it as a living organism that evolves in response to and in anticipation of new circumstances and requirements. If there are now major pressures on and in the IIP, then the government has to make some big decisions on how to manage them. And in our strategic environment, with our system of government, some transparency and informed public debate would be in order.

The substantial investment the government is making is delivering greatly enhanced capability across all of Defence's capability streams. Underneath the headlines about heavy investment in locally assembled protected and armoured vehicles, the digitisation of the Army (often referred to as its highest priority) continues, as do

enhancements to soldier systems. The delivery of key air capabilities such as P-8A maritime patrol aircraft and trainers is nearing completion. The Air Force still has some way to go to get the Reaper and Triton unmanned aerial systems into service. And Defence is in something of a golden age of infrastructure investment. Also, the upgrades necessary to keep the Anzac-class frigates and Collins-class submarines a relevant capability for many years during the long transition to the future fleet are being delivered.

The other key capability transition from the classic Hornet to the F-35A has entered a critical phase. While the first F-35A aircraft have arrived in Australia and supporting infrastructure has been delivered, the fleet's flying hours will need to increase nearly sixfold over the next four years to achieve final operating capability. As with every other platform, the increase in capability delivered by the new air combat fleet will come at significantly greater cost, particularly if the F-35A hourly flight cost continues to be twice the classic Hornet's.

This year in Chapter 5 we provide an update on progress in the Naval Shipbuilding Plan (NSP), which is at the core of the investment program and the government's Defence Industry Policy. In many regards, the NSP has made great progress. The Arafura-class offshore patrol vessel has started construction on schedule. In the past year, BAE's Type 26 was selected as the design for the Hunter-class future frigate. Importantly, the revised commercial strategy under which ASC Shipbuilding become a subsidiary of BAE has been implemented, and a head contract for the frigate program has been signed in an astonishingly short time.

In contrast, the Future Submarine Program delivering the Attack-class submarines took nearly three years to sign its head contract, which is the strategic partnering agreement. But it's done now, and Defence has repeatedly stated that the long negotiations over the agreement haven't affected schedule.

Progress continues on underpinning programmatic elements of the shipbuilding enterprise. Development of the Osborne South surface shipyard should be completed in time to start prototyping of frigate blocks in 2020. Work has commenced on the submarine yard, though it's mainly still in the design phase. The development of the necessary workforce was always one of the greatest risks and that hasn't changed. Nevertheless, several measures to address this risk are underway, including the start of the Naval Shipbuilding College (which in reality has more of a coordination function than an instruction-delivery function) and the release of the *Naval shipbuilding strategic workforce discussion paper* to inform development of a shipbuilding workforce strategy. While the number of skilled workers required may sound large and some skills in short supply, it's small compared to both Adelaide's and Australia's workforce. This means that the challenge is not insoluble, but also that the supply of shipbuilding workforce will always be exposed to changing demands for workers in the broader economy.

But as the schedule for the future frigates and submarines becomes clearer, we can see that we won't get the first of the frigates into service until around 2030. All going well, the first submarine won't be in service until 2034 or 2035, despite a conservative design philosophy based on using only currently mature technologies. Even if they deliver the planned capability, that's a long time to wait.

Moreover, the annual cash flow for the NSP is ramping up quickly. It passes \$2 billion this year even though the two biggest programs (frigates and submarines) don't start construction for several more years. Last year, we predicted that the annual cash flow for the NSP would reach \$3.5–4 billion; that's looking increasingly certain. We also predicted that Defence will have spent over \$20 billion before the first frigate and submarine become operational. That's looking conservative.

Meanwhile, as we review in Chapter 1, Australia's strategic circumstances are increasingly uncertain as China's power grows along with its willingness to use that power outside of the rules-based global order. US military power is increasingly stretched, and that can't be rectified through greater spending. So far, the government hasn't signalled any substantial changes either to the military strategy of the White Paper or its force structure,

but it's likely we'll need to become more self-reliant, at least in some areas of military capability. That probably can't wait until the 2030s.

The ships being delivered by the NSP will enter an operating environment characterised by proliferating threats, such as cheap anti-ship cruise missiles and potentially hypersonic missiles as well as a more congested undersea domain. While modern warships are designed to defeat a range of threats, this has meant they have become exquisitely expensive, so much so that they can only be acquired in small numbers. The value-for-money calculus doesn't favour billion-dollar manned platforms that are too valuable to risk losing.

The capability we need in the future could be enabled by another fundamental development reshaping the world: the 'fourth industrial revolution' (4IR). The key elements of the 4IR include autonomous systems, artificial intelligence (AI), more accessible space resources, and 3D printing. While these have the potential to 'democratise' technology by increasing the threat posed by non-state actors, they could help militaries to break out of the vicious cycle of increasingly complex but increasingly expensive manned platforms.

Chapter 6 suggests ways to hedge in the development of our future naval capability. The key is to devote more resources to autonomous systems. Even the US Navy, the world's largest, seems to have realised that this is the only viable way to deliver greater mass and is making significant investments in unmanned platforms that will complement manned vessels. The ADF needs to do the same to compensate for its lack of mass, to get new capability sooner, and perhaps most importantly to remove humans from an increasingly lethal battlespace. Moreover, the technologies in fields such as AI can be integrated into legacy platforms to enhance their effectiveness. Australian industry and academia are well placed to contribute to this—perhaps even better placed to do so than export large finished platforms.

Of course, it will require investment, but it needs to be done. Currently, less than 1% of Defence's budget goes into its innovation funds. That must be increased, and in a way that connects innovation to the large, well-funded programs in the IIP. But just as important is imagination and a willingness to pursue the disruptive potential of new technologies so they aren't dismissed out of hand as poor substitutes for traditional platforms.

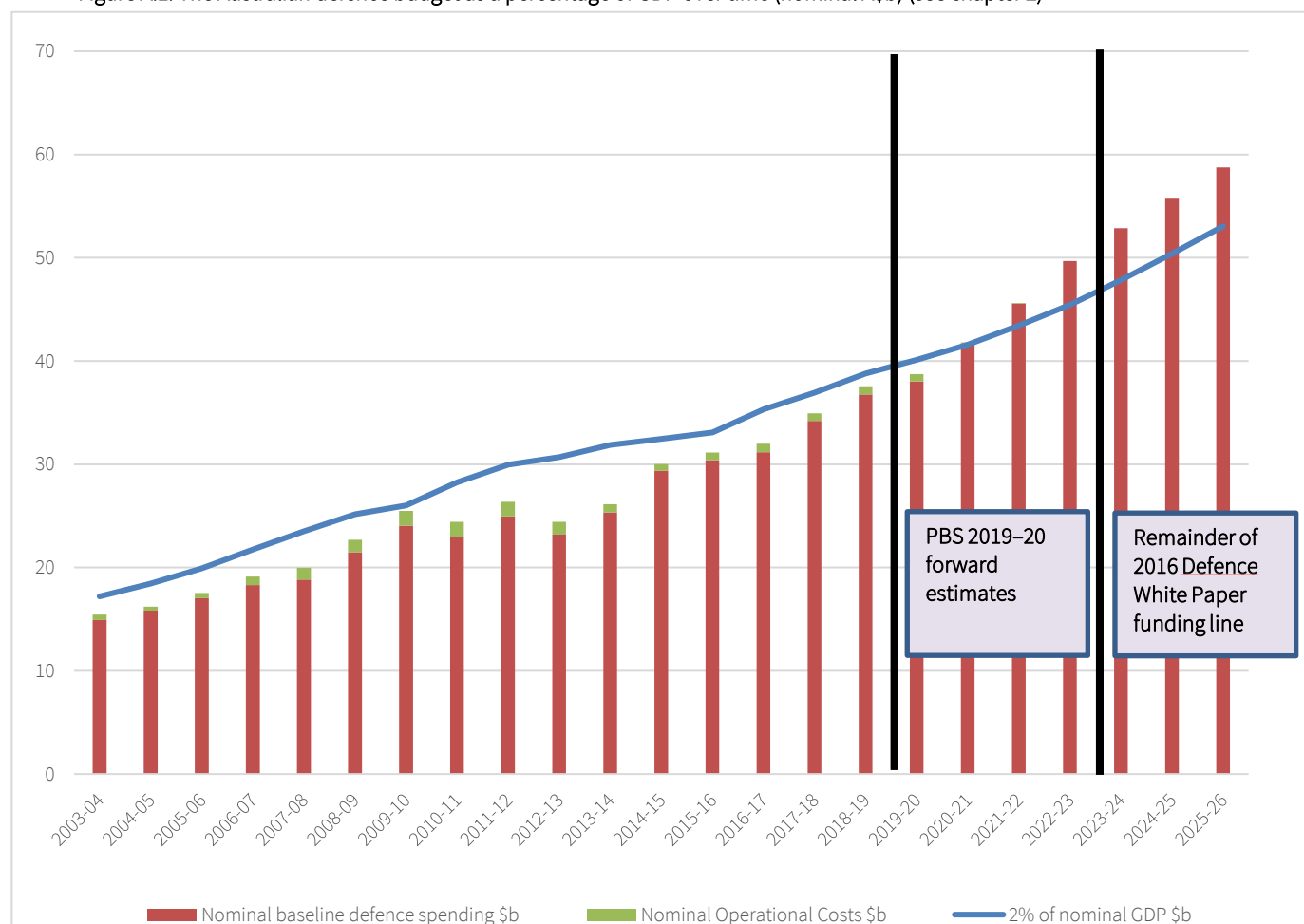
Chapter 7 briefly considers the way forward after the election. ASPI recently published *Agenda for change 2019: strategic choices for the next government*, which proposes policy recommendations for the new government in the areas of strategy, defence and security. Rather than duplicate them here, we refer readers to that document. However, there's no doubt that the world has changed fundamentally since the 2016 White Paper. There's no point investing billions in military capability if it doesn't support Australia's political or military strategy. It's time for a new Defence White Paper so that the government can assure itself that the strategic triumvirate of ends, ways and means are properly aligned to preserve Australia's security.

Defence in 10 tables

The tables presented here are discussed further in later chapters, so we won't provide detailed explanatory notes, but we have noted where the material illustrated in the tables is discussed in more detail in this brief.

The defence budget 2019–20

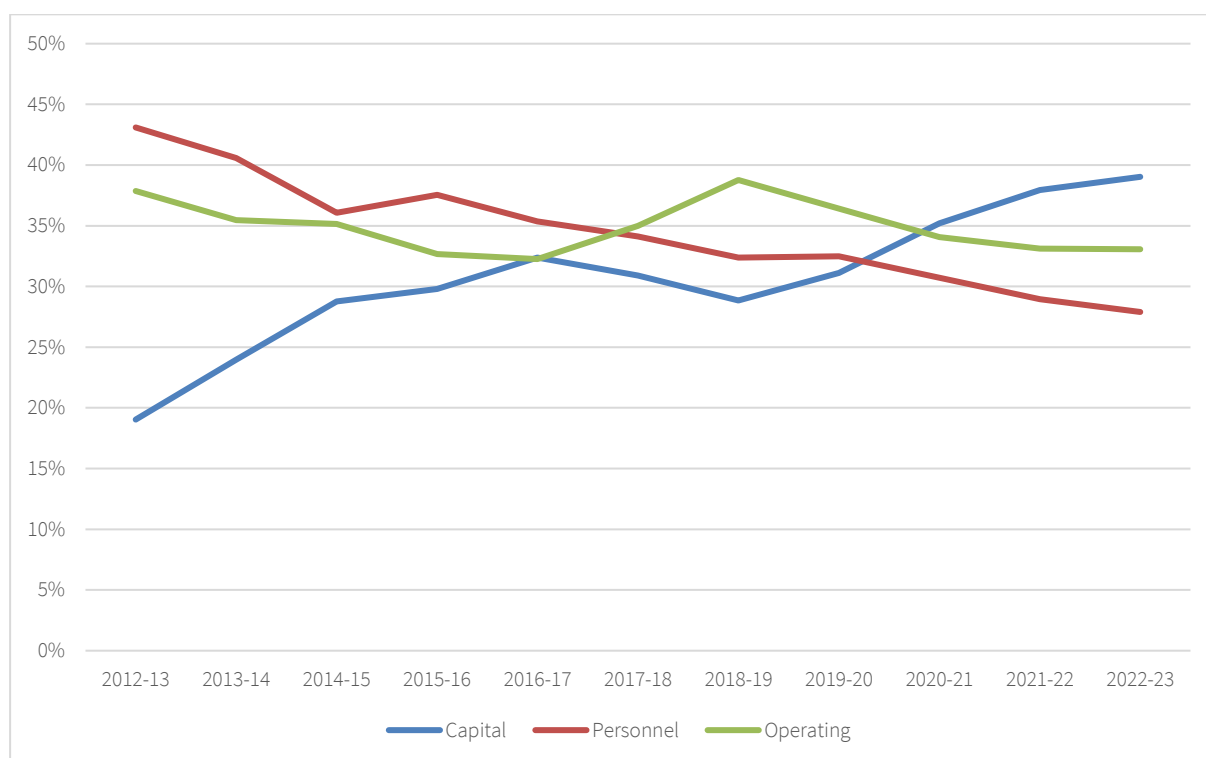
Figure A.1: The Australian defence budget as a percentage of GDP over time (nominal A\$b) (see chapter 2)



Sources: Spending: historical defence spending is taken from Defence annual reports and PAES. Spending data for 2018–19 to 2022–23 is taken from PBS 2019–20, which extends to the end of the forward estimates. Beyond that, the spending line is taken from the fixed funding line presented in Table 1 of the 2016 Defence White Paper. There are of course no guarantees that future funding will be delivered.

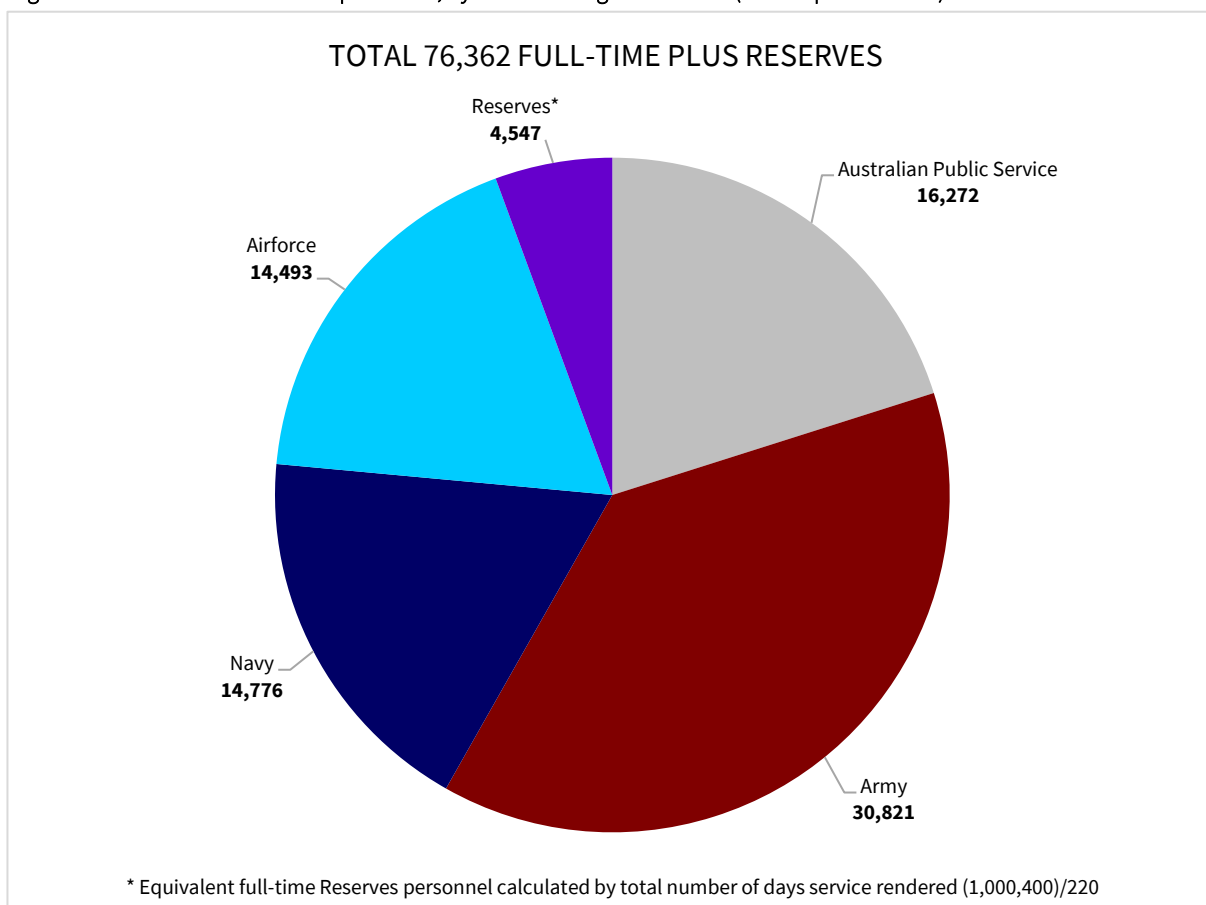
2% of GDP line—Historical data on GDP is taken from Budget Paper no. 1. Estimates for GDP over the forward estimates are also taken from Budget Paper no. 1 which predicts 3% GDP growth in 2021–22 and 2022–23. We have generated estimates for GDP beyond the forward estimates by projecting 3% GDP growth.

Figure A.2: Balance of the defence budget, 2012-13 to 2022-23 (%) (see chapters 2 and 3)



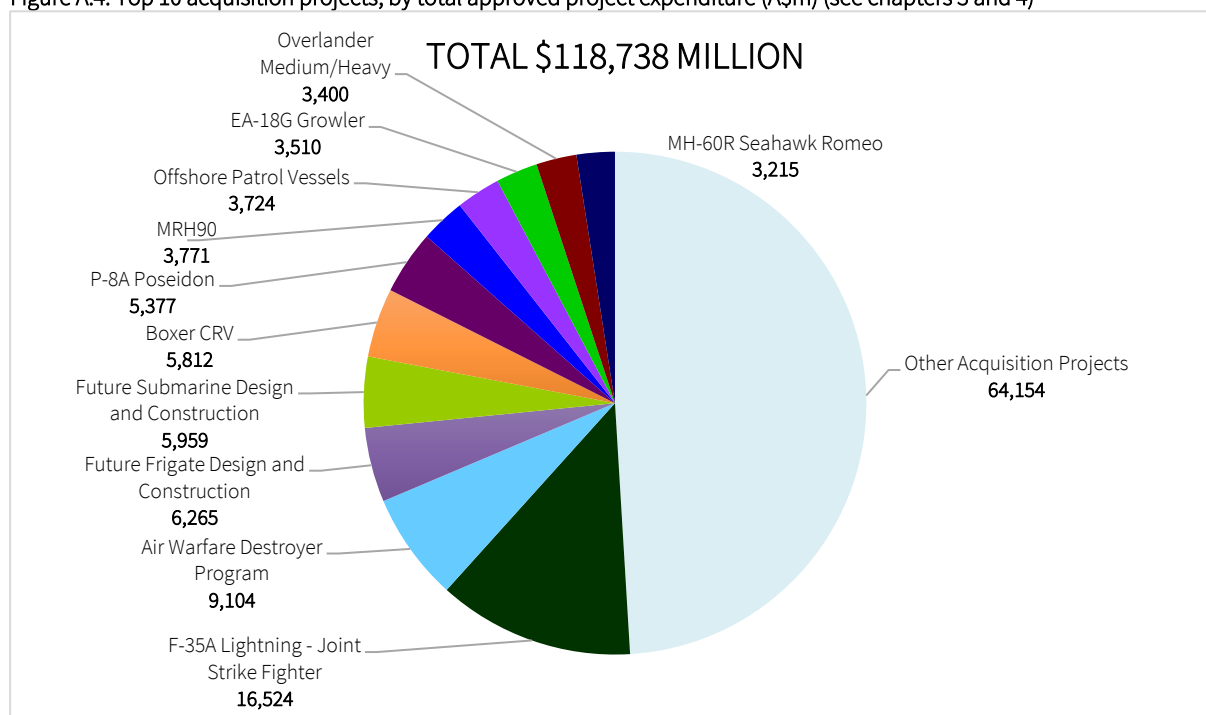
Source: PBS 2019–20 for 2019–20 onwards; previous ASPI budget briefs, derived from PBS.

Figure A.3: Breakdown of Defence personnel, by 2019-20 budget allocation (see chapters 3 and 4)



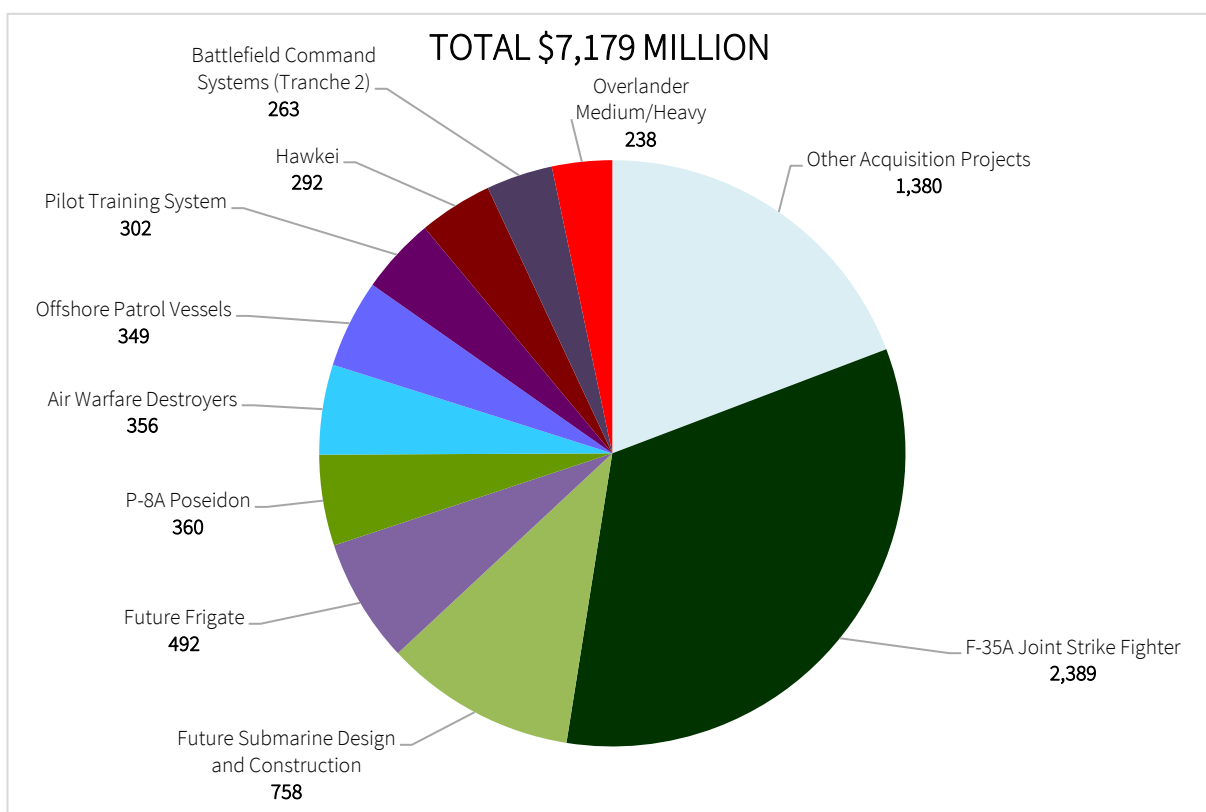
Source: PBS 2019–20, pages 23–24, tables 7 and 8.

Figure A.4: Top 10 acquisition projects, by total approved project expenditure (A\$m) (see chapters 3 and 4)



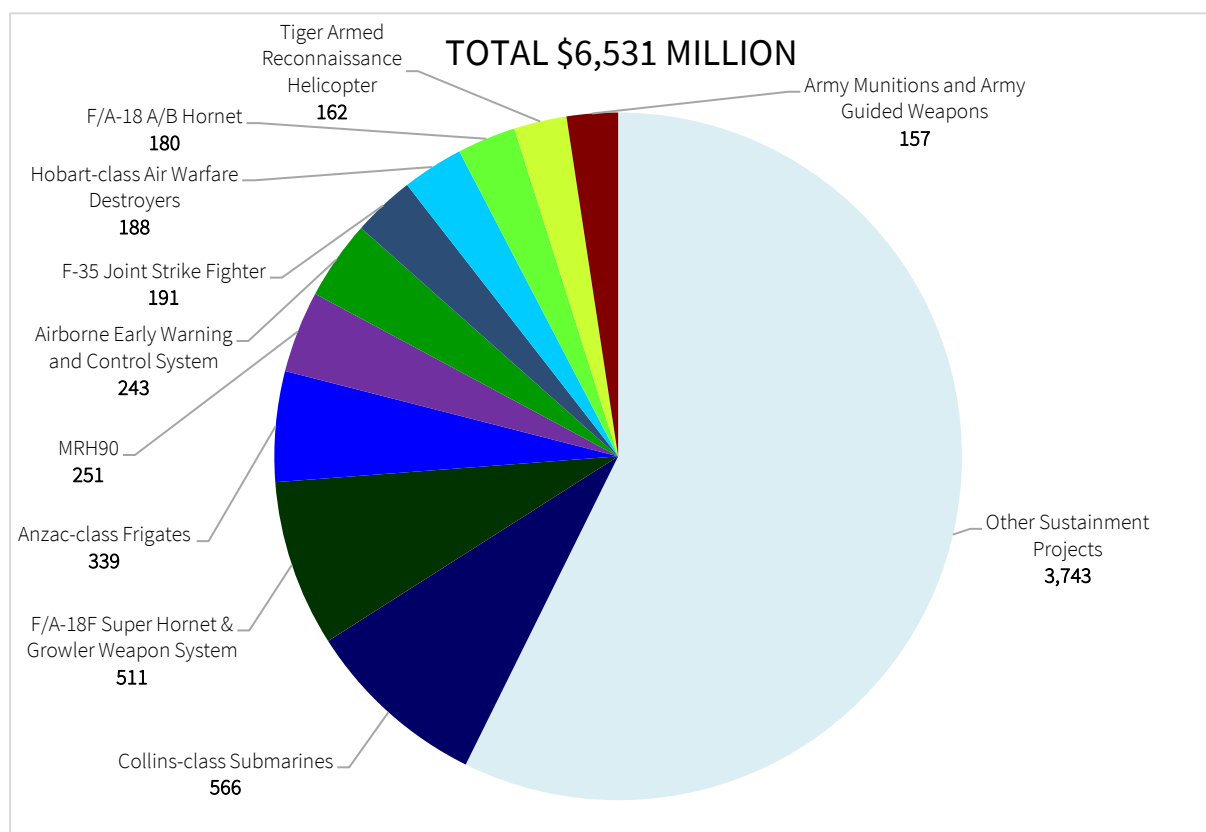
Sources: PBS 2019–20, pages 109–121, Table 55; ANAO's Major projects report; information for the Future Submarine Design and Construction from Defence. Figures only include CASG spend.

Figure A.5: Top 10 acquisition projects, by budgeted 2019-20 spend (A\$m) (see chapters 3 and 4)



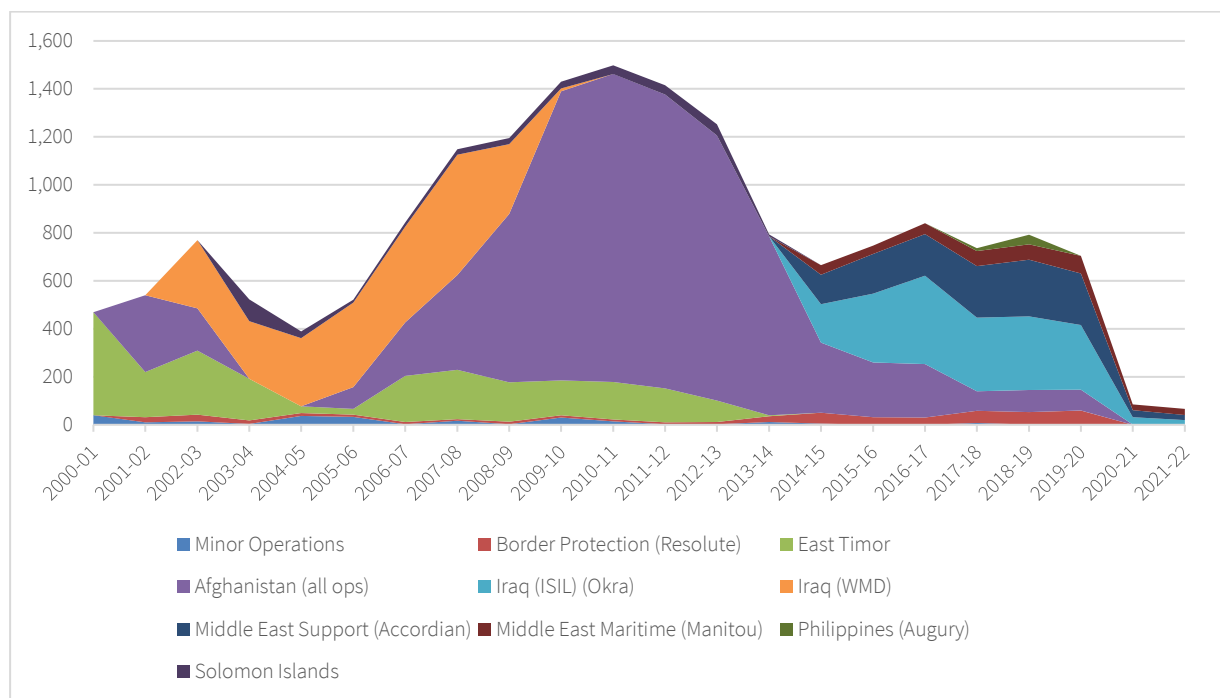
Source: PBS 2019–20, pages 109–121, Table 55. Figures include only CASG spend.

Figure A.6: Top 10 sustainment products, by budgeted 2019-20 spend (A\$m) (see chapters 3 and 4)



Source: PBS 2019-2020, pages 122-130, Table 56.

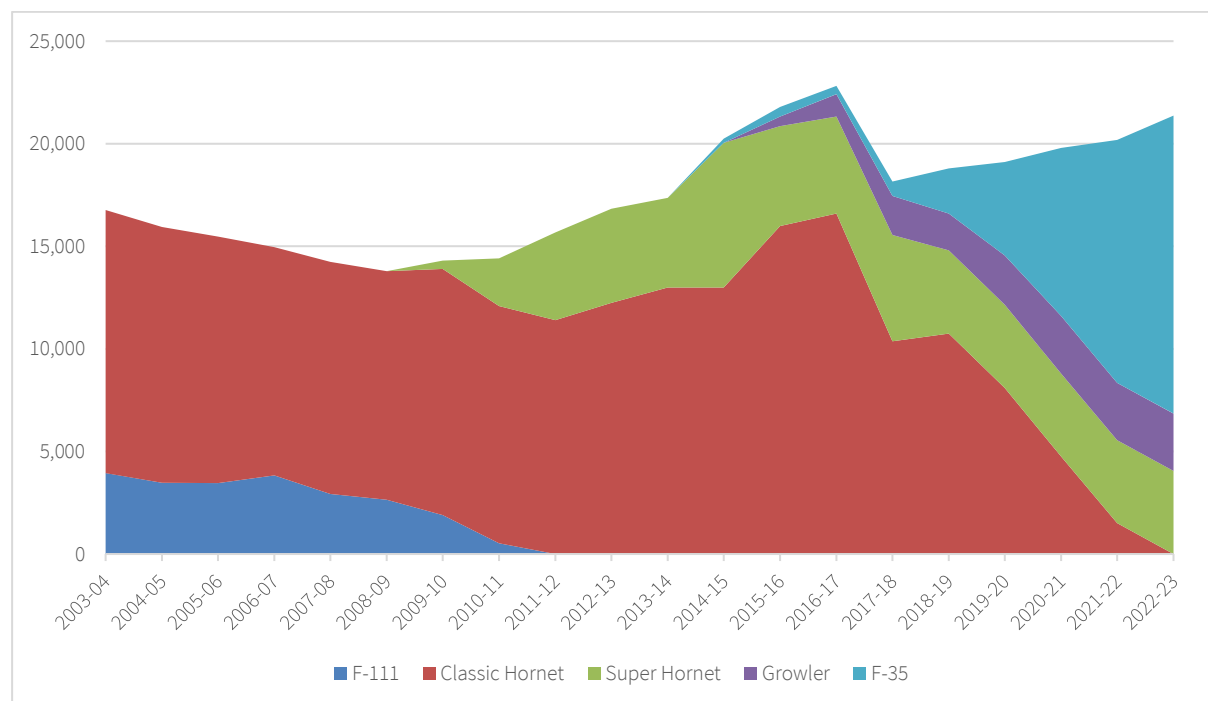
Figure A.7: Operational supplementation, 2000-01 to the present. Total spend \$17.3 billion (nominal A\$) (see chapters 1, 2 and 3)



Sources: Defence annual reports, PBS.

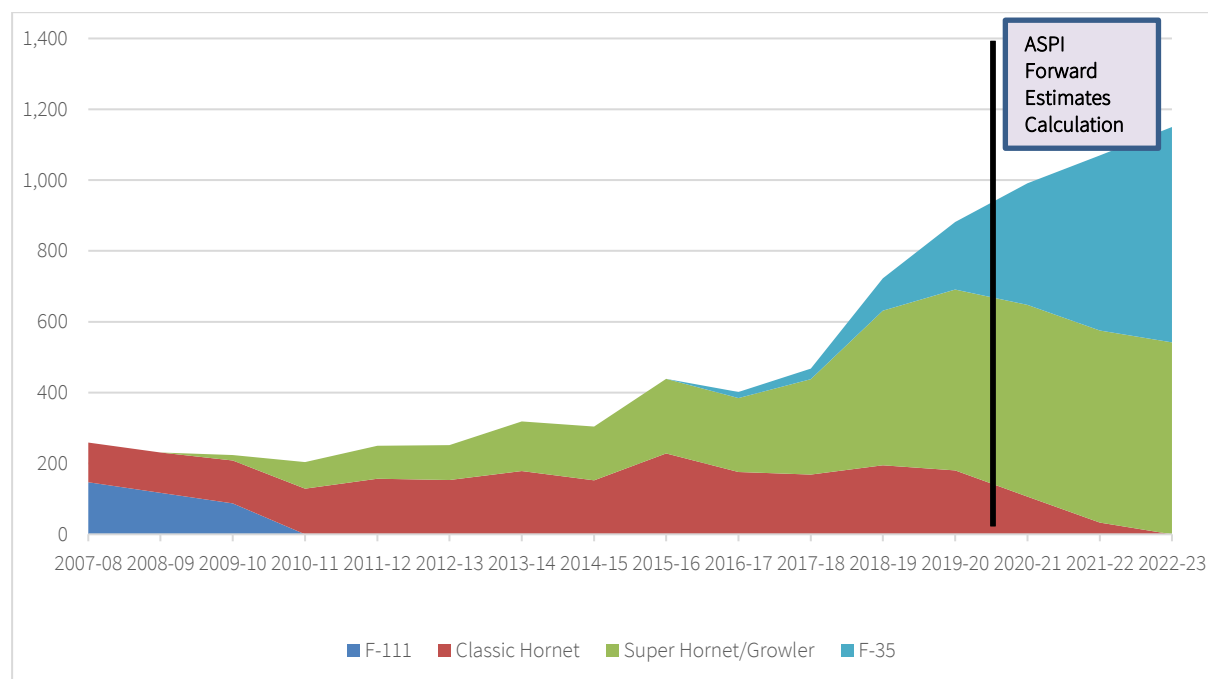
The air combat transition

Figure A.8: Flying hours for combat aircraft, 2003-04 to the present (see chapters 3 and 4)



Source: Defence annual reports, PBS.

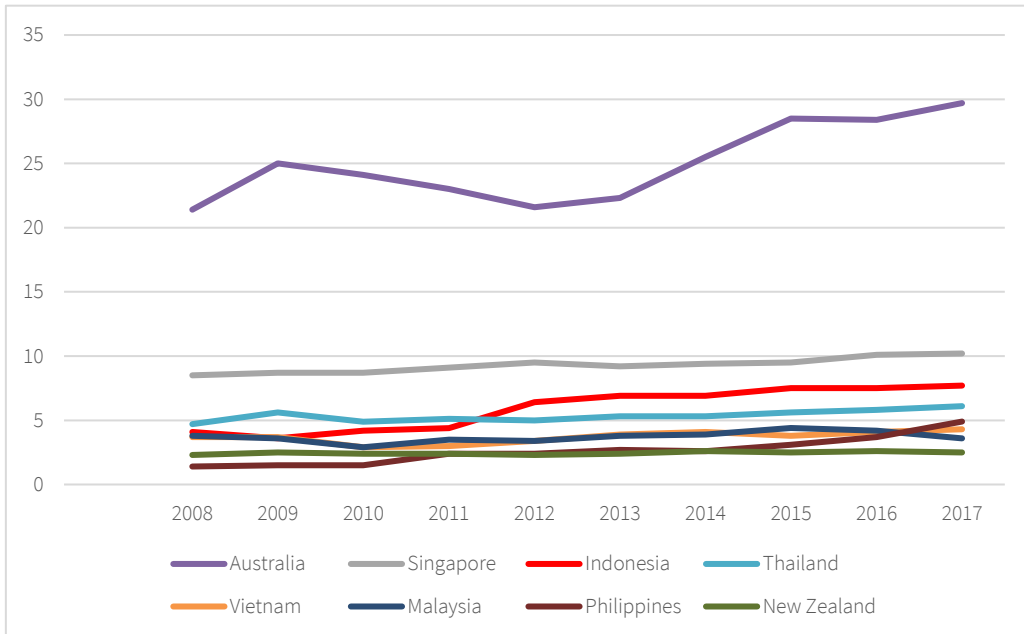
Figure A.9: Cost of flying combat aircraft, 2007-08 to 2022-23 (nominal A\$m) (see chapters 3 and 4)



Sources: PBS, PAES, Annual reports. The PBS presents a single, combined sustainment cost for both Super Hornet and Growler. The cost for the F-35A for the years before 2019-20 was generated by multiplying those years' flying hours by 2019-20's hourly cost. PBS sustainment cost projections do not extend beyond 2019-20. Years beyond 2019-20 were generated by multiplying the PBS's predicted flying hours by 2019-20's hourly flying cost.

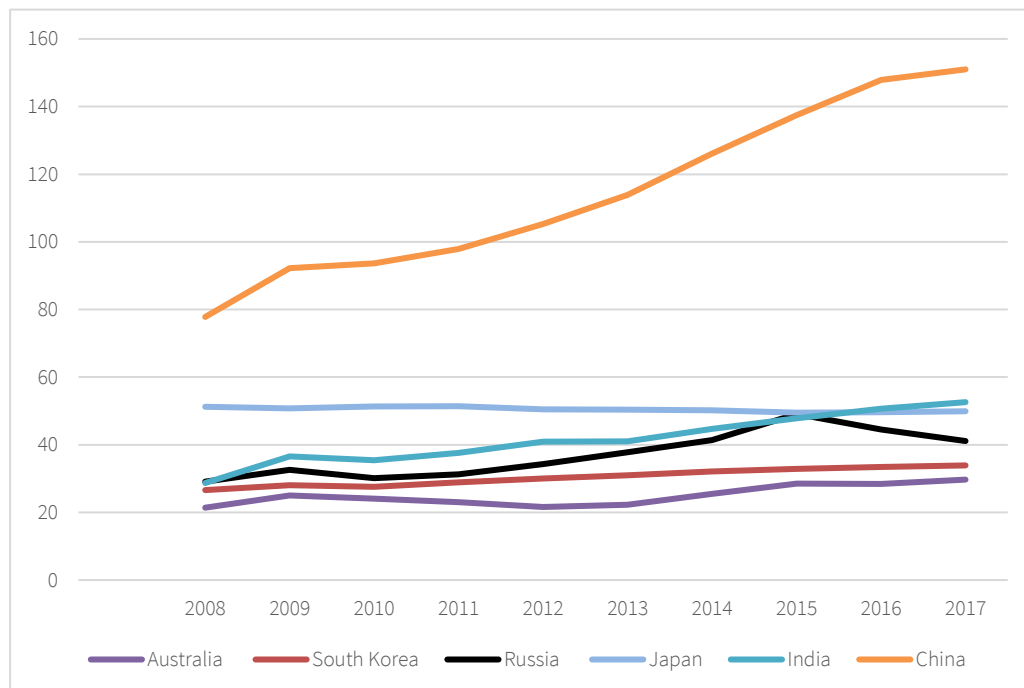
International comparisons

Figure A.10a: A big fish in a small pond: defence spending in maritime Southeast Asia (US\$b, 2016 constant and exchange rate) (see chapters 1 and 2)



Source: Defence Intelligence Organisation, 2018 Defence economic trends in the Asia-Pacific, Department of Defence, Canberra, [online](#).

Figure A.10b: A small fish in a big pond: defence spending in the greater Indo-Pacific (US\$b, 2016 constant and exchange rate) (see chapters 1 and 2)



Source: Defence Intelligence Organisation, 2018 Defence economic trends in the Asia-Pacific, Department of Defence, Canberra, [online](#).

Chapter 1: The context

Key points

- The strategic narrative that Australia has relied upon since the end of the Cold War has broken down through the rise of Chinese power. As yet, nothing has replaced it.
- President Trump's foreign policy might not be a 'blip', and the *relative* decline of US military supremacy is not likely to stop.
- Without a new narrative on Australia's security strategy, it's difficult to design the ADF coherently.
- The 'fourth industrial revolution' is occurring and offers the potential to transform military capability, but those opportunities must be actively pursued.
- The economy and the government's budget position are healthy, but ultimately what the government spends on defence is not strictly determined by either of those factors.

This chapter provides an overview of broader strategic issues to frame the analysis in the chapters that follow. It is pointless to discuss expenditure on military capabilities without having some understanding of the risks that those capabilities are meant to address.

1.1 The strategic context

The breakdown of the master narrative

In last year's *The cost of Defence*, we used the strategic risks presented in the *2016 Defence White Paper* as the framework for this chapter and assessed whether each risk had increased or decreased since early 2016. That's a reasonable approach. You have to have some kind of framework to structure your analysis so it's not just a collective of random observations, and using one that's familiar to both you and the people you want to engage with means you're all talking roughly the same language and understand the core assumptions being used.

And that's exactly the problem. If we all share the same assumptions, it's easy to indulge in groupthink and miss that fact that those assumptions no longer hold. It's easy to fall into the trap of continuing to use a framework even when its underpinnings no longer accurately represent the world. Whether it has collapsed under the weight of its own contradictions, to quote Marx, or become a dead parrot nailed to its perch, to quote Monty Python, at a certain point we have to admit that it no longer does the job. But creating a new narrative is difficult because it forces us to rethink those underlying assumptions, and in the field of grand strategy those assumptions relate to who how we see ourselves and our place in the world.

Over the past two decades, Australia's core strategic policy documents have sought to create a coherent narrative about the grand challenges of our times. Those documents crafted a narrative that tried to be both coherent and reassuring—coherent in the sense that they accurately described the world, and reassuring in the sense that they provided an achievable and affordable strategy to deal with the world.

On the challenge of terrorism, that narrative has largely been successful. We largely understand the threat, particularly its key characteristic of being constantly adaptive, and we have a strategy to manage it. That's of

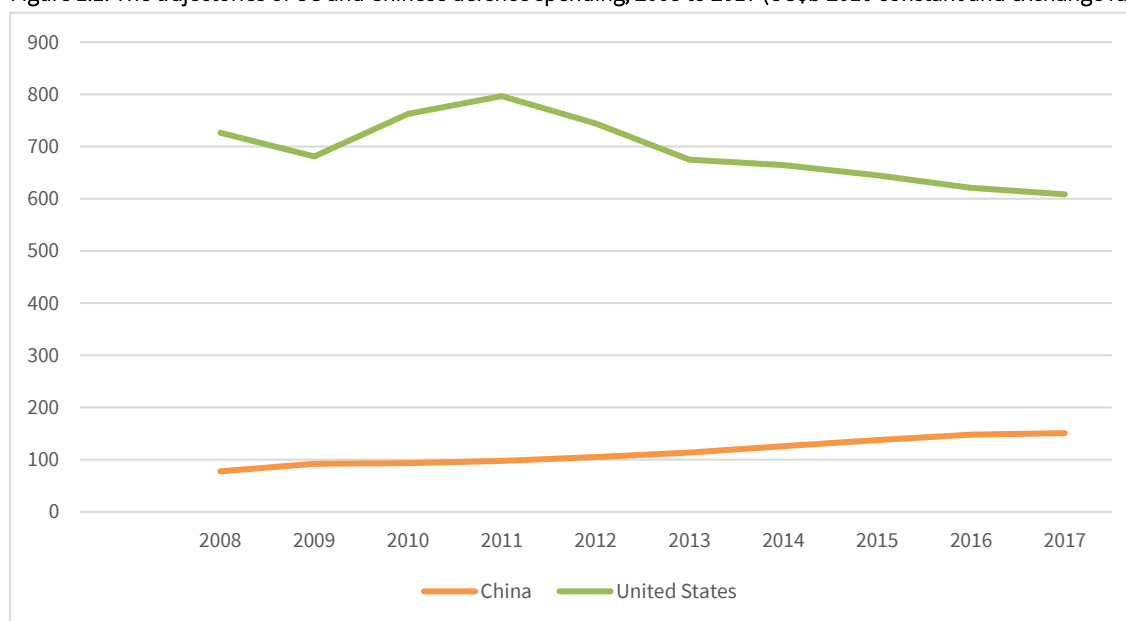
course very different from eliminating the threat, but many successful strategies are about managing risks, not eliminating them.

Getting China wrong

On the challenge presented by the rise of Chinese power, it's increasingly clear that the narrative hasn't succeeded. It hasn't been coherent. For example, strategic policy documents produced by Australia and by other nations, such as the US, have repeatedly stated that American military power will remain unchallenged or unmatched or predominant in the foreseeable future. Putting aside the fact that having military power alone doesn't allow a state to achieve its aims—it hasn't enabled the US and its partners to impose their will on a relatively small number of Central Asian subsistence farmers over the past 17 or so years—the narrative has assumed that the US is willing to apply its military power to ensure peace and order both for the Asia-Pacific (aka the Indo-Pacific) and, most importantly, for Australia.

At the same time, those analyses consistently stated that Chinese power, whether national, economic or military, has grown at a rate that previous assessments had not anticipated (Figure 1.1 and Figure A.20b in 'Defence in 10 tables'). In essence, they got the pace of growing Chinese power wrong. In fact, this is probably one of most consistent elements of that narrative. But if you're consistently getting it wrong, then there's probably something fundamentally wrong with your underlying assumptions.

Figure 1.1: The trajectories of US and Chinese defence spending, 2008 to 2017 (US\$b 2016 constant and exchange rate)



Source: Defence Intelligence Organisation, 2018 *Defence economic trends in the Asia-Pacific*, Department of Defence, Canberra, [online](#).

Some prophets proclaimed that these two views were irreconcilable. It has taken Australia's policy elites some time to also reach that view. But when things fall apart, they fall apart quickly. What's most remarkable is the extent to which the policy elite that crafted and adhered to the previous China narrative has rejected it over the past couple of years (although there are many continued advocates of the China policy of the past).

Perhaps more than any others, two developments pushed us over the tipping point. The first has been Chinese actions in the South China Sea. In the time it took Australia to craft the *2016 Defence White Paper* (another volume in the standard narrative), the Chinese military essentially annexed the South China Sea, demonstrating in deeds the emptiness of the previous narrative. China's mastery of the techniques of grey-zone conflict demonstrated that the US's conventional military power was of little use if the US couldn't apply it outside of conventional military conflict.

The Chinese state's simultaneous rejection of the International Court of Arbitration's ruling on Beijing's South China Sea claims showed that as a great power it was going to act within the global order as all great powers previously had; that is, to work through the system's mechanisms when they allowed it to secure its interests, and to act unilaterally when they didn't.

Trump's Jacksonian foreign policy

The other development was of course the election of Donald Trump. Certainly, the general capriciousness, egotism and clumsiness of his approach to foreign policy caused shockwaves, but, to the extent that there was an underlying coherence to his approach to foreign policy, it was equally disconcerting. Like Australia's policy elites, their US counterparts had shared a bipartisan approach to grand strategy. In that world view, the US had a unique role in creating and underpinning the world order. That came at a price in blood and treasure, but that was the cost of greatness. And, ultimately, the cost was repaid by ensuring that the world order enabled the creation of American wealth and security.

But while Wall Street may have reaped a return on the US's disproportionate investment in underpinning the global order by guaranteeing the security of other states, it's not clear that the average American did. And even if they did, they didn't necessarily believe it, and Trump successfully appealed to their sense that America was being used.

This doesn't mean that Trump has adopted a policy of isolationism, but his intervention in the world is driven by his sense of America first (and Trump first). Scholars have argued that this puts him in the Jacksonian tradition of US foreign and security policy—do what's in the US's immediate security interests, do it ruthlessly and quickly, and get out.¹

Whether Trump's approach to foreign policy is crazy like a fox, following an intuitive Jacksonian logic, or just plain crazy, it upsets the certainties that regional policymakers have taken for granted, such as that the US's and their security interests are fundamentally aligned and that the US actions will uphold them.

A Trumpian–Jacksonian foreign policy isn't likely to be blip on the US's foreign policy trajectory. Trump's election highlights just how far out of touch American policy elites are from the electorate. This is probably as stark in foreign policy as in economic and immigration policy. The US public simply doesn't see the value in being the world's policeman. And high-falutin' concepts such as the 'liberal world order' essentially mean nothing to them.² What, exactly, was the return on their investment of blood and treasure in wars in the Middle East? If there was one, it hasn't been articulated convincingly to them. If it's got something to do with preserving the global economic order and trading system, the Swiss have the same access to cheap Chinese washing machines and smartphones as Americans and they certainly didn't contribute blood or treasure to defend the rules-based global order.

It's by no means certain that the average American will regard future military intervention in Indo-Pacific conflicts any differently from how they see Middle East wars.

The thinning of US military power

The restoration of uncontested US military primacy is looking increasingly unlikely, particularly in the Western Pacific. It's true that President Trump has increased US defence spending, but there's only so much that can achieve. There are several reasons for this.

US military power is spread around the globe. Despite repeated efforts to focus on Asia (such as President Obama's shift to the Pacific, and Vice President Pence's statement that the US is in strategic competition with China), the US continues to have great difficulty in uncoupling itself from historical commitments around the globe. As this is being written, the US is once again ramping up military deployments to the Middle East on the

premise that it can create the world it wants there through the threatened or actual use of military force.³ In contrast, while China has become increasingly engaged in peacekeeping and has made forays into long-range deployments, its forces are overwhelmingly focused on nearer theatres.

Like virtually all Western militaries, the US Armed Forces have followed the path of investing in exquisitely capable yet exquisitely expensive military platforms. The cost of those platforms has grown at a rate that far exceeds inflation. This means that virtually all Western militaries are shrinking. That includes the US, even though it's spending over 3% of GDP on defence. To restore military 'mass' would take sustained spending at levels that far exceed even that, or a fundamental shift in force design.

The number of US Navy ships has declined from a Cold War level of over 500 to the current 272. The US Navy would like to halt that decline and return to 355 to meet global commitments. However, to do that with traditional ships it would need to spend 60% more in construction costs annually over the next 30 years than it has averaged over the past 30 years.⁴ It's a similar situation with the US Air Force's fleets. The air force has 5,600 aircraft. In 2017, it acquired 75 new ones. At that rate, it would require 75 years to replace its aircraft on a one-for-one basis based on current spending. However, a plan to replace them at the rate required with comparable aircraft would cost 25% more over the 2020s than has been spent on average over the past three decades and nearly 100% more over the 2030s.⁵

There are limits to what America can spend on defence. Those limits are not hard and fast, but there are constraints. US defence spending already makes up nearly half of the discretionary part of the federal budget (that is, things other than social security and health programs), and in President Trump's proposed FY2020 budget⁶ it would exceed it (\$671 billion to \$669 billion). The other elements have already been cut to the bone. Defence spending comprises 14.2% of federal government outlays (in Australia, it's 6.4%). There's no way for the US to pay for a \$2 trillion national infrastructure program and increase defence spending without finding a lot more revenue.

Since tax increases are even more inconceivable in the US than here, the only place the increased defence spending can come from is deficit spending. In Trump's budget, the annual deficit is over US\$1 trillion. To put it another way, the entire US defence budget (and then some) must be borrowed. In the wake of Trump's tax cuts, independent analysis indicates that US national debt will grow at an even faster rate. The Congressional Budget Office predicts it to grow from 78% of GDP to 92% in 2029 (in Australia, it's 18% this year).⁷

When a hawk such as John Bolton says, 'it's a fact that when your national debt gets to the level that ours is, that constitutes an existential threat to the society,' you have a problem.⁸

One could perhaps argue that the US economy is so large and the US dollar so fundamental to the global economy that it's become a singularity that essentially defies the laws of orthodox economics. It's simply too big to fail, so deficits and debt don't matter. Perhaps, but it seems unlikely that Americans will want to keep underpinning the security of countries that are unwilling to invest enough in their own security, particularly when Americans themselves don't enjoy the social benefits of government spending that the citizens of those countries enjoy.

This doesn't mean that US power has evaporated, but it suggests that we can't expect great-power dynamics to return to 'normal' simply by the US spending more on defence. We can't assume that the US can simultaneously manage every combination of contingencies. What if China took advantage of a US commitment to defend South Korea against the north to accelerate its plan to integrate Taiwan by force? What if Russia then used that as an opportunity for further adventurism in Eastern Europe? What would the US's priorities be? Where would it put its resources?

It's not a black and white narrative

China's economic rise has not, as once hoped, propelled it down a path towards greater liberalism. It hasn't allayed regional concerns about what kind of great power it will be. In fact, its actions during President Xi's tenure have been stark examples of the downside of growing authoritarian Chinese power. In addition to its virtual annexation of the South China Sea, we can add the internment of a million Uyghurs, the disappearance of the regime's critics, predatory loans under the guise of the One Belt, One Road initiative, the theft of intellectual property, state-sponsored cyberattacks on other states, and so on.

But the US's own actions have also contributed to the collapse of our comfortable strategic narrative. It's no longer obvious to the public that US interests align with ours. Our leaders and our policy statements continuously refer to the need to uphold the rules-based global order, while the US itself seems to want to disrupt that order. It has abandoned the Joint Comprehensive Plan of Action on Iran, causing many to wonder why any country would trust America. Moreover, it has imposed sanctions on Iran and forced all other countries to stop buying oil from Tehran under pain of suffering sanctions themselves.

Its policymaking is incoherent; it's seeking to persuade North Korea to give up existing nuclear weapons while telling the world that its commitments to agreements negotiated in good faith are worthless. Moreover, if North Korea is treated more favourably than Iran because it already has nuclear weapons, the US is simply signalling that it makes sense to acquire nuclear weapons as quickly as possible by any means possible.

Perhaps the most confusing part of the new picture is the extent to which our great and powerful ally shares our values and interests. Put another way, it was very clear to the vast majority of Australians whose side we were on in the Cold War. The narrative about friends and allies is more contested today. That's in part because we like to choose allies because they share our values, not just based on a realist calculus of interests.

For example, only 34% of Australians surveyed by the Lowy Institute in 2017 are in favour of using Australian military forces 'if China initiated a military conflict with one of its neighbours over disputed islands or territories'.⁹ That's probably not surprising, considering both major parties have consistently told Australians that we don't need to choose between China as our major economic partner and the US as our major security partner. Wouldn't intervening in a US-China war amount to having to choose?

Where are we at?

Our strategic situation is now characterised by several factors that we haven't had to deal with before:

- There's now an Asian great power with substantial economic, military and national power whose interests and values are not the same as ours (although there are certainly substantial shared interests on some matters, such as trade in resources).
- That power is willing to use its power to attain its goals, including in ways that are against our interests.
- That power is now our major trading partner by some margin (although it's still a considerable way from being our major investment partner).
- The military power of our great and powerful ally is no longer unchallenged across the region, and it may not reliably use its power in our interests.

Where to with the US alliance?

Acknowledging that US military power is no longer paramount or unchallenged doesn't necessarily mean abandoning the alliance, although there are those who argue that that's unavoidable. Nor does it mean rolling

over and accepting the Chinese Communist Party's bad behaviour. But it does mean developing a new, more coherent and compelling strategic narrative for Australia, and that strategy needs to articulate the values/interests proposition more cogently.¹⁰

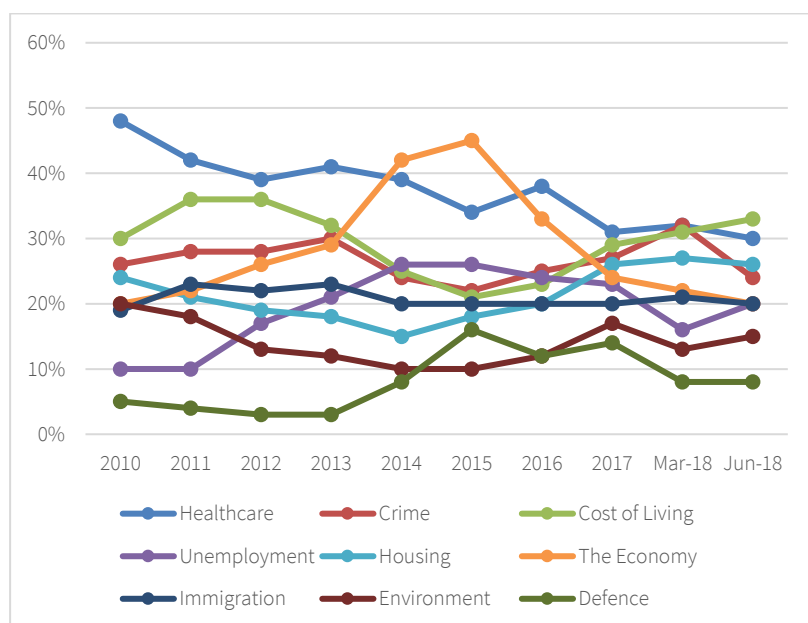
A coherent strategic narrative is especially important for the design of the ADF. Force design is a classic exercise in operationalising strategy; it's a fundamental exercise in aligning ends, ways and means. Investment in military capability is the acquisition of means, but it's not focused investment if it isn't clear how it's to be used (the ways) or what it's to achieve (the ends).

Historically, much of the ADF has been designed to provide contributions to US-led coalitions. Our strategic policy needs to state whether that's still the goal. Alternatively, if there's uncertainty about the extent or use of US power, do we need greater self-reliance? In which areas of capability? There's no doubt that greater self-reliance will cost more, even with continued access to US intelligence and technology.

Defence and public opinion

One of the most consistent results of opinion polling is that most Australians don't see defence and security issues as a major concern. IPSOS Issues Monitor has tracked this for almost a decade using essentially the same categories (Figure 1.2). Defence sits far below economic issues (the economy, cost of living, unemployment, housing) and quality of life (health, crime). In all but one year, it's even fallen below concern about the environment. The strategic policy community's concern about our collapsing grand strategic narrative is certainly not shared by the Australian people.

Figure 1.2: The big issues for Australians, 2010 to 2018



Source: Ipsos Issues Monitor.

Certainly, when asked specifically about threats, for example in the Lowy Institute's opinion polling,¹¹ respondents identify or rank threats. For example, over the past decade the number of respondents who think that it's likely or high likely that China will become a military threat to Australia in the next 20 years has averaged 43%, hovering between 39% and 48%. But far more see China as an economic partner than as a military threat (82% to 12%). The vast majority of Australians appear to accept the government's (and bipartisan) view that we don't need to choose between the US and China; in 2018, 81% said we can have good relationships with both.

In short, the atmosphere of growing crisis that has gripped the strategic policy community isn't shared by the Australian people. We suggested last year that in this environment the government would need to make a very compelling argument for increased defence spending, which it's shown no inclination to do. That assessment hasn't changed in the past year.

1.2 The 'fourth industrial revolution'

Aside from living in the middle of a fundamental change in great-power relationships, we're also in an era of technological and industrial change that has transformative potential for industrial and, therefore, military capability.

The transformative potential of the fourth industrial revolution

Previous industrial revolutions have transformed power relationships in the world. The first industrial revolution, starting in the 18th century, allowed relatively small states in Western Europe to conquer the great empires of the East, using small but technologically advanced military forces. It also reversed the historical polarity of economic weight between East and West.

The world's now entering the fourth industrial revolution (4IR), which has similarly transformative potential.¹² Some of the key elements of the 4IR include:

- uninhabited systems, which can do the dull, dirty, difficult or dangerous jobs that you'd prefer humans didn't do
- autonomous systems, which can do their jobs without constant human intervention, freeing up humans for higher value tasks such as decision-making
- artificial intelligence (AI), which supports that decision-making, allowing better decisions to be made faster
- big data, which provides the raw material that AI processes to recommend decisions
- the internet of things, which links increasingly greater numbers of objects, allowing uninhabited and autonomous systems to operate reliably while generating more data
- the blending of biotechnology and information technology, which enables human-machine teaming and the advantages that come from drawing on the strengths of each
- Space 2.0, which gives more participants cheaper, faster, more robust and tailorable access to space-enabled resources such as communications, imagery and precision navigation and timing
- advanced manufacturing and 3D printing, which allow people to make exactly what they need when they need it.

A key aspect of the 4IR is that its fundamental technologies are being driven more by the civilian economy than by military organisations. Google, for example, is investing deeply in AI. Farmers, oceanographers and amateur photographers are as interested as the military is in drones and the AI- and space-enabled capabilities they provide. Only a tiny percentage of R&D globally is focused specifically on military systems.¹³ This potentially offers great synergies that the Australian Defence organisation can take advantage of.

Opportunities and risks

Like all transformative processes and technologies, the 4IR poses opportunities and risks. Potentially, it could reinforce the dominance of the 'haves'—the nations and corporations that can invest heavily in key emergent technologies. As Vladimir Putin proclaimed, 'Whoever becomes the leader in [AI] will become the ruler of the world.'¹⁴

Alternatively, the 4IR has the potential to democratise technology and production, for example by lowering the cost of entry into key fields of technology such as space and by allowing actors to mix and match subsystems to create solutions tailored to their own needs at the local level. But this also has the potential to democratise military capability, as poorer states and non-state actors such as terrorists can access many technologies.

Australia in some senses is well placed to embrace and benefit from the 4IR. Australian industry and academia probably can't make a 6th-generation manned fighter to replace the Joint Strike Fighter, but they already make a wide range of unmanned and increasingly autonomous systems operating in a broad range of environments. And they're doing it for a fraction of the cost of traditional manned platforms. But Australia needs to invest to reap the benefits.

Potential scenarios

The 4IR could play out for Australia in a range of scenarios:

- *Scenario 1: The worst of all possible worlds.* The US and China invest heavily in a race to attain global leadership in key emergent technologies. Using the big data gathered through its 'social credit' scheme, China 'wins' the race for AI. It also wins the race in quantum computing and encryption, allowing it to protect its secrets and steal its competitors' with impunity. These advances are used to enhance conventional platforms and weapons to make the Western Pacific a no-go zone for the US. Meanwhile, in the West, US technological advantage is still so far ahead that Australian industry is left behind. Failure to invest in emergent, transformative technologies means Australian industry can't create the systems that the ADF needs. It's forced to acquire them off-the-shelf from overseas and has limited ability to modify them. Due to lack of investment in autonomous technologies, the ADF remains reliant on expensive manned platforms, which it can't use in operations due to the risk posed by China's advanced technologies. Furthermore, the proliferation of 4IR tools means that non-state actors such as terrorists can create more destructive weapons, whether physical or virtual.
- *Scenario 2: The best of all possible worlds.* Our ally, the US, wins the race for AI and quantum computing dominance. This enables it to retain military superiority over China, despite the latter's growing numbers of platforms and missiles. Due to clear government policy and strong, focused investment, Australian industry is well placed to team with US companies in order to contribute to technological innovation. Working with US primes, Australian industry has the capability to meet the ADF's requirements. The tipping point of delivering truly autonomous systems means that humans can be removed from the battlefield and replaced by Australian-made and joint US-Australian autonomous systems. Australian industry can rapidly adapt ADF systems to defeat terrorists' weapons and techniques. Moreover, advances in AI and surveillance technologies mean that terrorists' plans can be pre-empted.
- *Scenario 3: It's complicated.* The US and China remain competitors in emergent technologies, with neither gaining a clear advantage. Australia maximises its return on its investment in new technologies by focusing on a small number of key technologies for which it can develop centres of excellence. It uses those technologies to enhance platforms designed by overseas partners to provide a capability edge. One of those areas of focus is autonomy, and the ADF gradually moves into human-machine teaming but is still

reliant on manned platforms exposed to the risk of serious human losses. The struggle against terrorism remains ongoing as terrorists seek asymmetric advantage, which is then countered.

If Scenario 3 sounds a bit like business as usual, that's because, despite the transformative power of technology, there are certain patterns of human behaviour that endure across history.

1.3 The economic context

The Australian economy should pass a major milestone this year, reaching \$2 trillion in GDP. On a nominal basis, that puts it 13th or 14th in the world, depending on whose rankings you go by. It's a big beast. It's also a pretty healthy beast; it only took 13 years to get there from \$1 trillion.

In this section, we don't give a detailed analysis of the Australian economy. Rather, we examine the capacity of the economy to support defence spending.

The budget position

Both sides of Australian politics now essentially espouse the view that federal budget surpluses are inherently a good thing and that the best way to achieve them is to reduce spending rather than to increase taxation. And the electorate appears to share that view. Therefore, Australia's major political parties base their mandate to rule on their ability to deliver budget surpluses along with tax cuts.

From this perspective, the budget is in good shape. While the Coalition government might not have turned the deficit around quite as fast as it would have liked when it first came to power, in the past three years it has made substantial progress, and even faster than it predicted only a few years ago (Table 1.1). The budget papers predict a narrow return to surplus this year, to be maintained for the remainder of the forward estimates (that is, a surplus of less than 1% of GDP).

Table 1.1: Forecast versus actual underlying cash surplus/deficit, 2012–13 to 2019–20 federal budgets (A\$bn, nominal)

		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
2012-13	\$b cash	1.5	2.0	5.3	7.5							
	% GDP	0.1	0.1	0.3	0.4							
2013-14	\$b cash	-19.4	-18.0	-10.9	0.8	6.6						
	% GDP	-1.3	-1.1	-0.6	0.0	0.4						
2014-15	\$b cash	-18.8	-49.9	-29.8	-17.1	-10.6	-2.8					
	% GDP	-1.2	-3.1	-1.8	-1.0	-0.6	-0.2					
2015-16	\$b cash		-48.5	-41.1	-35.1	-25.8	-14.4	-6.9				
	% GDP		-3.1	-2.6	-2.1	-1.5	-0.8	-0.4				
2016-17	\$b cash			-37.9	-39.9	-37.1	-26.1	-15.4	-6.0			
	% GDP			-2.4	-2.4	-2.2	-1.4	-0.8	-0.3			
2017-18	\$b cash				-39.6	-37.6	-29.4	-21.4	-2.5	7.4		
	% GDP				-2.4	-2.1	-1.6	-1.1	-0.1	0.4		
2018-19	\$b cash					-33.2	-18.2	-14.5	2.2	11.0	16.6	
	% GDP					-1.9	-1.0	-0.8	0.1	0.5	0.8	
2019-20	\$b cash						-10.1	-4.2	7.1	11.0	17.8	9.2
	% GDP						-0.5	-0.2	0.4	0.5	0.8	0.4

Budget year estimate	Forward estimates	Actual achievement
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Source: Treasury, Budget paper no. 1.

At that rate, it will still take some time to pay down the debt, which is estimated at \$361 billion for 2019–20, or 18.0% of GDP. Moreover, the government has been able to achieve a surplus while retaining one of the lowest rates of taxation in the OECD. If budget surpluses, low debt and low taxation are the indicators of a healthy, well-managed economy, then Australia is in good shape.

It's reasonable, then, to conclude that the budget can support the current level of defence spending. However, there's not much room to increase defence spending without some political opportunity cost through either increased taxation, reduced spending on other federal programs or increased debt.

The economy

While the economy broadly speaking is healthy, it isn't necessarily performing as well as the government would like. The economy has stayed out of recession for 27 years (and is unique among OECD countries in doing so) and has averaged 3.1% annual growth over that period. However, since the global financial crisis of 2008, growth rates have stubbornly averaged around 2.6%. That's still good by the standards of developed nations, but it does make the budget papers' predictions for 3% growth by 2021–22 and 2022–23 appear ambitious.

One cause for concern is that the growth is mainly driven by immigration; the economy is getting bigger because there are more people in it. Per capita growth has been much lower, generally around 1%. That means we're not really getting more efficient, and therefore more competitive.

Overall, it looks like the economy can support predicted levels of defence spending, particularly if they stay somewhere in the vicinity of 2% of GDP. But ultimately what a nation spends on defence is not determined solely by its economy. Australia has spent more, even in peacetime; around 3% in the late 1950s, for example, and 2.5% in the mid-1980s. If a country is confronted by strategic risk, it will spend more. However, there needs to be a compelling strategic narrative and, as we've discussed, that's currently missing.

How much leverage does China have over the economy (and the government)?

It's no secret that China is by far Australia's largest trading partner.¹⁵ In 2017–18, it was our largest export destination and around two-and-a-half times larger than the next biggest, which was Japan. Our large trade surplus with China balances our deficits with other countries.¹⁶ Our two biggest exports by far are iron ore (\$61.4 billion) and coal (\$60.4 billion), of which 81.6% and 22%, respectively, goes to China.

One could ask whether, by basing their mandate to rule on their ability to achieve surpluses without increasing taxation, Australian Governments run the risk of putting their prospects in the hands of the Chinese Communist Party. By dialling down resource imports, China could reduce the Australian Government's taxation revenue, and with projected surpluses at less than 1% of GDP there's not much margin.

There are a couple of ways to answer this. First, we shouldn't automatically assume that China has the ability to turn off iron ore and coal imports whenever it wants to coerce us. There is, after all, a good reason China buys them in the first place: we provide commodities essential to the Chinese economy at a good price and with reliable supply. There would be a self-inflicted cost to China in turning off those imports.

Second, resource markets are already volatile, so changes to prices already affect government revenue. Over the past year, the price of iron ore has ranged from US\$63 to US\$100 per tonne. Treasury analysis suggests that even large decreases in price have marginal impact on the budget bottom line:

If the iron ore price was to fall immediately to US\$55 per tonne FOB, four quarters earlier than assumed, nominal GDP could be around \$5.8 billion lower than forecast in 2018–19 and \$10.6 billion lower in 2019–20. This would result in a decrease in tax receipts of around \$0.5 billion in 2018–19, \$2.6 billion in 2019–20 and \$1.0 billion in 2020–21.¹⁷

China would have to significantly reduce resource imports to replicate the effect that already occurs through price fluctuations. And, if it did, a half-trillion-dollar federal budget can absorb those changes.

Certainly, sections of the Australian community would be unhappy. But overreacting to Chinese adjustments to demand, whether deliberate or not, does reveal a vulnerability to China. Moreover, when sections of the Australian community blame Chinese coercion on the actions of the Australian Government in calling out poor behaviour and essentially suggest that we brought it upon ourselves, that again simply reveals to the Chinese Communist Party the simplest and most effective levers for shaping our political discourse and actions. We need to be resilient enough not to place those levers in the party's hands.

Overall economic analysis can illustrate the broad space the government has to operate in when it comes to defence funding, but it can't really define what the government can or can't spend. That comes down to the government's view of Australia's place in the world, its priorities, and its assessment of strategic risk.

And finally, some big-picture perspective

It's important not to lose perspective. Australia ranks third on the UN's 2017 Human Development Index.¹⁸ We are 11th in the *World happiness report*,¹⁹ although interestingly four or five of the 10 countries ahead of us are consistently in the top 10 taxing countries²⁰ (suggesting that the dominant political narrative here and in the US about the undesirability of tax increases might be misplaced).²¹ We rank 11th in GDP per capita on a nominal basis,²² which is nearly five times the global average (but only 21st on a purchasing power parity basis, which is why it's cheaper to holiday in Bali than Byron Bay²³).

We're seventh in life expectancy at birth at 83.1 years (and even the highest ranking country is only one year ahead of us), so we have a lot of time to enjoy our wealth and happiness. But we need to make sure we are making the right strategic decisions to preserve our fortunate situation.

Chapter 2: How much money is it?

Key points

- This year's Defence appropriation (including the Australian Signals Directorate) is \$38,742 million, which is 1.93% of GDP.
- This constitutes growth of 1.3% in real terms from last financial year.
- Based on the Budget papers, Defence funding will reach 2.01% of GDP by 2020–21, in accordance with the 2016 *Defence White Paper* commitment, and nearly 2.2% of GDP by the end of the forward estimates.
- Defence's capital budget continues to grow very strongly in real terms.

This chapter looks at how much money the government is providing Defence. Since Defence's Portfolio Budget Statements are available online on Defence's website, we won't reproduce PBS tables here.²⁴ When we're referring to a PBS table (as opposed to one in this brief), we flag that with the prefix 'PBS'. If we don't specify a year, the default assumption is 2019–20.

On 1 July 2018, the Australian Signals Directorate (ASD) became a statutory agency within the Defence portfolio. Its funding is now treated separately within the PBS. Because the government's commitment to increase the defence budget to 2% of GDP included ASD, our analysis of total Defence funding still includes ASD. We refer to this as 'consolidated' Defence funding. Most of our detailed analysis, however, focuses specifically on the Department of Defence. Because of the way the PBS is structured it's very difficult to break down the consolidated top-level line into its component parts. Since the department's share is 97.6% of the consolidated budget anyway, it doesn't make too much difference if we don't include ASD.

2.1 This year's budget

How did the defence budget go in 2018–19?

The 2018–19 defence budget ended up \$1,210 million more than predicted in PBS 2018–19: \$37,566 million as opposed to \$36,356 million. That's largely due to two main factors. The first is an additional \$484 million as a foreign exchange rate adjustment (when the Australian dollar goes down, Defence gets compensated to preserve its buying power). This is a no-win, no-loss adjustment, so it's an increase on paper but not in terms of buying power.

The second is that late in the financial year (after the February PAES), the government brought \$620 million of funding forward from 2019–20 into 2018–19. This is the kind of adjustment that Defence can usually manage quite easily by advancing the payment of big acquisition contracts and, according to its Senate estimates testimony, that's precisely what it did.²⁵ Again, this isn't an actual increase when the two years are taken together.

What's the total Defence appropriation for 2019–20?

The consolidated Defence appropriation for 2019–20 is \$38,742 million (Table 2.1).²⁶ This is the number presented in the Minister for Defence's Budget night media release as \$38.7 billion. However, the number can't

be found in a single consolidated table in the PBS this year (unlike last year) and has to be constructed by bringing together Defence Department funding (PBS Table 1) and ASD's funding (PBS tables 60 and 66).

Table 2.1: Consolidated defence budget, 2018–19 and 2019–20 (\$m)

Year	Department of Defence	Australian Signals Directorate	Total
2018–19 estimated actual	36,699	867	37,566
2019–20 estimated	37,825	917	38,742

Source: PBS 2019–20.

Even though \$620 million was moved forward from 2019–20 into 2018–19, there's still an increase of \$672 million from PBS 2018–19's prediction for 2019–20 (\$38,742 million as opposed to \$38,070 million). This is largely due to two factors. The first is foreign exchange adjustments of \$665 million (taking into account PAES 2018–19 and PBS 2019–20).

The second is additional operations funding of \$607 million. There's nothing unusual about the appearance of a large amount of operations funding in the current year's PBS that was not programmed in previous years' PBS. The PBS generally does not program substantial operations funding beyond the current year. In short, even though it wasn't predicted in last year's PBS for this year, it was always going to appear this year, given that deployments such as Iraq and Afghanistan are continuing. Operations funding is also no-win, no-loss: it covers only the additional cost of conducting operations, so in that sense it's not a budget increase or a net win for Defence.

Has the defence budget increased since last year?

The funding for 2019–20 is an increase from 2018–19 in nominal terms of \$1,176 million, or 3.1%. In real (2019–20) terms, it's an increase of \$480 million or 1.3%. That's the smallest real increase under the Abbott–Turnbull–Morrison government (Table 2.2). However, the increase would have been 4.6% if the previously discussed \$620 million hadn't been moved forward from 2019–20 into 2018–19.

Table 2.2: Defence budget, nominal and real increases, 2013–14 to 2022–23 (\$m)

	Nominal budget	Nominal increase	Real budget (2019–20 baseline)	Real increase	% of GDP
2013–14	26,132	6.9%	28,939	4.1%	1.64%
2014–15	30,023	14.9%	32,689	13.0%	1.85%
2015–16	31,151	3.8%	33,454	2.3%	1.88%
2016–17	32,000	2.7%	34,136	2.0%	1.83%
2017–18	34,926	8.0%	36,181	6.0%	1.89%
2018–19	37,566	7.6%	38,258	5.7%	1.94%
2019–20	38,742	3.1%	38,742	1.3%	1.93%
2020–21	41,791	7.9%	40,808	5.3%	2.01%
2021–22	45,623	9.2%	43,464	6.5%	2.10%

2022–23	49,693	8.9%	46,187	6.3%	2.19%
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Source: PBS.

Budget year estimate	Forward estimates
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How is the defence budget looking over the longer term?

The defence budget continues to increase in the longer term, this year being the seventh straight year of growth in real terms. The PBS's forward estimates also predict continued growth.

A table showing changes in the defence budget since 1999–2000 is in Appendix 1. Over the 20 years since then, the nominal defence budget has grown from \$12,033 million to \$38,742 million, or by 221%. In real terms, it's a more modest but still healthy growth of 92%.

Is the defence budget on track to 2% of GDP?

In the *2016 Defence White Paper*, the government made a commitment to increase the defence budget to 2% of GDP by 2020–21. The PBS predicts that will occur, hitting 2.01% of GDP next year.

We should note two things. The first is that, if GDP grows in real terms faster than the defence budget, the budget will decrease as a percentage of GDP despite increasing in real terms. That has occurred this year, from 1.94% to 1.93%. Again, if the shift of \$620 million from 2019–20 into 2018–19 hadn't occurred, the defence budget would have grown as a percentage of GDP from 1.90% to 1.96% over those two years.

Second, achieving 2% of GDP will require a substantial increase in the defence budget next year of \$3 billion, or 5.3% in real terms. This will be a large jump for the government to fund and for Defence to absorb, but it's certainly not unprecedented, particularly in recent years—real increases of 6.0% and 5.7% occurred in 2017–18 and 2018–19, respectively (and 2014–15 saw a 13% increase).

Over the next three years of the forward estimates, the budget is projected to grow strongly, by 5.3%, 6.5% and 6.3%, respectively. If those funds are delivered (and GDP grows as predicted in the Budget papers), the defence budget will reach 2.19% of GDP. That's a level not seen since the late 1980s (2.24% in 1987–88).

Beyond the forward estimates, we have to use the 2016 White Paper funding line and make some assumptions about GDP growth, but based on those assumptions the defence budget will sit at around 2.20% of GDP.

Was the White Paper funding delivered?

While most attention is given to the 2% target, the White Paper gave Defence a fixed funding line so that its budget would not go up and down with fluctuations in GDP. That is, while the government committed to growing the defence budget to 2% of GDP by 2020–21, Defence's annual funding was not set as a percentage of GDP.

We are now four years into that funding line. Based on the public data, ASPI assesses that over those four years the government has met its funding commitment.²⁷ Defence's actual funding over that period has come within 0.03% of the White Paper's funding line, falling just \$38 million short. Considering that over that period Defence's funding has been over \$143 billion, that's pretty good. This issue is discussed in more detail in Appendix 2.

We should note, however, that while it appears the government has provided Defence with the promised funding, we don't have good visibility of how the things it's to be spent on have changed since the White Paper. Better visibility of this, through more transparent reporting by the department, would allow progress to be assessed, beyond counting how much cash was delivered and spent.

The increasing gap between 2% and the 2016 White Paper's funding

While much public discussion (and criticism) suggests that the Coalition government pegged the defence budget at 2% of GDP, that's not the case. The government did commit to reaching 2% of GDP by 2020–21, but it didn't mechanically pin the budget at that level in perpetuity. In its *2016 Defence White Paper*, the government acknowledged that doing so would mean the defence budget would fluctuate up and down in sync with GDP predictions. This would make it difficult for Defence planners, particularly in the area of major acquisitions such as shipbuilding, which are planned years or even decades in advance.

So the Coalition 'decoupled' the budget from GDP growth estimates, and instead committed to a 10-year fixed funding line that's printed in black and white in the White Paper on page 180.

After 2020–21, the fixed funding line in the White Paper and a hypothetical funding line based on 2% of Treasury's GDP predictions start to diverge. The fixed funding line reaches 2.2% of predicted GDP. While a difference of 0.2% of GDP might not sound like much, in dollar terms that gap quickly reaches \$5 billion per year (Table 2.3). The difference totals \$22.4 billion over the second half of the White Paper decade (unless, of course, GDP growth makes a dramatic recovery).

Table 2.3: White Paper funding line versus 2% of GDP (\$b)

Year	2021–22	2022–23	2023–24	2024–25	2025–26	Total
PBS / White Paper 2016	45.6	49.7	52.9	55.7	58.7	262.6
2% of GDP	43.5	45.4	47.8	50.4	53.1	240.2
Shortfall	-2.1	-4.3	-5.0	-5.4	-5.7	-22.4

Sources: PBS, *2016 Defence White Paper*, Budget paper no. 1.

To illustrate the scale of that quantity in capital terms, it's more than the entire Joint Strike Fighter (JSF) program. In terms of annual cash flow, \$5 billion a year is more than the entire naval shipbuilding program. In sustainment terms, \$5 billion a year is more than the cost of operating Defence's 30 most expensive capabilities.

We should note that we are using the budget paper's forecast of GDP increases of 2.75% and then 3% from 2021–22. Over the past decade since the global financial crisis, GDP growth has only averaged around 2.6% per annum. If that continues, the gap between 2% of GDP and the White Paper funding line will get even bigger.

We are not suggesting that the government is intending to limit funding to 2%. As discussed above, over the four budgets since the White Paper it has delivered the fixed funding line. According to this year's PBS, which is the government's budget plan, by the end of the forward estimates (2022–23), the defence budget will be around 2.19%.

It's one of those iron rules of Defence planning that every dollar in its budget is spoken for. There are no pots of unassigned cash sitting around in future years—if there were, Treasury would quickly sniff them out and snap them up. That's essentially what a fully costed White Paper means; Defence develops a plan and government gives it exactly the right amount of money to deliver the plan.

So the point is this: Defence is already basing its planning on a funding line that exceeds 2% of GDP. In fact, the government would have insisted on it.

Budget measures

Budget measures (that is, the funding adjustments to previous years' plans in this year's budget) are listed in PBS Table 2. The Defence PBS doesn't explain what they are; for that you need to go to Budget paper no. 2,²⁸ which briefly explains all budget measures across government (Defence's are on page 66). Because most of Defence's long-term commitments are set out in white papers, it generally has few major budget measures in the PBS other than foreign exchange adjustments and operations funding.

The main budget measures this year are the additional \$607.3 million for operations mentioned above, an additional \$171.2 million as a foreign exchange adjustment (\$168.3 million for the department and \$2.9 million for ASD), and the \$620 million moved forward into 2018–19 that we have discussed above.

Other than that, there is only –\$2.1 million in variations.

2.2 The big three

At this point, we'll focus just on the Department of Defence's budget.

It's useful to look at the defence budget as made up of three main components—personnel, capital and operating—even though the PBS is not exactly structured that way.

Personnel

Defence's personnel costs for 2018–19 are coming in at \$11,880 million, which is only 0.9% over the PBS 2018–19 target (Table 2.4).²⁹ That's pretty good budgeting.

Table 2.4: Defence personnel costs since the 2016 White Paper—annual increases (\$m)

	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23
Personnel costs	11,393	11,979	11,881	12,285	12,513	12,943	13,607
Nominal increase %	–2.3%	5.1%	–0.8%	3.4%	1.9%	3.4%	5.1%
Real increase %	–3.9%	3.1%	–2.5%	1.5%	–0.5%	0.9%	2.6%
Personnel	75,949	75,882	74,675	76,362	76,780	77,194	77,565
Personnel increase %	–0.2%	–0.1%	–1.6%	2.3%	0.5%	0.5%	0.5%

Actual achievement	Budget year estimate	Forward estimates
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Sources: PBS for budget year and forward estimates, Defence annual report for actual achievement.

For 2019–20, the personnel budget is estimated at \$12,285 million.³⁰ Growth over the forward estimates is very modest, particularly in real terms. It's difficult to know whether this will be enough. Personnel numbers are planned to grow only modestly at around 400–500 per year, but ASPI's analysis in previous editions of *The cost of Defence* indicates that uniformed personnel costs grow in real terms (that is, faster than the CPI) independently of personnel numbers.

The Capital Investment Program

Section 1.4 of the PBS covers the Capital Investment Program. The PBS table does not provide a line giving the previous year's actual achievement (nor does the annual report), so it isn't possible to tell exactly how Defence went against last year's PBS prediction in its Capital Investment Program. The best we get is the PAES mid-year update on expected achievement. For 2018–19, the PAES estimate in February 2019 was \$10,590.2 million against a PBS prediction of \$11,025 million (that is, it was looking like it would underspend by \$434.8 million for the year).

This year, planned capital investment is \$11,768.4 million. PBS Table 4 breaks it down into its main elements. The biggest is the Major Capital Investment Program (military equipment) at \$8,687.9 million, followed by Capital Facilities (infrastructure such as buildings, runways, wharves and so on) at \$2,093 million. We discuss how these will be spent in more detail in Chapter 3. The ICT program is also considerable at \$864.1 million.

Historically in the Australian context, when the defence budget is under pressure, it's the capital budget that usually shrinks most. Therefore, the capital budget is more prone to fluctuations than the other two big components. However, the intent of the White Paper was that the increase in defence funding should flow disproportionately into Defence's capital budget. Not surprisingly then, PBS 2016–17, the first one after the White Paper, planned substantial increases to the capital budget across the forward estimates.

Now we're entering the final year of PBS 2016–17's forward estimates, we can see what was actually achieved, and the picture is mixed. Certainly, capital spending has increased each year, except for a small decrease from 2015–16 to 2016–17 (see the 'Achieved increase' line in Table 2.5).

Yet every year since 2016–17 has also seen a revision downwards in both predicted achievement and actual achievement. For example, if you read the 2019–20 column in Table 2.5 downward, the prediction for that year has gone down every year since PBS 2016–17, from \$13,512.1 million, to \$13,071.7 million in PBS 2017–18, to \$12,331.4 million in PBS 2018–19, to \$11,768.4 million in this year's PBS. And actual achievement has been even less than the revised predictions. Over the years 2016–17 to 2019–20, these shortfalls total \$5.17 billion, or 11% of the original 2016–17 prediction.

How to read our tables

Defence's reporting shows how it performed against a particular target (budget, personnel, flying hours, and so on) in a particular year. But it can be just as important to know how the target itself has changed over time. *The cost of Defence* uses a table format that shows both.

For example, take Table 2.5. If you read across a row, it shows you the view *from* that year, essentially that year's PBS forecast for the PBS year (orange) and forward estimates (mauve), as well as the historical achievement for previous years (blue). If you read down a column, it shows how the target for that year has changed over time. For example, if you read down the 2018–19 column you can see how the prediction for the capital program budget was progressively reduced from 2016–17 to 2018–19 and actual expenditure for that year was even less again.

Table 2.5: Defence Capital Program since the 2016 White Paper—predicted spend versus actual achievement (\$m)

	2016–17	2017–18	2018–19	2019–20	2016–17 forward estimates total
2016–17	9,908.6	10,701.5	12,293.3	13,512.1	46,415.5
2017–18	9,151.5	10,416.0	11,742.6	13,071.7	44,381.8
2018–19	9,151.5	9,732.6	11,025.2	12,331.4	42,240.7
2019–20	9,151.5	9,732.6	10,590.2	11,768.4	41,242.7
Shortfall against 2016–17 target	-757.1	-968.9	-1,703.1	-1,743.7	-5,172.8
Shortfall %	-7.6%	-9.1%	-13.9%	-12.9%	-11.0%
Achieved increase (nominal)	-1.4%	6.3%	8.8%	11.1%	26.8%
Foreign exchange adjustments	-435.0	-593.2	-214.0	-278.4	-1,574.6

Actual achievement	Budget year estimate	Forward estimates
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Sources: PBS for budget year and forward estimates, PAES for actual achievement. To allow for an apples-to-apples comparison, this table does not include an 'Other' investment line, as that line was removed from PBS Table 4 in 2018–19.

Some of this shortfall is due to exchange rate adjustments (when the Australian dollar was strong, Defence did not need to spend as many of them to acquire the same amount of capability). We have included in Table 2.5 a line showing Defence's total exchange rate adjustment since PBS 2016–17. Even if we assume it was all applied to the capital program (which it wasn't, as some would have been applied to sustainment), it still doesn't account for the entire shortfall. We're still around \$3.6 billion short, the bulk of which is in 2018–19 and 2019–20.

The bottom line is that it can be hard to ramp up capital spending quickly. Based on the experience of previous years, it would be a brave person who bet that Defence would achieve this year's predicted capital spend, which is an 11.1% increase on last year's.

PBS 2019–20 predicts a very large increase in capital spending over the forward estimates (Table 2.6). If we compare that to what Defence has actually achieved since the White Paper, the increases in 2020–21 and 2021–22 of 21.8% and 18.4%, respectively, seem very ambitious. To get that money out the door, Defence needs to get more projects approved, get them spending quickly and keep existing major projects (particularly in shipbuilding) ramping up spending, while making sure the capital budget isn't raided to fund other priorities, whether inside or outside the department.

Table 2.6: Defence Capital Investment Program since the 2016 White Paper—annual increases (\$m)

	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23
Total capital program	9,151.5	9,732.6	10,590.1	11,768.4	14,337.3	16,970.1	19,035.4
Nominal increase	926.7	581.1	857.5	1178.3	2568.9	2632.8	2065.3
Nominal increase %	11.3%	6.3%	8.8%	11.1%	21.8%	18.4%	12.2%
Real increase %	9.4%	4.3%	7.0%	9.1%	19.0%	15.5%	9.4%

Actual achievement	Budget year estimate	Forward estimates
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Sources: PBS for budget year and forward estimates, PAES for actual achievement. To allow for an apples-to-apples comparison, this table does not include an 'Other' investment line, as that line was removed from PBS Table 4 in 2018–19.

Operating costs and the Capability Sustainment Program

There's no clearly identifiable line in the PBS for operating costs *per se*. ASPI essentially counts as operating costs everything that isn't capital or personnel costs. This might not keep accountants happy, but it's a useful way of looking at things for the rest of us. The operating budget fluctuates considerably from year to year but is broadly on an upwards trajectory.

One very large element of the operating budget is sustainment, which is presented in PBS Table 5. Sustainment covers the cost of operating, maintaining and repairing Defence's capabilities. It doesn't include the cost of Defence personnel doing those activities. While the Capital Investment Program is not broken down by service or group, the Capability Sustainment Program is.³¹

One reason the Capital Investment Program hasn't grown at the rate planned in the White Paper is potentially related to the sustainment budget. While the investment program has underachieved against the White Paper's forecasts, virtually all elements of the sustainment program have increased, totalling some \$4.1 billion more than forecast in the White Paper (Table 2.7). For example, the PBS 2016–17 prediction for this year was \$10,867 million; it's now \$12,091 million. This suggests that in the White Paper Defence may have underestimated the rate at which sustainment costs are rising and now needs to reduce its spending in other areas to meet them. If that continues, some difficult trade-offs will be needed.

Table 2.7: Capability Sustainment Program since the 2016 White Paper—predicted spend versus actual achievement (\$m)

	2016–17	2017–18	2018–19	2019–20	2016–17 forward estimates total
2016–17	8,665.5	9,176.2	10,044.5	10,867.0	38,753.2
2017–18	8,276.3	9,474.2	9,931.9	10,743.4	38,425.8
2018–19	8,276.3	11,060.4	10,975.0	11,697.4	42,009.1
2019–20	8,276.3	11,060.4	11,430.4	12,091.3	42,858.4
Overspend against 2016–17 target	–389.2	1,884.2	1,385.9	1,224.3	4,105.2
Overspend %	–4.5%	20.5%	13.8%	11.3%	10.6%

Actual achievement	Budget year estimate	Forward estimates
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Sources: PBS for budget year and forward estimates, PAES for actual achievement.

2.3 What's the balance between personnel, capital and operating costs?

There is no 'carved in stone' rule on the optimal balance between personnel, capital and operating costs.³² An equal split is sometimes postulated as a rule of thumb but, like the 2% of GDP concept, it's horses for courses. NATO is aiming for its members to achieve 20% of defence spending on equipment, but in 2018 only 15 of the 28 members were at that level, and only five exceeded 30%.³³ The UK and the US are at 23.9% and 28.2%, respectively (including both equipment and infrastructure).

If a country isn't investing enough in capital equipment, it probably isn't replacing its ageing systems or investing in new technologies and therefore is operating a lot of obsolete equipment. But if it isn't spending enough on personnel, it may not have enough people to operate the equipment that it's acquiring. And if it isn't spending on operating expenses, its forces may not be well trained or at a level of readiness sufficient to deploy.

Capital has historically been the poor cousin here in Australia as well, but its position has been improving (Figure A.2 in 'Defence in 10 tables'). In fact, over the forward estimates it's going to grow to 39% of the defence budget, while operating costs will be 33% and personnel costs (traditionally the biggest of the three) only 28% of the total. According to Figure 5 on page 182 of the *2016 Defence White Paper*, that balance will continue out to the end of the decade in 2025–26.

While recapitalisation is necessary, it's far from certain that Defence can achieve that level of capital spending. It has remained stuck at around 30% over the past several years. But if something like 40% is sustained over time, it could be difficult to find the funding to operate all that new equipment. And, as we discuss in Chapter 4, the White Paper gives the ADF only modest personnel increases and even they are not being achieved—in essence, Defence is getting a lot of new equipment but not a lot of new people. The next strategic review of Defence will need to assess whether it has the balance right.

Where's the \$200 billion figure from?

We have noted that Defence's capital budget is increasing. Since the White Paper, the government has consistently referred to its \$200 billion investment in military capability over the decade following the White

Where's the \$200 billion figure from?

We have noted that Defence's capital budget is increasing. Since the White Paper, the government has consistently referred to its \$200 billion investment in military capability over the decade following the White Paper. There's no public document that presents an explanation or breakdown of that figure. The PBS does give a capital funding line, but only for the forward estimates, not for the whole decade. We have tried to determine whether that's a credible figure.

If we look at the decade immediately following the White Paper, we can get a capital spending picture for seven years of the decade if we add the three years since the White Paper (\$32 billion) to this year's PBS prediction for the forward estimates (\$62 billion), for a total of \$94 billion. We can get an estimate for the final three years by taking the White Paper's statement that by end of the decade capital will comprise 39% of the total budget. That adds another \$67 billion for a total of \$161 billion. So we're about \$39 billion short.

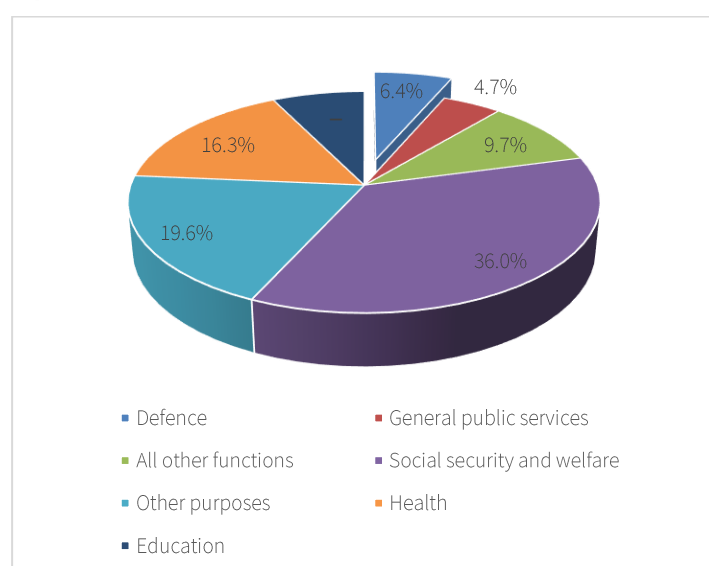
However, as we move through time and the budget grows, at some point we reach a 10-year period in which the capital budget alone does add up to \$200 billion. If we assume that the defence budget continues grow beyond 2025–26 at the same rate as the last few years of the White Paper decade (that is, 5.4% nominal annual growth), then that period starts this year. For the decade from 2019–20 to 2028–29, we can generate a capital budget of \$207 billion. That does, however, require the capital share of the budget to sit around 40% from 2023–23. So while the \$200 billion figure is credible on paper, whether it actually achievable is another matter.

2.5 Comparisons

How does it compare with the broader federal budget?

The Budget papers predict Australian Government payments to be \$493.3 billion, or 24.6% of GDP, this year. Defence constitutes 6.4% of Australian Government expenses, the same as last year (Figure 2.2).³⁴

Figure 2.2: Australian Government expenses, by function, 2019–20



Source: Budget paper no. 1, 2019–20, pages 5–9.

Defence has only two 'programs' in the Australian Government's top 20 programs: the Air Force at 18 and the Army at 19.³⁵

is unchanged since 2017. In fact, the relative ranking of the entire top 15 is unchanged and Australia continues to sit between Brazil and Italy.

Since most of us aren't overly concerned about Brazil and Italy's military power, it's more useful to compare Australia to other countries in our region. We have included figures in 'Defence in 10 tables' showing how regional defence spending has changed over time, based on data in the 2018 edition of the Defence Intelligence Organisation's annual *Defence Economic Trends in the Asia-Pacific*. The data is baselined against 2016 constant US dollars (see Figures A.10a and A.10b).

Last year we suggested Australia was a big fish in the small pond of our near region. If we consider our position over time, we are becoming an even bigger fish. None of the comparator states has significantly closed the gap and, if anything, Australia's lead in spending has increased over the past few years.

We also noted that Australia was a small fish in the much bigger pond of the Indo-Pacific. There, we have remained the smallest of the comparator states. The most striking feature over the past decade is of course the growth of China's defence spending both in absolute terms and relative to other states. In 2008, our defence spending was 28% of China's. Despite the strong growth in Australian defence spending in recent years, it's now slightly less than 20% of China's. The gap between China and Japan is increasing even more dramatically since Japan's defence budget has essentially flatlined in real terms.

Chapter 3: Where does the money go?

Key points

In 2019–20, Defence plans to spend:

- \$703.6 million to conduct operations
- \$12,285 million to employ its allocation of 60,090 uniformed and 16,272 public service personnel
- \$11,768 million in capital acquisitions, including \$8,687 million on equipment
- \$13,771 to operate, including \$12,091 million on the sustainment of its equipment and facilities.

This chapter looks at what the average Australian taxpayer gets for their \$1,529.07 per year.³⁶ Incidentally, that works out at \$4.18 per day, or around the cost of a flat white. You can argue that this is very good value for an insurance policy that has largely bought Australians security and peace of mind, but it is important to ensure that those funds are spent well, and the first step to assess that is to understand what they're spent on.

The discussion here is based on the Department of Defence's appropriation of \$37,665 million for 2019–20 and doesn't include ASD. Again, we assume readers have access to the PBS [online](#), so we will avoid duplicating its tables as much as possible.

3.1 How is the money divided up among groups and services?

There are a number of ways to look at how the money is divided up. The first is among Defence's groups and services.

Section 2 of the PBS (page 27) presents the outcomes that the government expects from Defence in return for the money. There are two outcomes. Outcome 1 is the conduct of operations, while Outcome 2 is ensuring that Defence has the ability to conduct them. Outcome 1 comprises three programs, which are essentially things to do. Outcome 2 comprises 17 programs, which are organisations within Defence. We don't consider programs 14–17, as they are administered programs that deal with things like military superannuation and housing assistance and therefore are not directly related to military capability. They also aren't part of the \$37,665 million. The three defence services are 'programs', in public service jargon.

Each program has a very high-level statement of objectives, a statement of how the objectives will be achieved, performance criteria and targets. 'High-level' is hardly an exaggeration. For example, since the role of the service chiefs ('capability managers', in Defence-speak) now is only to raise, train and sustain forces that they provide to the Chief of Joint Operations to use on operations, each of the services has only one performance criterion ('Defence's integrated capabilities including workforce are generated, trained and sustained to meet preparedness requirements') and one target ('Forces meet preparedness requirements and are available for the conduct of operations and national support tasks').

The outcomes for other programs are at a similarly high level. Whether this is sufficient to describe to the people of Australia what their defence force will be doing this year is a separate question. The Defence annual report assesses whether these targets were achieved, which we discuss in Chapter 4.

Funding by outcome is shown in Table 3.1.³⁷

Table 3.1: Funding for departmental outputs

Outcome/program	2018–19 estimated actual (\$m)	PBS 2019–20 (\$m)	% change since 2018–19	% of total 2019–20
Outcome 1				
Program 1.1: Operations Contributing to the Safety of the Immediate Neighbourhood	41,123	2,285	–94%	0.01%
Program 1.2: Operations Supporting Wider Interests	667,312	644,557	–3%	1.90%
Program 1.3: Defence Contribution to National Support Tasks in Australia	32,407	59,297	83%	0.18%
Outcome 1: Total department outputs	740,842	706,139	–5%	2.08%
Outcome 2				
Program 2.1: Strategic Policy and Intelligence	697,705	757,540	9%	2.24%
Program 2.2: Defence Executive Support	252,772	261,976	4%	0.77%
Program 2.3: Defence Finance	169,304	178,108	5%	0.53%
Program 2.4: Joint Capabilities Group	1,851,943	1,882,479	2%	5.56%
Program 2.5: Navy Capabilities	6,296,957	6,574,517	4%	19.41%
Program 2.6: Army Capabilities	7,545,104	7,623,190	1%	22.50%
Program 2.7: Air Force Capabilities	7,057,159	7,498,572	6%	22.13%
Program 2.8: Australian Defence Force Headquarters	93,782	157,396	68%	0.46%
Program 2.9: Capability Acquisition and Sustainment	630,716	673,003	7%	1.99%
Program 2.10: Estate and Infrastructure	4,721,221	4,894,228	4%	14.45%
Program 2.11: Chief Information Officer	1,647,186	1,671,007	1%	4.93%
Program 2.12: Defence People	498,438	531,873	7%	1.57%
Program 2.13: Defence Science and Technology	468,754	468,282	0%	1.38%
Outcome 2: Total department outputs	31,931,041	33,172,171	4%	97.92%
Total department outputs	32,671,883	33,878,310	4%	100.00%

Source: PBS.

Why is this less than the appropriation?

Readers might notice that the aggregated costs of all the programs at \$33,878 million does not equal the total departmental appropriation, but only appropriation 1 (PBS Table 1, serial 1). This is because the costs of each program are an accrual income statement view; that is, they include revenue and expenses only. They do not include capital expenditure. As an accrual-based view they do include a line covering depreciation. But this is insufficient to cover the cost of new acquisitions (new stuff always costs more than the old). The shortfall between depreciation and new acquisitions is covered by a second appropriation called the ‘equity injection’ (PBS Table 1, serial 2). In 2019–20 that is an additional \$3,947 million. The two appropriations combined are the total appropriation.

Outcome 1

Outcome 1 is 'Defend Australia and its national interests through the conduct of operations and provision of support for the Australian community and civilian authorities in accordance with Government direction.' The three programs that make up Outcome 1 are:

- Program 1.1: Operations Contributing to the Safety of the Immediate Neighbourhood.
- Program 1.2: Operations Supporting Wider Interests
- Program 1.3: Defence Contribution to National Support Tasks in Australia.

Government funding for Outcome 1 is \$706.1 million, plus \$27.5 million in the department's own-source revenue (PBS Table 11).³⁸ The resources for Outcome 1 don't exactly match the cost of operations in PBS Table 3 (\$703.6 million) because not all operations are listed in PBS Table 3, only the ones that Defence receives no-win, no-loss funding for. Defence has to pay for the smaller ones up to \$10 million out of its own pocket.

This is a good place to discuss funding for operations (Figure A.7 in 'Defence in 10 tables' shows spending on operations over the past two decades). Defence currently has 2,400 personnel deployed on operations (Table 3.2).³⁹

Table 3.2: Current Defence operations, May 2019

Operation	Location	Nature of contribution	Personnel	2018–19 Budget (\$m)	2019–20 Budget (\$m)
Accordion	Middle East region	Sustainment of other ADF operations in the Middle East.	500	235.8	215.8
Aslan	Sudan	Headquarters roles in the UN Mission in South Sudan.	25	Not listed	Not listed
Augury	Philippines	Partnership activity with the Armed Forces of the Philippines focused on sharing experiences and approaches to countering complex urban terrorist tactics.	100	40.1	Not listed
Manitou	Middle East region	Maritime security operations in the Middle East. In addition to headquarters roles, the Navy has a vessel on permanent rotation to the Middle East, currently totalling 66 rotations since 1990.	240	64.9	72.4
Mazurka	Egypt	Contribution to the Multinational Force and Observers overseeing peace agreements in the Sinai.	27	Not listed	Not listed
Okra	Middle East and Iraq	Contribution to the international effort to defeat Daesh/ISIS. Comprises Air Task Group, Special Operations Task Group, and a training element (Task Group Tajik).	600	306.5	269.3
Paladin	Israel/Lebanon	Contribution to the UN Truce Supervision Organization in Egypt, Israel, Jordan, Lebanon and Syria.	12	Not listed	Not listed
Resolute	Australian maritime interests	ADF contribution to Maritime Border Command conducting civil maritime security operations. Can include maritime patrol aircraft, patrol boats and larger vessels with embarked security	600	53.2	59.3

		elements, and Regional Force Surveillance Units on land.			
Highroad	Afghanistan	Support to the NATO-led train, advise and assist mission called Resolute Support, including Afghan National Army Officer Training Academy, as well as embedded roles in Allied headquarters.	300	91.9	86.8

Sources: PBS and Defence website, [online](#).

The personnel numbers in the table haven't changed since ASPI last published this data in May 2018.

Defence receives supplementation on a no-win, no-loss basis for operations. This means extra money to cover operating costs and the rapid acquisition of any equipment specific to an operation. If Defence was going to buy equipment anyway (that is, the gear is already included in the Integrated Investment Program), then Defence generally doesn't receive supplementation for it.

Outcome 2

Outcome 2 is 'We project and advance Australia's strategic interests through the provision of strategic policy, the development, delivery and sustainment of military, intelligence and enabling capabilities, and the promotion of regional and global security and stability as directed by Government.'

Outcome 2 contains the 13 programs that make up Defence's groups and services (not including the four administered programs). Government funding for the 13 programs is \$33,172 million, plus \$788.9 million in the department's own-source revenue (for example, funds raised from what Defence charges its members for providing them with food and accommodation when they are not deployed). PBS Table 14 gives a high-level summary of the budget for each program. Pages 47–78 outline each program, giving a high-level cost breakdown (employees, suppliers and so on).⁴⁰

Since these cost summaries are so high level, they don't tell us much beyond what's probably intuitively obvious—large programs like the three services have large budgets. Similarly intuitive is the fact that the Navy (Program 2.5) and the Air Force (Program 2.7), which are very platform focused, spend slightly more on suppliers (that is, supporting those platforms) than on personnel, whereas the Army (Program 2.6), which is people-intensive, spends a lot more on personnel than on suppliers.

Other big spenders are Estate and Infrastructure Group (E&IG; Program 2.10), which provides bases and garrison services to the rest of Defence under Defence's shared services model, and Chief Information Officer Group (Program 2.11), which provides ICT services to Defence. One would expect Capability Acquisition and Sustainment Group (CASG; Program 2.9) to also have a large budget, since it acquires and sustains equipment on behalf of the services, but its program budget covers only its own people and operating costs, not the equipment it acquires and sustains for the rest of Defence. Those costs are reported against the relevant capability managers (see PBS Table 5 for a break down).

Each of the three service programs also provides estimated deliverables for its platforms for the previous and the budget year. The annual report details actual achievement. Those deliverables are presented in flying hours for aircraft fleets and unit availability days for ships (there are no deliverables provided for vehicle fleets). While flying hours are broken down by aircraft type, naval assets are aggregated, so it isn't possible to distinguish between different classes of frigates and destroyers, or indeed between ships and submarines.

3.2 Personnel

Another way to describe how the money is divided up is among the personnel–capital–operating triumvirate. Let's start with personnel.

The personnel budget for 2018–19 is \$12,285 million (from PBS Table 40). This allows Defence to employ the full-time workforce allocation shown in Table 3.3.

Table 3.3: Defence full-time workforce allocation, 2018–19

Navy	Army	Air Force	ADF total	Australian Public Service	Defence total
14,776	30,821	14,493	60,090	16,272	76,362

Source: PBS, Table 7.

Australian Defence Force personnel

Compared to last year's PBS prediction for this year, the Navy's allocation has increased by 50, exactly offset by a reduction of 50 to the Army. The Air Force's allocation is unchanged from last year's prediction. The ADF allocation increases by around 400–500 per year over the forward estimates to reach 61,402 by the end of the forward estimates. The *2016 Defence White Paper* intended it to grow to around 62,400 by the end of the decade following the White Paper. We look at how Defence is going at achieving its allocation in the next chapter.

Defence also has an allocation for military reservists (PBS Table 8). For 2019–20, this totals 1,000,400 days of service spread among 20,450 reservists. If we assume that 220 days is roughly equivalent to a year's full-time service, that equates to 4,547 full-time members. This is an increase of 16,080 days (around 73 full-time equivalents) from 2018–19 as well as an increase of 11,800 days from last year's prediction for 2019–20 (around 54 full-time equivalents).

Australian Public Service personnel

Last year, the Department of Defence's civilian allocation was reduced by around 2,000, largely due to machinery-of-government changes, in particular ASD becoming a statutory agency. This year, there are only small changes from last year's forward estimates allocation (up by 18 from 16,254 to 16,272) but, since the actual number is 16,010, the Australian Public Service (APS) has to grow by 262 to hit the target. The Coalition's revitalised efficiency dividend could affect future allocations.

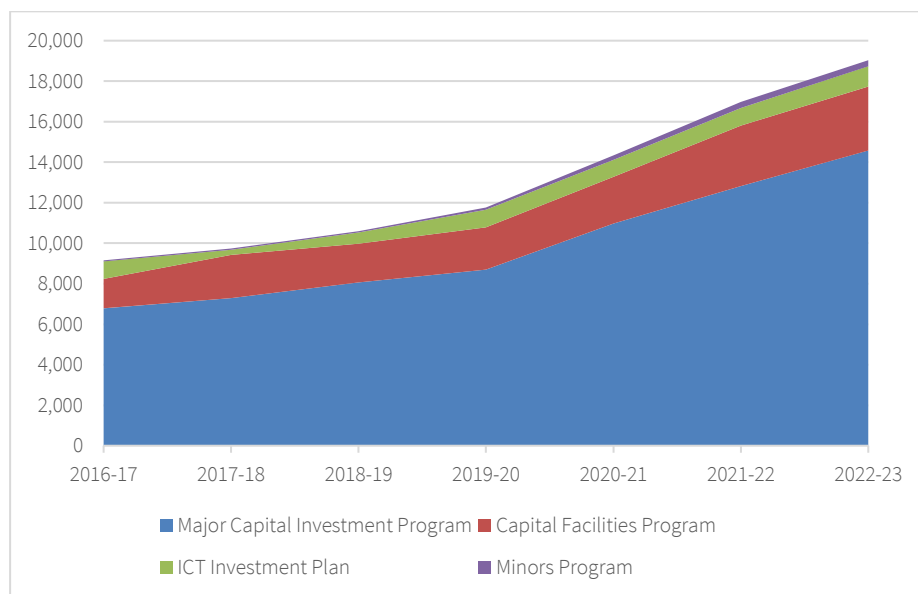
Appendix 1 provides Defence personnel numbers from 1999–2000 to 2022–23.

3.3 Capital

Defence's planned capital investment budget for 2019–20 is \$11,768 million.

The capital budget is further divided into smaller (but still huge) programs (see PBS Table 4). As discussed in Chapter 2, the Capital Investment Program grows strongly (and perhaps unachievably) by \$8,445 million or 80% over the forward estimates (Figure 3.1).

Figure 3.1: Increase in Integrated Investment Program funding, 2016–17 to 2022–23 (nominal \$m)



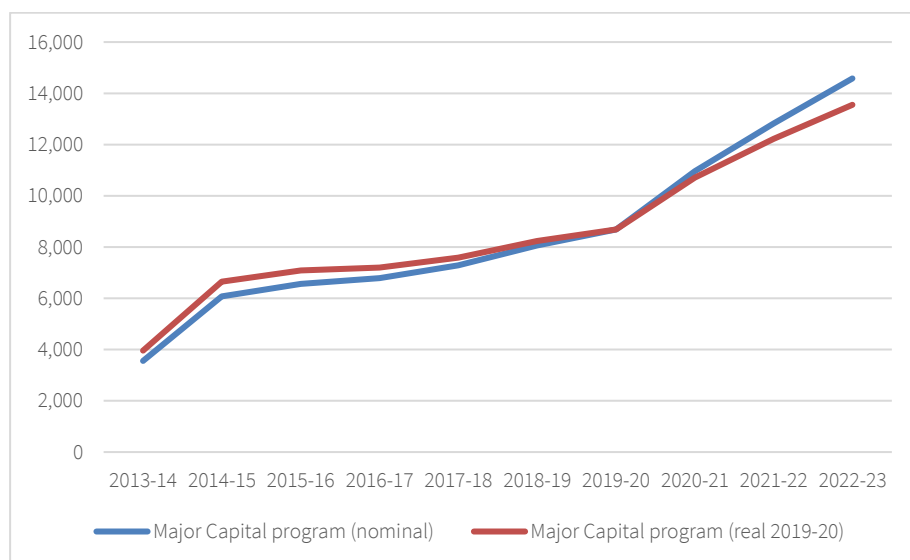
Sources: PAES, PBS.

Table A1.3 in Appendix 1 details Defence capital expenditure from 1990–2000 to 2022–23, broken down into major categories.

Capital equipment

The largest of the capital investment subprograms is Major Capital Investment, which covers military equipment. Figure 3.2 shows the strong forecast growth in the program over the decade out to the end of the forward estimates.

Figure 3.2: Major capital investment program, 2013–14 to 2022–23 (\$m)



Sources: PAES, PBS.

PBS Table 55 lists the top 30 capital equipment acquisition projects by 2019–20 forecast expenditure. The table also gives a useful summary of the projects' key goals for the year. Projects below the top 30 aren't covered. This

year, the cut-off is around \$55 million. The table includes only capital equipment projects, not ICT or facilities projects, so there are literally hundreds of projects that the PBS contains no information on.

The table also has a summary table of the capital equipment program's cash flow. The 'Gross plan' line states what Defence would need if all projects were delivered as planned on schedule (\$8,664 million). However, because there will always be projects that don't deliver on schedule, that won't happen. The 'Management margin (slippage)' line is what Defence thinks the shortfall will be, and Defence deducts that amount from the gross plan to come up with the amount of cash it thinks it will actually spend on capital equipment—\$7,179 million.⁴¹

Figure A.5 in 'Defence in 10 tables' shows the size of the 10 largest projects by planned 2019–20 spend, illustrating their impact on the overall program.

Last year, the JSF project was on track to spend around \$2,200 million (\$1,933 million on equipment and \$266 million on facilities) and was the first Defence project to exceed \$2 billion expenditure in a year. This year, it will reach almost \$2.5 billion (\$2,389 million on equipment and \$105 million on facilities). At \$2,389 million, it will be spending 27% of Defence's capital equipment budget.⁴² That still won't get it halfway to its total budget of around \$16.5 billion, so it's likely to stay around that level of expenditure for the next several years in order to achieve initial operating capability for the first combat squadron by the end of 2020 and final operating capability by late 2023.

Two more air projects are in the top 10: P-8A maritime patrol aircraft at \$360 million and the pilot training system at \$302 million. The P-8A project is receiving the final four of a total of 12 aircraft this year, and its spending is already ramping down. Similarly, the pilot training system will receive the last 15 of its PC-21 aircraft, so its spending will also ramp down after this year.

Army has placed a high priority on digitisation, and that's backed up by spending:

- LAND 200 Phase 2A (Battlefield Command Systems Tranche 2); \$263 million. This is essentially digital radios and battle management systems, including for vehicle types not included in the previous tranche.
- JP 2072 Phase 2B (Battlespace Communications System Land); \$207 million. This provides the deployable communications 'backbone'.

Defence is continuing to invest in Army vehicles this year:

- LAND 121 Phase 4 (Hawkei protected mobility vehicle—light), at \$292 million, is down substantially from last year's goal of \$396 million, but up from what it looks like it actually achieved last year—\$109 million (we consider this in more detail in Chapter 4).
- LAND 121 Phase 3B (Medium and heavy trucks and trailers), at \$238 million, is ramping down substantially from last year's \$639 million.
- LAND 400 Phase 2 (Boxer combat reconnaissance vehicles) appears for the first time in the top 30 with an even \$200 million.

A spending milestone reached this year is that the naval shipbuilding program has hit \$2 billion. We discuss progress in the Naval Shipbuilding Plan in Chapter 5, but here is a summary of this year's projected cash flow:

- Future submarine—\$758 million.⁴³ This makes the submarine program the second biggest spender even though it's still several years from the completion of design and the start of construction. The costs of

building the submarine shipyard aren't included in this figure as they are outside the scope of the project and are being conducted by a separate entity (discussed in more detail in Chapter 5). We don't know how much that is either in total or this year's cash flow.

- Future frigate—\$492 million. This makes this project the third biggest spender, even though it isn't due to start 'prototyping' until late 2020. Again, the costs of surface shipyard construction (consistently given by the government as \$535 million in total, but we don't know this year's cash flow) aren't included in this figure for the same reason.
- Air warfare destroyer—\$356 million.
- Offshore patrol vessel—\$349 million.
- Pacific Patrol Boat replacement—\$71 million.

There are also several upgrade projects to frigates and submarines being conducted in Australia.

We have also provided a figure showing the top 10 projects by *total* approved budget as opposed to 2019–20 cash flow (see Figure A.4 in 'Defence in 10 tables'). The JSF project is the largest.

Planned project approvals

Defence no longer provides a PBS table listing capital equipment projects scheduled for government consideration in the coming year.

A note on project budgets

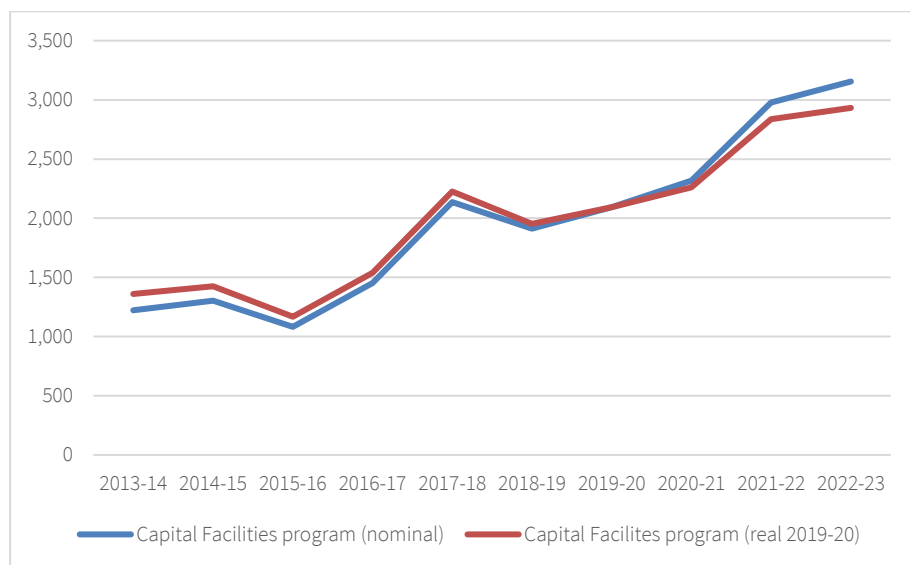
The budgets provided in PBS Table 55 for approved project budgets and annual cash flow refer only to CASG's share of the total project budget (that is, acquisition of capital equipment), but there are other elements that make up the total project budget, such as the facilities component delivered by E&IG. For example, the \$16,524 million budget for the JSF in Table 55 doesn't include the \$1,486 million for JSF facilities in Table 57. There are other components that aren't listed in the PBS at all, such as \$397 million for Defence Science and Technology to support the future submarine project (in addition to the \$5,959 million CASG component). In general, the amounts going to other groups and services in Defence are much smaller than those going to CASG and E&IG, but they can still be real money.

There's no source that provides the total approved budget for Defence projects. The *Major projects report* produced by the Australian National Audit Office (ANAO) refers only to the CASG component. So generally we don't know what the total approved budget is. Therefore, for consistency when ASPI refers to project budgets, the reference is just to the CASG component unless noted otherwise, but the reader should be aware that is not the entire approved budget.

Facilities

PBS Appendix D covers the facilities and infrastructure program. The planned spend for 2019–20 is \$2,093.0 million (Figure 3.3).⁴⁴ That's a dramatic turnaround from only a few years ago, when it was under \$1.1 billion. Even converted to real dollars, it's very strong growth. And it continues through the forward estimates, passing \$3 billion by 2022–23. If that doesn't make up for long periods of neglect, nothing will.

Figure 3.3: Capital Facilities Program, 2013–14 to 2022–23 (\$m)



Sources: PAES to 2018–19, PBS from 2019–20.

With Defence in something of a golden age of infrastructure investment, it's not surprising that the *Australian Defence Magazine's* list of the top 40 defence industry companies by turnover is headed by a construction company Lendlease Building, with a 2018 turnover of \$1,205 million. A further seven companies that conduct facilities design and construction are in the top 40.⁴⁵

PBS Appendix D also outlines at a high level what work each project is conducting and the project's total budget, spend to date and planned spend for 2019–20.

PBS Table 57 details expenditure on approved major capital facilities projects. The biggest spending projects this year are:

- P-8A facilities at \$181.2 million (primarily at RAAF bases Edinburg, Darwin and Pearce)
- the redevelopment of the Navy's largest training establishment, HMAS Cerberus on the Mornington Peninsula in Victoria, at \$141 million
- health facilities upgrades at a large number of bases around Australia, at \$131.8 million
- airfield major maintenance, primarily at RAAF Pearce in Western Australian and Oakey in Queensland, at \$128.6 million
- infrastructure to support the new replenishment ships, at \$120.7 million (the bulk being spent at HMAS Stirling in Western Australia).

If we aggregate works being conducted under different projects, it's clear that there's a lot of investment going into particular locations such as the Navy's two main fleet bases:

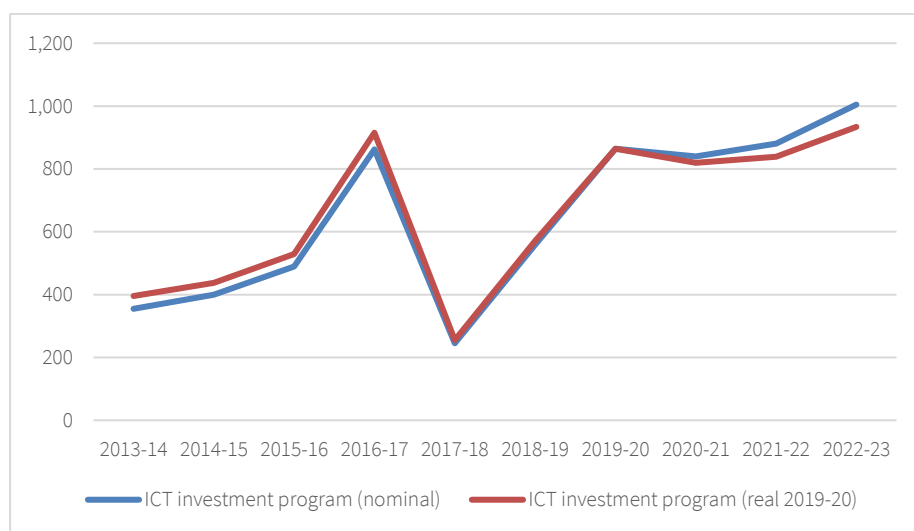
- \$221 million at HMAS Stirling
- \$170.4 million at Garden Island in Sydney.

Facilities projects scheduled for government and Parliamentary Works Committee consideration in 2019–20 are listed in PBS Appendix E.

ICT projects

The projected spend for ICT acquisition projects is \$864.1 million in 2019–20. This basically gets it back to where it was before the crash in 2017–18 down to \$245 million. We don't know what caused the crash, or indeed whether it even happened, since Defence doesn't include actual achieved numbers in the PBS, PAES or annual report. The program is essentially steady for the next couple of years, followed by a 14% jump to 2022–23 (Figure 3.4).

Figure 3.4: ICT investment program, 2013–14 to 2022–23 (\$m)



Sources: PAES to 2018–19, PBS from 2019–20.

There's no way to say what this money is being spent on. As in previous years, there's no discussion of the program or its component projects in the PBS. Nor is there any coverage in the Defence annual report, or in the ANAO's *Major projects report*. There's no useful or meaningful information about it on Defence's website. A project could go catastrophically bad or require a budget increase of hundreds of millions of dollars and there would be no public reporting on it. It isn't clear how parliament is informed of the performance of the ICT program. This is despite the fact that all of Defence's capabilities and platforms are absolutely reliant on ICT.

One of the major recommendations of the First Principles Review of Defence was that Defence should manage a single, integrated investment program. Defence states that it has met this recommendation. Yet it still treats its major capital programs separately and inconsistently in its governance and accountability mechanisms. The ANAO also does not seem to have taken this recommendation on board.

3.4 Operating and sustainment costs

Operating costs cover a vast range of goods and services.

Defence is not only the largest landholder in Australia, but also one of the largest renters of commercial space. On one day alone, 11 July 2018, Defence signed leases worth \$1.6 billion.⁴⁶ Of that, \$586 million was for office space at Canberra Airport.

Defence has also engaged in public-private partnerships (PPPs) to build and operate facilities. According to Austender, Defence signed a PPP with Praeco Pty Ltd for the headquarters of Joint Operations Command near Bungendore, outside Canberra. The agreement runs from 2018 to 2036 and is valued at \$1,211,023,944. That translates into around \$67 million a year, or \$184,326 per day. That seems like quite a lot for a building.

Top 30 sustainment products

The biggest element of the operating budget is the Capability Sustainment Program. This year, Defence plans to spend \$12,091 million on sustainment.

The top 30 sustainment 'products' are presented in PBS Table 65. The sustainment program isn't dominated by a small number of projects to quite the same extent as the top 30 acquisition projects, but nonetheless there are a few standouts. We show the top 10 in Figure A.6 in 'Defence in 10 tables'.

As always, the largest product is the Collins submarines at \$566 million, down from \$592 million (this doesn't include capability upgrades, which are funded by the capital program). The Anzac frigates remain at third, despite their budget decreasing from \$367 million to \$339 million. Again, that doesn't include capability upgrades. The DDG (aka the air warfare destroyer) appeared in the top 30 for the first time last year, at \$161 million. Although the third and final ship arrives this year, that only increases to \$188 million. Despite early fears about the operating cost of the landing helicopter docks (LHDs), the Navy's largest ever ships at around 27,000 tonnes, their operating cost appears to have stabilised around \$125–135 million (\$132 million this year).

Last year, the Super Hornets/Growlers jumped from \$266 million to \$436 million to take second place. This year, their sustainment costs increase even further to \$511 million, which seems like a staggeringly large amount of money for 35 aircraft (around \$14.6 million each). The cost per flying hour is around \$79,000, more than three and a half times the cost of the classic Hornet, and even more than the fifth-generation F-35A. The Air Force also has the fifth most expensive product in the Wedgetail airborne early warning and control aircraft (\$243 million). The JSF appears for the first time at sixth (\$191 million). That will increase as flying hours ramp up dramatically (see further analysis in Chapter 4).

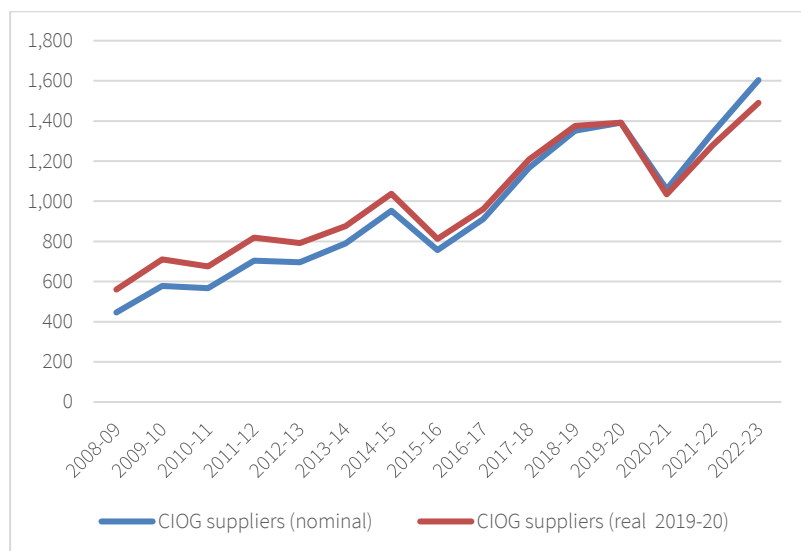
The Army's MRH-90 and Tiger helicopters come in at fourth (\$251 million) and ninth (\$162 million), respectively. At least the Army is now getting a solid rate of effort out of both.

The ICT backbone

Chief Information Officer Group (CIOG) delivers ICT services to Defence. In essence, it provides the ICT backbone that holds Defence's capabilities together. It's not just desktop computers and telephones, but also the satellite and fibre optic bandwidth that allows all of the new platforms that Defence is acquiring to share all of the data they are collecting. It's the network that enables the networked force to function. But as the force has become increasingly networked, the cost of providing that network has increased.

If we look at CIOG's suppliers budget, we can get a sense of how the cost of providing the ICT backbone has gone up (Figure 3.5). Since 2008-09, about as far back as the public data allows us to go, the cost of CIOG's suppliers has gone up from \$446 million to \$1,392 million in 2019-20. In real terms, that's growth of 148%. In the same time, the Defence budget has only gone up 36% in real terms.

Figure 3.5. The increasing cost of Defence's ICT backbone (\$m)



Source: Defence annual reports

Defence Cooperation Program

PBS Appendix A (page 16) covers the Defence Cooperation Program, which is Defence's own regional aid program aimed at developing the capacity of and Defence's relationships with South Pacific and Southeast Asian security forces. It's not necessarily a lot of money by Defence's standards (less than 0.5% of the total budget), but it makes a big difference to regional forces, particularly in the South Pacific.

Last year, the program budget increased significantly, from \$117.5 million to \$153.6 million (although this was short of the target of \$163.5 million). This was driven by the Pacific Maritime Security Program, the centrepiece of which is the replacement patrol boat program. The 21 Guardian patrol boats for South Pacific nations and Timor-Leste are being constructed by Austal in Henderson in Western Australia. The first was handed over to Papua New Guinea on 30 November 2018.

This year, the budget remains at a similar level (\$159.2 million) as construction continues. That means there doesn't appear to be a substantial increase yet to fund the measures announced by the government late last year under the 'Pacific step-up'.

One of those measures is 'a dedicated vessel to deliver our support to our partners in the Pacific, including for humanitarian assistance and response'.⁴⁷ At Senate estimates, Defence officials stated that they didn't know exactly what the ship would look like but suggested that HMAS *Choules* or the Australian Defence Vessel *Ocean Protector* could be exemplars. Australia acquired *Choules* from the UK at a fire-sale auction for the bargain price of \$100 million in 2011.⁴⁸ *Ocean Protector* was reacquired in 2015 for around \$65 million,⁴⁹ although a similar ship, ADV *Ocean Shield*, cost \$130 million new in 2012.⁵⁰

Officials also stated that Defence wasn't receiving any additional funding from government for those measures but had to find the money in its existing budget.⁵¹ In short, Defence has to find around \$100 million just for that element of the Pacific step-up. The foreshadowed work at Lombrum naval base on PNG's Manus Island is a further unknown cost that Defence will most likely have to find the funds for in its existing budget.

3.6 Where's the money spent?

By state and territory

It's reasonable to want to know where the money is spent. State and territory governments are particularly interested. While there is no holistic public data on where spending occurs by state or region, the PBS breaks spending by each capital facilities project down by electorate and state/territory. Table 3.4 sums the spend by state/territory. This doesn't include work on redeveloping the shipyards in Adelaide.

Table 3.4. Defence capital facilities spend by state/territory, 2019–20

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Total
Facilities capital spend (\$m)	368.9	326.5	230.6	127.3	300.5	0	331.7	115.3	1,800.8
% of total	20.5%	18.1%	12.8%	7.1%	16.7%	0.0%	18.4%	6.4%	100.0%

Source: PBS 2019–20, Table 57.

The Defence annual report provides a table of personnel by workforce location. We've divided the total Defence personnel spend (\$12,285 million) by each state or territory's share of total personnel (Table 3.5). These numbers should be used with caution, since they relate one year's personnel with another year's spending, but they provide a broad sense of where the personnel dollars are going.⁵²

Table 3.5: Defence personnel and spending, by state and territory

	NSW	Vic.	Qld	SA	WA	Tas.	NT	ACT	Overseas	Total
Total Defence personnel	19,928	9,672	19,033	6,533	4,344	256	4,763	15,715	878	81,122
% of total	24.6%	11.9%	23.5%	8.1%	5.4%	0.3%	5.9%	19.4%	1.1%	100.0%
Personnel spending (\$m)	3,018	1,465	2,882	989	658	39	721	2,380	133	12,285

Sources: Defence annual report 2017–18 and PBS 2019–20.

Local versus overseas spending

The picture of local versus overseas spending is clearer. We can assume that the vast bulk of Defence salaries and benefits are spent in Australia (Table 3.6). Similarly, the bulk of facilities construction money is probably spent here. Where we need to look to find large sums being spent overseas is in the Major Capital Investment Program run by CASG. Fortunately, Defence kindly provides ASPI with data on the breakdown between local and overseas spending and has updated it for this year.

Table 3.6: Capability Acquisition and Sustainment Group, local and overseas spending (\$m)

	Acquisition			Sustainment		
	Local	Overseas	Total	Local	Overseas	Total
2012–13	1,515	1,946	3,461	3,346	1,224	4,570
	44%	56%		73%	27%	
2013–14	1,604	2,669	4,273	3,218	1,407	4,625
	38%	62%		70%	30%	

2014–15	1,648	4,926	6,574	3,536	1,482	5,018
	25%	75%		70%	30%	
2015–16	1,989	4,436	6,426	3,852	2,097	5,949
	31%	69%		65%	35%	
2016–17	2,120	4,152	6,272	3,891	1,706	5,597
	34%	66%		70%	30%	
2017–18	2,453	4,855	7,308	3,863	2,118	5,982
	34%	66%		65%	35%	
2018–19 (planned)	2,819	5,441	8,260	4,794	2,028	6,822
	34%	66%		70%	30%	
2019–20 (planned)	2,571	4,613	7,183	4,546	2,254	6,801
	36%	64%		67%	33%	
Total	16,719	33,039	49,758	31,046	14,316	45,363
	34%	66%		68%	32%	

Source: Defence-supplied data.

We can make several observations about this data. First, over the past eight years, acquisition and sustainment spending have been broadly similar (\$49.8 billion versus \$45.4 billion). Interestingly, the proportions of funds spent locally and overseas for those two categories are almost exactly the mirror image of each other. That is, while acquisition spending is split 34% local / 66% overseas, sustainment spending is split 68% local / 32% overseas. What this means is that total local and total overseas spending for the period is almost identical (\$47.8 billion local versus \$47.4 billion overseas). So, while acquisition programs tend to get the headlines, and industry policy focuses on boosting the local acquisition spend, sustainment programs are already keeping much of the defence dollar here.

And while local industry is very happy with the current Defence Industry Policy, so far the policy doesn't seem to be altering in a substantial way the breakdown between local and overseas acquisition spending. The long-term average is 34% local (noting there have been fluctuations between 25% and 44%). In 2016–17, the year of the White Paper and the Defence Industry Policy Statement, it was 34%. It stayed at 34% for the subsequent two years, and only this year will it move to 36%, according to Defence's prediction.

This doesn't mean that the Defence Industry Policy is failing. We suggested last year that it would take some time to change the local acquisition spend significantly. In large part, this is due to legacy projects with high foreign content. The JSF project is spending around \$2.5 billion this year (up from around \$2 billion last year), and virtually all of that is going overseas. A lot of the early spend for shipbuilding will also go overseas as Defence orders long-lead items, such as engines and combat system components, which are unlikely to be procured locally.

Chapter 4: How is Defence delivering?

Key points

- Implementation of the First Principles Review's recommendations is largely complete, which should mean Defence is well situated to conduct a new White Paper or strategic review.
- Defence assessed itself as largely meeting its key performance targets in 2017–18.
- Growth in Defence's uniformed people numbers is slow and falling short of White Paper targets.
- Due to a lack of reporting, there's no comprehensive list of planned or achieved project approvals, which makes it hard to assess whether Defence is delivering the Integrated Investment Plan.
- Projects continue to reach important milestones, but there's still a long way to go to get key capabilities such as the JSF into service.
- The shift to a program rather project approach to force design and delivery is not obvious in Defence's reporting.

In this chapter, we give an overview of how Defence has performed against PBS 2017–18 (and as much as possible against PBS 2018–19, since the annual report for this year is not out yet).

The first PBS to follow the *2016 Defence White Paper* was PBS 2016–17. In essence, that PBS started the implementation of the White Paper. Since 2019–20 is the final year of the 2016–17 forward estimates, we now have four years of information to assess progress in the implementation of the White Paper.

4.1 Implementation of the First Principles Review of Defence

Before we jump into detail, it's worth having a quick look at the implementation of the First Principles Review of Defence. This was commissioned early in the Coalition government's tenure in August 2014 to ensure that Defence was 'fit for purpose and able to deliver against its strategy with the minimum resources necessary'.

The review team submitted its report in April 2015 and recommended a 'One Defence' approach with four key features:

- a stronger and more strategic centre
- an end-to-end approach for capability development in which capability managers have clear authority and accountability for the delivery of capability outcomes
- integrated and customer-centric enablers
- a planned and professional workforce with a strong performance management culture at its core.

The review made 75 recommendations that were agreed by the government. In March 2019, Defence informed the Senate that all had been implemented, with the exception of Recommendation 2.4 relating to the reform of CASG's system program offices to 'determine where each fits within the Smart Buyer function, the most

appropriate procurement model and achiev[es] value for money'.⁵³ Because that was still open, Key recommendation 2 ('establish a single end-to-end capability development function') was still open. Defence expected to close the recommendation by June 2020.

So, other than that, the First Principles Review has been implemented. The ANAO released an audit of implementation in April 2018 that was largely positive.⁵⁴

But there's a difference between implementing the recommendations and achieving the outcomes sought by the review and presumably by the government by agreeing to the recommendations. At some level, the metrics for success are subjective; for example, do senior decision-makers in the government and the department feel that the 'strong strategic centre' is providing them with appropriate options and with the information necessary to support a decision? It may take some time to assess whether the new capability life cycle framework is delivering military capability more effectively and efficiently. While some acquisition decisions appear to have been made more quickly, indicating a greater willingness to accept some risk, it will be some time before we can see whether those decisions and the subsequent delivery were more effective than Defence's previous processes.

One opportunity to demonstrate that the One Defence construct has improved Defence's overall performance could present itself should the new government commission a new Defence White Paper or similar strategic review. These exercises have traditionally taken considerable time, because Defence has usually had to set up dedicated 'offline' teams to conduct the necessary analysis and generate policy options, they require new governments to get their heads around difficult choices, they involve costing things and activities far into the future, and Defence hasn't necessarily understood its current costs very well.

If the First Principles Review's reforms are working, Defence should presumably have:

- a policy centre well versed in providing better quality advice to government
- combined intelligence and policy functions so that it can understand the strategic challenges and develop options to address them
- better enterprise-wide planning and performance monitoring tools so it understands its current cost drivers
- a holistic understanding of its investment program and a forum (the Investment Committee) than can make informed prioritisation decisions
- a capability development process that's able to quickly develop high-level costs for future capability options
- the right people to support it in existing line functions across the department.

A white paper or similar review would be a good test for the post-FPR machinery.

4.2 Defence's self-assessment for 2017–18

Defence's *Annual report 17–18* provides Defence's self-assessment of how it delivered against the PBS and Corporate Plan.

Changes in the structure of Defence's outcomes

The PBS 2017–18 whittled Defence's three outcomes down to two:

- Outcome 1 was renamed Outcome 2.
- Outcome 2 was renamed Outcome 1.
- The only program in Outcome 3 ('Defence Contribution to National Support Tasks in Australia') moved into the new Outcome 1 to be with Defence's two other operationally focused outcomes.
- The 13 programs in the new Outcome 2 were the same as those in the old Outcome 1, but the numbering changed—for example, the Navy was Program 1.2 but became Program 2.5.

PBS 2017–18 stated that the programs have been renumbered 'in order to reflect the strategic intent of the 2016 White Paper, First Principles Review and Corporate Plan Purposes (page 31).' Presumably, this is meant to reinforce the concept of the strong strategic centre. The four organisations within Defence whose heads sit on the Defence Committee with the Secretary and Chief of Defence Force—Strategic Policy and Intelligence Group, Defence Executive Support (which works for the Associate Secretary), Chief Finance Officer Group (which has since been renamed Defence Finance Group), and Vice Chief of the Defence Force—have been 'promoted' in the program numbering to become programs 2.1 to 2.4, bumping the services down.

Defence gave itself a score of 46 out of 50

We lamented last year that the performance framework was a confusing terminological soup. This year, it's the same (aside from the renumbering of outcomes and programs). Putting that aside, the bottom line is that the Defence annual report provides Defence's self-assessment against 50 performance measures, which are a combination of 'measures', 'intended results' and 'performance criteria' derived from the PBS, the PAES and the Corporate Plan.⁵⁵

Defence assessed that it achieved 46 of the measures (92%) and partially achieved four. All measures relating to the provision of advice to government on operations, the conduct of operations and military preparedness were met, which is good, considering that this is the point of having a defence force.

The annual report states that Defence had achieved the measures of 'Government has confidence in the relevance and quality of advice' (p. 27) and 'Minister expresses high to very high confidence in Defence advice' (p. 30). The annual report doesn't actually state what ministers thought of Defence's advice. There certainly was a lot of it though—3,000 individual pieces.

The four 'partially met' measures were all in the area of workforce:

- 'Meet recruitment targets as specified by the Services.' The reason was that ADF permanent force enlistments from all sources were 94% of the full-year target of 5,593.
- 'Actions identified in the 2016–2026 Defence Strategic Workforce Plan are implemented to attract, recruit, develop and retain a highly skilled workforce.' The reason given was that some individual activities have been delayed, but 'these are not having an impact on overall delivery of the action plan'.
- 'Enhance linkages between Defence and the Department of Veterans' Affairs to enable greater support to veterans and ADF members.' No specific reason is given for the partially achieved assessment.

- ‘Australian Defence Force members and families are supported through the delivery of the family support program, transition service and bereavement support.’ The ‘partially achieved’ status reflected a continued focus on improvement (which would seem to be a good thing, so what is not being said?).

If achieving 94% of the target is only a partial achievement, then one would assume that the other 46 criteria did better than that. Interestingly, in 2016–17 Defence assessed that it had met the criterion of ‘Required preparedness levels are achieved and maintained’, even though the preparedness of available Defence elements was only at 80.8%, because it was able ‘to meet all tasking requirements from Government.’ The 2017–18 annual report doesn’t provide a similar global preparedness figure, but a review of ADF platforms’ availability and flying hours indicates that some achieved well below 94% of the PBS target (such as Navy minor combatants, PC-21, C-27J and Growler).⁵⁶ So it would appear that whoever is assessing performance in Defence’s people space is a much harder marker than some others in Defence.⁵⁷

Has performance improved since last year?

Overall, it seems performance has improved from 2016–17, when Defence assessed that it had achieved 50 of 61 performance measures (82%) and partially achieved 11.

Three of the partially achieved measures were related to workforce. One related to ADF recruitment, where Defence has gone slightly backwards from 97% achievement of targets to 94%.

But there’s been a substantial improvement in another area. Last year, we noted that there was a ‘hotspot’ of partial achievement in the 2016–17 annual report’s performance assessment centred on Defence’s management and use of corporate information to support decision-making and on its development of information systems. Eight of the 11 ‘partially met’ measures were in this area. This year, there are no ‘partially met’ in this area. Five of the eight are repeated in the 2017–18 annual report and are assessed as met. Three do not appear but arguably are subsumed under other measures that are assessed as met.

If the self-assessment is accurate and Defence’s information systems and decision-support tools are working effectively, that bodes well for its ability to develop a credible White Paper or similar strategic policy document in a timely way.

4.3 People

The White Paper target

The White Paper put the ADF on a growth trajectory from around 58,000 to 62,400 personnel by the end of the decade (that is, by 2025–26)—an increase of 4,400. While that’s less than an 8% increase overall, when we consider that Defence has at times had trouble just staying in place, getting there will require achieving higher recruitment targets and keeping separation rates at an acceptable level.

Recruitment and separations

According to the 2017–18 annual report, the ADF hit 94% of its recruitment targets. This is down from the previous year’s 97% achievement, but that was the best result for the past two decades (Table 4.1), and 94% is still considerably better than the 20-year average of 86%. One suspects that there’s still a post-mining-boom dividend at work.

Table 4.1: Percentage of recruitment targets met, 1998–99 to 2017–18 (%)

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Navy	76	57	74	85	84	86	73	72	78	73	72	91	87	88	88	92	92	94	97	90
Army	78.5	83	79	100	79	84	81	89	86	76	76	90	90	87	85	94	85	89	97	95
Air Force	90.5	83	88	87	94	90	92	88	86	85	86	92	93	86	81	88	92	91	100	95
ADF	80	76	80	93	84	86	80	84	84	77	76	91	89	87	85	92	88	90	97	94

Sources: Information provided by Defence; Defence annual reports; Defence submission to the Foreign Affairs, Defence and Trade Committee inquiry into ADF recruitment and retention, May 2001.

Retention rates are also stable (Table 4.2). The 2017–18 separation rate of 9.4% was up marginally from the previous year’s 9.0%, but still below the 20-year average of 10.2%. As with everything, the devil is in the detail, and in Defence there are always key trades that are difficult to fill. Since shortages in key trades have capability implications, Defence doesn’t publish that data.

Table 4.2: ADF separation rates, 1998–99 to 2017–18 (%)

	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Navy	12.6	13.3	13.2	11.5	11.6	10.1	12.2	11.3	12.3	11.0	10.8	8.4	7.8	9.2	8.9	8.9	7.9	7.7	9.6	9.3
Army	12.9	13.0	13.2	11.5	9.8	11.0	12.7	12.4	11.9	10.6	10.3	7.4	8.8	11.7	12.3	12.3	11.3	10.0	10.2	10.8
Air Force	11.9	11.6	15.6	10.4	8.1	7.4	8.4	8.5	9.0	7.2	6.4	5.2	6.2	6.9	6.3	6.3	5.7	5.3	6.0	6.7
ADF	12.6	12.0	13.8	11.2	9.8	9.9	11.5	10.7	11.2	9.8	9.4	7.1	7.9	9.9	9.9	10.0	9.1	8.3	9.0	9.4

Sources: Defence annual reports; Foreign Affairs, Defence and Trade Committee inquiry into ADF recruitment and retention, May 2001; advice from Defence.

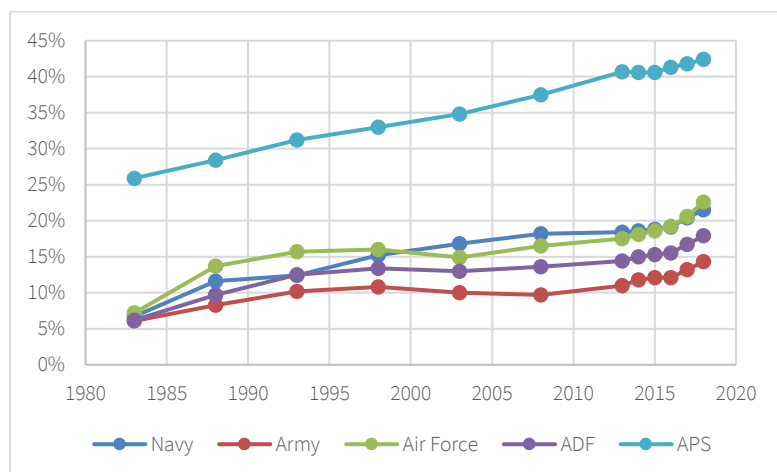
Women in Defence

Clearly, one of the best ways to boost recruitment as well as to reap the benefits of diversity is to recruit more heavily from the 50.18% of Australia’s population that is female. Thirty years ago, only 7% of the ADF was female. That picture is slowly but steadily changing.

The percentage of women in the ADF continued its rise in 2017–18, reaching 17.9%, up from 16.7% the previous year (Figure 4.1). Both the Air Force and the Navy passed 20% last year, and that trajectory continues. The Air Force leads the services with 22.1%, followed closely by the Navy at 21.5%, with the Army some way behind at 14.3%. The percentage of women in Defence’s APS staff is higher at 42.5%, but considerably below the APS-wide level of 59% (June 2017). This is probably in part related to the high number of former service personnel in Defence’s APS staff.

Interestingly, 30% of recruits into the ADF in 2017–18 were women (1,571 of 5,237), so we should see the percentage of women in the ADF rise more rapidly if that continues.

Figure 4.1: Percentage of women in Defence, 1983 to 2017



Source: Defence annual report.

The roles that women perform in Defence are also slowly changing. From September 2012, all ADF employment roles have been open to women, including combat roles. On 4 July 2018, Defence responded to a Senate estimates question on notice regarding women in combat roles, providing the following information:⁵⁸

- Forty female pilots were in the Air Force, including two fast jet pilots.
- The Air Force had one female Airfield Defence Guard and one female Ground Defence Officer.
- Eighty-two women were serving in combat roles, including in the Army's infantry, artillery and armour permanent trained force.
- No women had successfully completed the Navy clearance diver training program.

Of course, women serve on the Navy's ships, including as commanding officers of frigates deployed on operations.

Recruitment challenges—ADF

Despite the generally good news on recruitment and retention, Defence is still a little behind where it should be. The ADF is not quite on track to hit its White Paper targets (Table 4.3). It finished 2017–18 around 1,200 short of the original White Paper target for the year and, even though the target was revised downwards in PBS 2017–18, it still missed that target by over 700. Based on preliminary numbers in this year's PBS, the picture will be similar, with the total falling over 1,100 short, or 1.9%, of the allocation.

Table 4.3: ADF personnel—White Paper allocation versus actual achievement

	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23
PBS 2015–16 (start point)	57,982	59,378	59,559	59,382				
PBS 2016–17 (White Paper)	58,061	59,209	59,681	59,792	60,090			
PBS 2017–18		58,680	59,194	59,794	60,090	60,585		
PBS 2018–19			58,475	59,794	60,090	60,585	61,027	
PBS 2019–20				58,665	60,090	60,585	61,027	61,402
Actual shortfall against White Paper		-529	-1,206	-1,127				

Budget year estimate	Forward estimates	Actual achievement
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Sources: Defence annual report, PBS.

On the whole, that doesn't sound too bad, but it is a cause for concern that over the three years since the White Paper, despite Defence being given the funding to increase its people, exceeding historical recruitment rates, and achieving high retention rates, it's been able to increase its total numbers by only 600. Or, put another way, it has achieved only around one-third of the growth planned for this point in time.

Recruitment challenges—Navy

Last year, we argued that the Navy was the service that was having the greatest difficulty in achieving its White Paper targets. Not only was it not growing to meet its target, but it had gone backwards two years in a row. The good news is that in 2018–19 the Navy has managed to grow by over 300 (Table 4.4). That still leaves it around 540 people (around 3.7%) short of where it should be, but it's heading in the right direction.

Table 4.4: Navy personnel—White Paper allocation versus achievement

	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23
PBS 2015–16 (start point)	14,238	14,368	14,416	14,350				
PBS 2016–17 (White Paper)	14,232	14,394	14,456	14,684	14,718			
PBS 2017–18		14,077	14,123	14,683	14,718	14,763		
PBS 2018–19			13,818	14,689	14,726	14,772	14,893	
PBS 2019–20				14,143	14,776	14,825	14,946	15,078
Actual shortfall against White Paper		-317	-638	-540				

Sources: Defence annual report, PBS.

That progress will need to continue, as the shortages are being felt. The ANAO reported that when HMAS *Perth* finished its latest deep maintenance cycle in October 2017, which also installed several important capability upgrades, it had to be left up on blocks as the Navy was unable to crew it. By the time a crew is assembled sometime between July 2019 and January 2020, it will have lost around two years of service and return on

investment.⁵⁹ When two of the eight Anzac frigates are almost always in deep maintenance, leaving only six available, having an extra one out of service means a 16.7% reduction in capacity.⁶⁰

We should note that the Navy isn't the only service facing difficulties; the Army went marginally backwards in 2018–19, from 30,410 to 30,223. It should have grown to 30,810, according to PBS 2018–19, so it's about 600 short.

4.4 How is Defence going at delivering capability?

Last year, *The cost of Defence* looked at whether the reforms of the First Principles Review were resulting in Defence delivering capability better. Overall, we concluded that it was too early to say. Since little data has emerged that would change that assessment, we will not repeat that analysis.

The number of approvals is going up—but what does it mean?

One area we briefly examine this year is project approvals. The government has claimed record numbers of project decisions and cited this as evidence that the implementation of the recommendations of the First Principles Review and Defence's new capability life cycle has sped things up so that more projects are getting through the capability development pipeline more quickly.

That may be true, but it's hard to make an apples-to-apples comparison with data from earlier periods analysed in earlier editions of *The cost of Defence*. Previous project approval counts covered only equipment projects; now they include infrastructure and ICT. This is a good thing and consistent with the First Principles Review's recommendation to have a single integrated investment program, although we note that equipment, infrastructure and ICT projects are still all treated differently across Defence's various reporting vehicles.

But the count also includes things other than first- and second-pass approvals, such as 'advice', and 2017–18 figures included 'early funding'. This essentially covers relatively small amounts of early project development funding to get projects ready for first-pass consideration. Since this used to be approved in house without going to government, including it in the count now is not evidence that more projects are moving through the pipeline.

But the main problem with the way approvals are handled is that the government and Defence do not consistently announce them. There's no way to know what's been approved. And since the Integrated Investment Plan and PBS don't include planned approval dates there's no way to know what's scheduled for approval and whether it has been achieved. This is despite the 2016 White Paper's commitment to a better conversation with industry.

We believe that this is an area where the government and Defence can do better and provide greater transparency to their partners in industry and to the Australian public more broadly.

Since Defence is no longer publishing comprehensive lists of project approvals, this year ASPI attempted to identify and collate as many project approvals as possible. The sources we used were:

- Defence annual reports, which make high-level statements about approvals but don't provide supporting details
- ministerial media releases (although it can be difficult to determine which project a media release is referring to and what was approved)
- Austender (although details are thin, so some guesswork is required)

- The PAES, which had a table listing some project approvals (this was discontinued in PAES 2018–19).

Not surprisingly, the number we were able to identify fell well short of the numbers stated in annual reports. Our list is in Appendix 3.

2016–17 approvals

In PBS 2016–17, Defence planned 36 project approvals. They were exclusively in the Major Capital Investment (that is, equipment) Program. The annual report for that year stated that Defence had achieved 74, but only 12 are listed in the supporting tables. We have identified 30 (Table 4.5).

Table 4.5: Project approvals, 2016–17

	Planned approvals	Achieved					
		First pass	Second pass	Other Integrated Investment Plan	Advice	Total 'other'	Total achieved
PBS 2016–17	36 ^a						-
PAES 2016–17							15
2016–17 annual report text	62	15	31	15	13	28	74
2016–17 annual report tables							12
ASPI count		Unclear	Unclear	Unclear	Unclear	Unclear	30

a This consisted of 10 first passes, 23 second passes and 3 other passes.

2017–18 approvals

In PBS 2017–18, Defence planned 59 approvals. For the first time this included facilities and ICT projects, indicating that Defence was working towards the First Principles Review goal of having a single, integrated investment program. The annual report claimed 111 total government considerations, but only nine are listed in the supporting tables. We have identified 26 (Table 4.6).

Table 4.6: Project approvals, 2017–18

	Planned approvals	Achieved						
		First pass	Second pass	Advice	Early funding	Something else ^a	Total 'other'	Total achieved
PBS 2017–18	59 ^b							
PAES 2017–18								5
2017–18 annual report text	62	21	35	14	35	6	55	111
2017–18 annual report tables								9
ASPI count		Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	26

^a Accounts for the difference between the 49 combined advice and early funding submissions and the total of 55 other submissions.

^b This comprised 20 first passes, 37 second passes and 2 other approvals.

2018–19 approvals

In PBS 2018–19, Defence ceased including a table of planned approvals. The annual report hasn't yet appeared, so we don't know what Defence believes it has achieved. We have found 15 (Table 4.7).

Table 4.7: Project approvals, 2018–19

	Planned approvals	Total achieved
PBS 2018–19	No table	
PAES 2018–19	No table	No table
2018–19 annual report	Not yet published	Not yet published
ASPI count		15

There has to be a better way to do business than this haphazard approach.

Defence is underspending its capital budget ...

As we discuss in Chapter 2, since the White Paper, Defence's capital spending has increased but not at the rate predicted in the White Paper.

In 2017–18, there was a significant decrease of \$811.5 million in the predicted capital spend between the PBS in May and the PAES in February. We assessed that exchange rate adjustments, which were only \$89.9 million across Defence, couldn't account for this shortfall. A key factor appeared to be the huge 72% drop of \$643.9 million in the ICT program.⁶¹

In 2018–19, there's another if somewhat smaller shortfall of \$434.9 million between the PBS and PAES (Table 4.8). Most of this is a shortfall of \$363.2 million in the Major Capital Investment Program. However, once we take exchange rate variations into account, the shortfall is even greater. In PAES 2018–19, Defence was supplemented with an additional \$476.6 million just for 2018–19 to compensate for the falling Australian dollar. Much of this would have been applied to the capital investment program. For example, the JSF program

adjusted its spending upwards by \$112 million ‘with the forecast variation primarily attributable to foreign exchange updates’ (page 81).

Table 4.8: Variation in the 2018–19 Capital Investment Program between PBS and PAES

	PBS 2018–19 estimate	PAES 2018–19 revised estimate	Variation
Major Capital Investment Program	8,426.5	8,063.3	–363.2
Capital Facilities Program	1,868.5	1,911.3	42.8
ICT Investment Plan	623.4	559.0	–64.4
Minors Program	106.8	56.5	–50.3
Total Capital Investment Program	11,025.1	10,590.2	–434.9

Source: PAES 2017–18, Table 8.

To achieve the same outcome in delivering military capability, Defence should have spent the originally planned \$8,426 million plus a large chunk of the \$476.6 million in foreign exchange supplementation, yet it revised its prediction down to \$8,063.3 million, so the actual shortfall is more likely in the \$700–800 million range.

... and overspending its sustainment budget

Meanwhile, sustainment budgets are going up. In Chapter 2, we note that the overspend in sustainment spending since the White Paper mirrored the underspend in the capital budget. In 2017–18, the sustainment program increased by \$1,586.1 million between the PBS and the PAES (from \$9,474.2 million to \$11,060.4 million)—a substantial increase of 16.7%.

The pattern was repeated in 2018–19. The PBS prediction of \$10,975 million was already more than \$900 million higher than the White Paper estimate for that year of \$10,045 million, but between the PBS and PAES it went up by a further \$455.4 million to \$11,430 million.

While we shouldn’t automatically assume that one thing going up is related to another thing going down, this amount is oddly similar to the Capital Investment Program underspend. But it isn’t always clear which is the cause and which is the effect.

4.5 Key projects

Here we provide here a brief overview of progress on the largest individual projects in Defence’s investment plan. We treat the Naval Shipbuilding Plan separately in Chapter 5, so its component projects are discussed there.

AIR 6000: F-35A Joint Strike Fighter (approved CASG budget \$16,524 million)

Globally, the F-35 is achieving initial operating capability (IOC) with other militaries and is being deployed on operations. The big news here this year was that the RAAF’s first two JSFs arrived in Australia. In terms of aircraft deliveries, the project remains on track to have the first squadron operational by the end of 2020 and all 72 aircraft delivered by 2023, but there’s still a lot of cash to get out the door to achieve that. In 2018–19, the project spent nearly \$2 billion, bringing its total spend to \$4.6 billion. With over \$10 billion still to go, it’s not surprising that it’s aiming to spend nearly \$2.4 billion this year, but that will put the squeeze on Defence’s capital equipment budget (\$8,688 million this year). In short, the JSF alone is consuming 27.5% of the equipment budget.

While it's looking like Defence is spending enough to get its aircraft on time, it will have to ramp up flying hours dramatically to achieve IOC and final operating capability (FOC; Table 4.9). The latter will require nearly a sixfold increase. One potential risk in achieving that is the immaturity of the JSF sustainment system, which has been closely analysed by the US Government Accountability Office.⁶²

Table 4.9: JSF flying hours, planned and achieved, 2014–15 to 2022–23

	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23
PBS 2015–16	201	500	500	752	2,000				
PBS 2016–17		468	500	752	2,538	4,564			
PBS 2017–18			408	752	2,538	4,564	8,204		
PBS 2018–19				702	2,538	4,564	8,204	11,831	
PBS 2019–20					2,200	4,564	8,204	11,831	14,519

Budget year estimate	Forward estimates	Actual achievement
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Sources: Defence annual report and PBS.

Currently, aircraft availability rates across the international fleet are significantly below war-fighters' requirements, in part due to the immaturity of the sustainment system. Under the JSF program's sustainment concept, all spares are owned by the US Department of Defense and assigned to program members under a prioritisation framework. This means that the RAAF is effectively competing with other users for scarce spares and, should a war break out, units on operations or in conflict have the highest priority for spares. If the US, as the largest member of the consortium, is in a conflict, everyone else's supply could dry up unless the system is fixed. According to the Government Accountability Office, that doesn't look like it will happen until 2024 at the earliest.

Figure A.8 in 'Defence in 10 tables' shows total flying hours of Defence's air combat platforms in the long transition from F-111 and classic Hornet to the Super Hornet and Growler and ultimately JSF. The next few years are crucial to achieve a successful transition so it is vital that the RAAF can fly JSF enough to convert its pilots.

While acquisition costs appear to be following the learning curve downwards, there's still major uncertainty about sustainment costs. Last year (page 43), we argued that one of the big risks to Defence's sustainment budget was the operating cost of the F-35A. The JSF program was aiming for a sustainment cost similar to that for legacy aircraft such as the classic Hornet but, if the cost of sustaining the JSF turned out to be more like the costs for the Super Hornet and Growler electronic attack aircraft, the sustainment budget would be under pressure.

The 2019–20 budget sheds some initial light on things: for the first time, the F-35A puts in an appearance in the top 30 sustainment products table. At \$41,800 per flying hour in 2019–20, it's between the classic Hornets at \$22,200 and the Super Hornets/Growlers at \$79,000; that's derived by dividing the sustainment costs (pages 122–123) by annual flying hours (page 65). It's early days, so we hope that will come down as the sustainment system matures, although earlier this year a Lockheed Martin official stated that the cost of operating the JSF wouldn't get down to fourth-generation aircraft levels until the 2035–2040 time frame.⁶³

Using the data we have now, we've mapped the cost of the air combat capability over the transition (Figure A 9 in 'Defence in 10 tables'). Additional capability comes at significantly greater cost.

But if we have buyer's remorse, it's too late to go back to the classic Hornets. Deliveries of our old aircraft to Canada have started.

LAND 400 Phase 2: Combat reconnaissance vehicle (approved CASG budget \$5,812 million)

Last year at approval, the government announced that the budget for the Boxer combat reconnaissance vehicles was \$5.2 billion. The PBS lists it this year at \$5.8 billion. Defence has explained to ASPI that the difference is due to the latter figure including contingency, which is a risk provision that Defence is authorised to spend if it needs to (but would definitely prefer not to, as it doesn't hold that provision anywhere as cash). The \$5.8 billion likely doesn't include facilities (see our note on project budgets in Chapter 3), which will no doubt be required, as the Boxer is much bigger than the ASLAV that it's replacing. Its predicted spend for 2019–20 is only \$200 million (or only 3% of the project's total), suggesting there's still some way to go until local production really ramps up.

When the project was approved, the government announced that the first 25 of the 211 vehicles would be built in Europe. The first vehicles have now been handed over to Defence for the installation of Australian-specific modifications, such as the battle management system.⁶⁴

LAND 400 Phase 3: Infantry fighting vehicle (unapproved budget \$10–15 billion)

Tender responses have been received for Phase 3, which is the infantry fighting vehicle (IFV) component of LAND 400. Defence sought bids for 450 tracked vehicles with manned turrets. This means the Army will have 611 vehicles in total between the two phases.

The companies that have announced that they are bidding and the vehicles offered are:

- Hanwha Group: AS21 Redback IFV, a variant of which is already in service with the South Korean Army
- Rheinmetall: Lynx IFV, which does not yet have a customer
- General Dynamics Land Systems: Ajax armoured fighting vehicle, which is entering service with the British Army
- BAE Systems: CV90 IFV, which is already in service with a number of European armies.

The selection process still has some distance to run. According to Defence, short-listing down to a maximum of two contenders will occur in Q3 this year.⁶⁵ Three of each vehicle will be acquired and put through year-long testing and evaluation. A government decision on the successful solution will be made in 2022. IOC is scheduled for 2024–25 and FOC for 2030.

While it may appear that Rheinmetall may have a head start, having been selected for the Phase 2 combat reconnaissance vehicle, Defence has been at pains to say that's not the case and the competition is wide open. While there's no 'already in service' requirement, it's possible that the fact that the Lynx hasn't been ordered by any military let alone entered service could work against it. If another contender is selected, that raises the awkward prospect of two workforce 'valleys of death' in the armoured vehicle business once the two phases have delivered.

We hope we won't see a re-run of the interstate brawling that marked the Phase 2 competition. The bottom line is that the government will take Defence's recommendation and Defence will make its recommendation on capability grounds, not on which state promises more jobs. It always does. This will be no different.

LAND 121 Phase 4: Hawkei protected mobility vehicle—light (approved CASG budget \$1,980 million)

It hasn't been smooth sailing for the Hawkei project, which is scoped to deliver 1,100 Hawkei protected mobility vehicles—essentially vehicles that provide the same level of protection as the highly successful Bushmaster. However, the Hawkei is considerably smaller, allowing it to be transported by Chinook helicopters.

The project strategy was always a little odd. According to the ANAO, Defence spent \$221 million on 214 additional Bushmasters to keep the Bendigo production line going until the Hawkei design was mature.⁶⁶ Yet the Hawkei project strategy seeks to produce 1,000 full-rate production vehicles in only two and a half years (between mid-2018 and late 2020), despite the original Bushmasters needing to be replaced from 2025. Now we appear to have entered an era of continuous [insert name of capability here] building; this does not seem to have been well thought through.⁶⁷

The Hawkei has successfully passed blast testing, which is a remarkable achievement, given its small size compared to the Bushmaster, but two issues have upset the original schedule. The first is persistent reliability issues that have been reported over several years in the PBS and, in great detail, in the ANAO's *Major projects report*.⁶⁸

The second is that the subcontractor supplying engines, an Austrian company called Steyr that's owned by a Chinese holding company, went into receivership last year. At Senate estimates in February this year, Defence said that the prime contractor, Thales, had not yet determined a way forward.

The impact on the project can be seen in Table 4.10. Actual expenditure has fallen short of the target, critically so in 2018–19. The start of full-rate production has been delayed, and it appears that even the rescheduled target date has been missed. Despite this, IOC (December this year) and FOC (June 2023) have not been formally adjusted.

Table 4.10: LAND 121 Phase 4 expenditure (\$m)

Year	PBS planned expenditure	PAES revised expenditure	Achieved expenditure	Total spend to end of year
2015–16	No entry	No entry	?	247
2016–17	95	56	26	273
2017–18	223	203	190	463
2018–19	396	203	118	581
2019–20	292	–	–	–

Sources: PBS, PAES, ANAO *Major projects reports* for 2016–17 and 2017–18.

However, according to Thales' advice to ASPI in May 2019, a way forward has now been found and Steyr will continue to produce engines for the Hawkei.⁶⁹ Work is continuing on addressing the reliability issues and, assuming Thales can demonstrate that they've been addressed, the project will move from low-rate initial production (100 vehicles) to full-rate production late this year. That would be about a year and a half after the original schedule.

There are a couple of useful lessons or at least reminders here. The first is how challenging it can be to achieve sovereignty in the defence industry. Even a vehicle largely designed and manufactured in Australia in peacetime is subject to delays caused by disruptions to its offshore supply chains. And that's without anybody intentionally attempting to disrupt those supply chains.

The second is that developmental projects almost always take longer than expected. And it's not always the stuff that seems like it would be the most challenging (such as building a small vehicle with a similar level of protection to a big vehicle) that causes the unexpected problems.

Air Force UAVs (unapproved budget: Reaper, \$1–2 billion; Triton, \$3–4 billion)

It may appear odd in this age of burgeoning uninhabited and autonomous technology that the Air Force doesn't currently operate any unmanned aerial vehicles (UAVs). It operated the unarmed Heron in Afghanistan, but that aircraft is no longer in service. However, two projects for large UAVs are progressing. One (AIR 7003) is to acquire a medium-altitude, long-endurance armed UAV. In November 2018, the government announced that whatever armed UAV it gets, it will be a variant of the US Reaper. The government doesn't appear to have made a final second-pass acquisition decision yet.

The second is acquiring the Triton high-altitude, long-endurance surveillance UAV. After approving the first of six or seven Tritons and supporting systems in June 2018, the government announced the approval of a second aircraft in March this year. It's not clear why the government and Defence have adopted a trickle-feed approach; it could indicate cash flow is tight. There's still some way to go to deliver capability; the first Triton won't be in service until mid-2023, followed by IOC in 2024–25 and FOC in 2025–26.

AIR 7000 Phase 2B: P-8 Maritime patrol aircraft (approved CASG budget \$5,377 million)

Until recent approvals for the future frigates and submarines, this had the third biggest approved project budget in Defence's portfolio. It has now slipped to fifth. Despite its size, it has quietly delivered capability with minimal fanfare, achieving IOC in January 2018 and already deploying on operations to enforce sanctions against North Korea.

The delivery of the final four of 12 aircraft is expected in 2019–20. With \$3,901 million already expended and another \$360 million planned this year, the project should come in well under budget, reinforcing again the benefits of going off-the-shelf when the right thing is available on the global market.

Collins-class submarines

With all the attention devoted to the future submarine program, it's easy to lose sight of the fact that some of the Collins fleet will be in service until the second half of the 2040s, and (based on current schedule) the Navy won't have more Attack-class submarines than Collins until some time in the first half of that decade. So that means Collins will be the core of our submarine capability for a further 20 years or more. Keeping them relevant requires investment.

That's occurring under the SEA 1439 constellation of projects. The full-cycle docking that commenced last year (HMAS *Waller*) will be the first to include the sonar upgrade being delivered under Phase 6 of that program. Thales UK has delivered the first new bow sonar array. Upgrades to the ship control system and communications systems are also being installed.

The cost of sustaining the Collins boats is budgeted this year at \$566 million (the most expensive of all of Defence's platforms), but that doesn't include the SEA 1439 capability upgrades, which are part of the capital

investment program. This year, two are in the top 30: the sonar capability assurance program (Phase 6) at \$105 million and communications and electronic warfare improvements (Phase 5B2) at \$96 million.⁷⁰

Soldier systems

Although individual soldier systems generally only make the headlines when somebody is unhappy with their boots, Defence is investing heavily in the soldier combat ensemble, which is the field equipment used by personnel across the Army, Navy and Air Force. The basic soldier combat ensemble costs \$25,284 and includes a combat uniform, protective equipment, a rifle and night-vision goggles.⁷¹

Other key project milestones

Over the past year, Defence capability projects have achieved some key milestones, including the following:

- IOC for the Helicopter Aircrew Training System was announced at the start of April 2019.
- IOC for the F/A-18G Growler electronic attack capability was achieved in April 2019, despite the loss of one of 12 aircraft through accident. Defence hasn't determined whether the lost aircraft will be replaced, either with one of the Air Force's initial 12 Super Hornets that were pre-wired in build for potential later conversion to Growler configuration, or through the acquisition of a new aircraft. Operating the aircraft is proving to be very expensive: the combined Growler/Super Hornet fleet costs even more per hour than the Wedgetail early warning and control aircraft, according to figures in PBS 2019–20.
- The upgrade of the Hawk lead-in fighter was declared complete in March 2019. In some ways, this makes the jet trainer a flying simulator, better preparing pilots for conversion to advanced aircraft such as the JSF and Super Hornet.
- The first of two replenishment ships, to be called HMAS *Supply*, was launched by Navantia at the Ferrol shipyard in Spain in November 2018. In 2019–20, her sea trials will commence and her sister ship, HMAS *Stalwart*, will be launched. The *Major projects report* shows they are on time and on budget. Despite some lamenting that they should have been built in Australia, there is no way that the current schedule or cost could have been achieved. For one, we would have first had to build a shipyard big enough to handle the construction of 20,000 tonne vessels—without it interfering in the development of the shipyards for the future frigates and submarines.

Projects of Concern

We couldn't find the Projects of Concern list on Defence's website but, according to the 2017–18 Defence annual report, the following projects are on the list:

- AIR 9000 Phases 2, 4 and 6 (MRH-90 multi-role helicopters)
- JP 2008 Phase 3F (Australian defence satellite communication capability terrestrial enhancement)
- AIR 5431 Phase 1 (Deployable defence air traffic management and control system).

Despite its chequered history, which is well covered in the *Major projects report* and other ANAO reports, the performance of the MRH-90 has improved dramatically over the past several years.⁷² Only two years ago, it achieved just 5,349 flying hours, a level at which it had stagnated for several years. Last year, it was up to 8,430 and it's aiming for 9,670 this year. That's a pretty impressive turnaround. Defence seems to have given up a previous final target of over 11,000 hours and is settling for 10,300, but even if it gets there the MRH-90 is still

delivering more hours than the two aircraft it's replacing (the Black Hawk and Sea King) ever achieved in combination.⁷³

That increase in flying hours has been accompanied by a decrease in cost per hour, but it's still an expensive platform to operate, costing more than the Seahawk Romeo, which is arguably a more complex platform with its suite of sensors and weapons, and the CH-47F Chinook, which is a much larger platform. We hope that Defence is aiming to get operating costs down as well as to increase flying hours.⁷⁴

The other two projects do not make the MPR or PBS top 30, so there's little information to enable us to say what the problems are and whether they're close to being resolved.

The ANAO published a report on the Projects of Concern list earlier this year. It concluded as follows:

While the Projects of Concern regime is an appropriate mechanism for escalating troubled projects to the attention of senior managers and ministers, Defence is not able to demonstrate the effectiveness of its regime in managing the recovery of underperforming projects. Defence remains confident of the regime's effectiveness but its confidence is based on management perception and anecdotal evidence, as it has not attempted any systematic analysis. Over the last five years, the transparency and rigor of the framework's application has [sic] declined.⁷⁵

That may be so, but it seems to miss the point a little. The Projects of Concern regime is not a mechanical toolkit to help manage struggling projects better, or a 10-step path to wellness. Rather, it's a way of shining a very bright and public light on a project in order to get stakeholders focused on fixing it. Ultimately, it's a way of applying some leverage to industry—fix this, or we'll let the world know you're underdelivering. In an environment in which Defence is trying to improve relationships with industry rather than bludgeon it, it's always going to be the means of last resort.

Chapter 5: Shipbuilding stocktake

Key points

- The three shipbuilding streams have made significant progress since the release of the *2016 Defence White Paper* and the 2017 Naval Shipbuilding Plan.
- Solutions, designers and builders for all three have been identified and head contracts signed.
- Progress is also occurring in underpinning programmatic elements such as shipyard construction and workforce development.
- The schedule for the future frigates and submarines is becoming clearer, but initial operating capability for both is still a long way off in around 2030 and 2034–35, respectively.
- Cash-flow requirements are ramping up rapidly, hitting \$2 billion this year, well before construction starts on frigates and submarines. This is likely to be putting pressure on the rest of Defence's capital program.
- Defence has taken a large step forward towards autonomous systems with the government cancelling the upgrade of legacy manned minehunters in favour of moving more quickly to autonomous solutions.

This chapter provides an overview on progress to date in the shipbuilding program, including individual projects as well as programmatic elements.

5.1 The Naval Shipbuilding Plan

The government announced elements of the program incrementally even before the release of the *2016 Defence White Paper*. However, the outlines of the overall program were brought together and presented in the 2017 Naval Shipbuilding Plan (NSP).⁷⁶ Since then, the program has largely developed in accordance with the NSP, with some minor variations.

Much of the NSP is informed by a highly influential RAND Corporation study on the Australian naval shipbuilding industry commissioned by Defence and published in 2015. Key assumptions in the NSP about the premium historically paid for local shipbuilding, the advantages of continuous shipbuilding, and potential future shipbuilding workforce numbers, for example, are derived from the RAND report. The report suggested ways to prevent another shipbuilding 'valley of death' (that is, the waxing and waning of demand and consequently the workforce).

The NSP, however, is not simply the implementation of the RAND report. The report did not cover submarines, for example. And one could argue that the parallel continuous major surface combatant and minor war vessel shipbuilding streams in the NSP are not exactly what the RAND report recommended. Nevertheless, much of the argument for continuous naval shipbuilding comes from that report.⁷⁷ Unfortunately there has not been much public focus on its measures designed to bring down the premium for building in Australia and instead an emphasis on the number of jobs and dollars.

The NSP envisages an enterprise consisting of three continuous shipbuilding programs delivering submarines, major surface combatants and minor war vessels.⁷⁸ The key difference between the current

NSP and previous shipbuilding undertakings in Australia is that the new enterprise is intended to be continuous. That means that as construction of one class of vessel in a stream ramps down, another will ramp up without interruption. There won't be another shipbuilding valley of death between builds. To achieve this, the NSP seeks not just to deliver the ships themselves, but also to create an enduring indigenous capability to design and build warships.

The NSP described what success would look like:

Delivering the Naval Shipbuilding Plan will result in a national approach to the delivery of affordable and achievable naval capability through a sovereign Australian industrial base that is reformed, secure, productive and cost-competitive.

Achieving this objective will result in future Australian Governments being able to plan and execute: the design, construction and sustainment of future fleets of major surface combatants and minor naval vessels; and the acquisition, construction and sustainment of submarines (designed in conjunction with an international partner) in Australia. (p. 20)

Because the ANAO *Major projects report* does not cover any of the projects in the continuous naval shipbuilding program other than the air warfare destroyer (AWD), this chapter relies heavily on other sources, such as Senate estimates hearings, including Defence's responses to questions on notice. The ANAO has released reports on the future submarine competitive evaluation process⁷⁹ and on the mobilisation of the naval construction programs.⁸⁰ It has also announced it will conduct a report on the future submarine program's schedule.

5.2 Overview of the shipbuilding streams

Minor war vessels

The minor war vessel stream currently consists of the Guardian-class replacement Pacific patrol boat and the Arafura-class offshore patrol vessel, with further vessels foreshadowed in the NSP and recent government announcements. The minor vessel stream is to be centred on Henderson in Western Australia.

SEA 3036 Phase 1: Guardian-class replacement Pacific patrol boat (approved budget \$504 million)

This project is providing 19 new patrol boats to 12 Pacific island countries and two to Timor-Leste. They are being constructed by Austal at Henderson. The vessels are a significant increase in capability for those nations and are intended to improve their ability to conduct border and fisheries protection.

Austal has extensive experience in designing and building aluminium ships. The Guardian class represents Austal's first major foray into steel ship construction. The project is progressing well, and the first boat was handed over to PNG in November 2018 and the second to Tuvalu in April this year. Four vessels are scheduled for delivery in 2019–20, and the project budget for this year is \$78 million.

The final vessel is scheduled for delivery in late 2023, which will prompt some consideration in government and Defence about what 'continuous' means for Austal. Certainly, other work will be continuing in the minor war vessel stream, but not necessarily by Austal.

Figure 5.1: Guardian-class Pacific patrol boat



Image © Commonwealth of Australia, Department of Defence, [online](#).

SEA 1180 Phase 1: Arafura-class offshore patrol vessel (approved budget \$3,724 million)

The offshore patrol vessel (OPV) project has made remarkable progress, and all involved should be commended. The project achieved second-pass government approval in November 2017 after a relatively short development process. The government selected as the prime the German company Lürssen, which is using ASC as its subcontractor for the build of the first two ships in Adelaide, and Cimtec for the subsequent 10 in Henderson.

In order to prevent or minimise a workforce valley of death, the government directed Defence to advance construction to a 2018 start date, which it achieved when the build of the first vessel commenced in Adelaide in November 2018. Keel-laying for the first vessel occurred in May 2019. Despite Western Australian fears that the build of the subsequent 10 ships might not transfer as planned to Henderson, there's been no sign that the 2+10 plan will change.

The build of the second vessel will also start in 2019–20 in Adelaide. Expenditure for this year is planned to ramp up sharply, up to \$349 million from \$221 million last year.

The Arafura class will revolutionise Defence's patrol capability.⁸¹ With greater range, endurance and capacity than the Armadale-class patrol boats, they will be well suited to support the Pacific step-up by demonstrating greater ADF presence in the South Pacific. This could potentially involve rotations through Manus Island naval base.

The OPV's ability to launch and recover unmanned aerial, surface and underwater vehicles, as well as carry the additional crew needed to operate them, means it has the potential to act as a mothership for a network of unmanned vessels. The government announced a new naval mine countermeasure strategy during the election campaign based on autonomous systems and new countermeasure support vessels from the mid-2020s,⁸² but once the OPV enters service in late 2021⁸³ the Navy will already have many of the

key components of that strategy between the OPV itself and the autonomous mine-clearing systems being introduced under SEA 1778.⁸⁴

Due to this capability, the OPV could also take the place of frigates on deployments to the Middle East when those missions mainly have a patrol and border protection focus, reversing the opportunity cost of using major war vessels on such tasks. Once the design is mature and the first vessels have been completed, it would make sense to integrate a version of CEA's phased-array radar into subsequent vessels to make the class a more capable contributor to Defence's operating picture. The groundwork for this has already been laid by the very sensible decision to mandate Saab's 9LV combat management system for all of the Navy's surface fleet,⁸⁵ since 9LV and CEA are designed to work optimally together.

Figure 5.2: Then Minister for Defence, Christopher Pyne (centre), inspects a model of the Arafura-class offshore patrol vessel at Osborne Naval Shipyard in Adelaide



Image © Commonwealth of Australia, Department of Defence, [online](#).

Future minor war vessels

The NSP refers to future elements of the continuous minor war vessel stream, including a strategic hydrography ship starting construction in the mid-2020s and mine warfare vessels after the OPV build. During the election, Prime Minister Morrison confirmed the plan for the hydrographic ship and brought the build of two mine countermeasure vessels forward to the mid-2020s.

This may seem relatively unremarkable, but it's a significant development. Rather than continuing with a very expensive upgrade to its existing minehunters, Defence is taking a calculated risk to move more rapidly to autonomous systems for mine clearance. It's rare that Defence turns off a project after a formal first pass, but it appears to have done that with the minehunter coastal upgrade. The question is, where else is Defence prepared to be forward leaning on the path to autonomous systems?

Major surface combatant stream

The major surface combatant stream includes the AWD project that was well underway before the 2016 White Paper and the NSP and the Hunter-class future frigate project.

SEA 4000 Phase 3: Hobart-class air warfare destroyer (approved budget \$9,104 million)

Since a restructuring of the project in 2015, which brought in the designer Navantia to manage construction, rebaselined the schedule and granted a substantial increase to its approved funding, the AWD project has progressed well, delivering against cost, schedule and capability. The first ship, HMAS *Hobart*, achieved IOC late last year. This required the successful completion of rigorous combat system trials off the US. It also demonstrated the successful integration of the US Cooperative Engagement Capability—the first time this has been done by a non-US platform. The capability allows ships and aircraft to not only share sensor information, but also cue weapons launched from other platforms.

The second vessel was commissioned last year and the third and final ship is expected this year. Despite the project ramping down, there's a slight bump up in spending this year; this could be related to the need to complete modifications to fully integrate the Seahawk Romeo helicopter before delivery,⁸⁶ or aimed at wrapping things up quickly to free up workers for the OPV and future frigate.

Figure 5.3. An Evolved Sea Sparrow Missile is fired from HMAS Hobart during test firings off the US west coast



Image © Commonwealth of Australia, Department of Defence, [online](#).

SEA 5000: Hunter-class frigate (approved budget \$6,265 million; total IIP provision \$35 billion)

The government announced that BAE's Type 26 Global Combat Ship had won the competitive evaluation process for the future frigate in June 2018. The Type 26 was not in service at the time and, in fact, had only recently started construction in the UK. Nonetheless, Defence has since said that it was the lowest risk of the three contenders.⁸⁷

Figure 5.4: An artist's impression of the Hunter-class future frigate



Image © Commonwealth of Australia, Department of Defence, [online](#).

During the competitive evaluation and tender processes, the project's strategy was adjusted so that 'ASC Shipbuilding was to transfer to the successful tenderer at a nominal consideration and that the Commonwealth would have the option to reacquire ASC Shipbuilding for nominal consideration.' Essentially, ASC Shipbuilding would become a subsidiary of BAE, build its ship design and construction expertise, and then revert to the Australian Government to ensure the development of 'sovereign design and shipbuilding capability in Australia.'⁸⁸

An interim contract was signed between Defence and BAE in October 2018. The formal transfer of ASC Shipbuilding to BAE occurred in December 2018 and at the same time Defence and ASC Shipbuilding signed the head contract that provides the framework for the design and build of the Hunter class. It was a remarkably quick process.

The IIP provision for the project is \$35 billion. To date, \$6,265 million in funding has been approved and around \$468 million spent.⁸⁹ The planned budget for 2019–20 is \$492 million, a big increase from 2018–19's \$222 million, indicating that work is ramping up rapidly.

As with the OPV, the government set the future frigate project an ambitious schedule to prevent a valley of death. Even though the competitive evaluation process required an existing design, there's still significant technical risk, as Australia's variant will have different radar, combat management system, weapons and helicopters from the UK's. Modifying the design to integrate those elements while meeting the government's goal of starting construction by 2020 was assessed by Defence as an extreme risk.⁹⁰ Fortunately, common sense prevailed and the strategy was amended to mitigate that risk. Now construction will commence in 2020 with 'prototyping' of blocks to reduce risk and demonstrate the maturity of the shipyard, followed by the start of construction of the first ship in 2022.⁹¹ Defence has consistently said this will be achieved.

The schedule for the future frigate's IOC has been a little open. Over the past year, it has firmed up (based on Defence's Senate estimates testimony and a recent ANAO report on Anzac-class sustainment).⁹² The first will enter service (that is, IOC, as opposed to commissioning) around 2029 or 2030. On a two-year delivery drumbeat, that means the ninth will enter service around 2045. So the ninth frigate won't be delivered by 2038 as indicated in the NSP (p. 110). The 2045 date works well if the NSP is about ensuring continuous industry workflow as two years after that it will be about the right time for the replacement for the first AWD to arrive.⁹³

A corollary of this schedule is that the first Anzac won't retire until 2032–33 and the last until 2042–43. So Defence will need to keep that fleet going for at least another 20 years (see ASPI's analysis of the frigate transition⁹⁴).

The Hunter class will be a significant step forward in capability from the Anzac class, which is absolutely necessary in light of the rapidly evolving threat environment. It's somewhat ironic that Defence previously refused to countenance the build of a fourth or fifth AWD to bridge the shipbuilding valley of death because it didn't think it needed more than three AWDs. Yet now it's essentially getting 12 AWDs; with its world-leading CEA phased-array radar, Aegis combat system and SM-2 area air-defence missile, the Hunter class is at least as capable an air-defence platform as the Hobart class. And it's even bigger (8,800 tonnes compared to 7,000).

Submarines

SEA 1000: Attack-class submarine (approved budget \$6,364 million; total IIP provision \$50 billion constant / ca. \$79 billion out-turned)

In April 2016, the government announced it had selected France's Naval Group (then DCNS) as its preferred partner for the Future Submarine Program. Defence submissions to the Senate have made it clear that the intent of the competitive evaluation process was always to identify a prime for the design and build process, not merely a design partner.⁹⁵

Figure 5.5: An artist's impression of the Attack-class future submarine



Image © Commonwealth of Australia, Department of Defence, [online](#).

While much commentary has suggested somewhat imprecisely that Naval Group had won the contract to build the 12 future submarines, that wasn't quite the case. A 'design and mobilisation' contract was signed at the end of September 2016, allowing the design phase of the program to start. The actual design contract couldn't be signed until negotiations over the strategic partnering agreement (SPA), which is essentially the head contract governing the entire program, were complete.⁹⁶ That process took two and a half years, with the agreement finally being signed in February 2019.

It's not entirely clear why it took so long (particularly in comparison with the future frigate project). Defence stated essentially that the reason was the sheer size and complexity of the program and the need to protect the Commonwealth's interests.⁹⁷ No doubt French industry policy and legal and technical cultures differing from Australian practices played a role. Almost immediately after the SPA was signed, the government and Naval Group entered into the design contract. There has been no build contract.

Meanwhile, Lockheed Martin Australia was announced as the preferred combat system integrator for the program at the end of September 2016. The core of the combat system will be the US Navy's AN/BYG-1, currently used on the Collins class. This will help provide continuity between the two classes, as well as interoperability with the US Navy.

Defence provided the program schedule shown in Table 5.1 to the Senate in May 2018.

Table 5.1: Future Submarine Program schedule milestones

Milestone	Date
Preliminary design review	Conclude March 2020
Critical design review	June 2022
Operation of the propulsion system land-based test site	Commence in 2022–23

Operation of the combat system physical integration facility	Commence in 2022–23
Construction of the first future submarine	Commence in 2022–23
Construction of the second future submarine	Commence in 2025–26
Sea trials for the first future submarine	Commence in 2031–32
Acceptance of first future submarine	2032–33

Source: Department of Defence response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, portfolio question no. 41, 2017–18 additional estimates, response dated 9 May 2018.

Construction of the first submarine is scheduled to start in 2022–23. Defence has said that, despite the delays in signing the SPA, all necessary work to keep the project on schedule was performed under the design and mobilisation contract.

The key date in terms of actual capability is IOC, and Defence did not provide that date with the other information in Table 5.1. Over the past year or so, the schedule for IOC does appear to have moved to the right, with the Chief of Navy stating publicly that IOC for the first submarine will be around 2034 or 2035. This is due to the extended test and evaluation process that will follow acceptance of the first submarine. Based on a two-year delivery drumbeat, the 12th submarine will enter service around the mid-2050s.

We analysed the implications of the future submarine schedule for the transition from the Collins class to the Attack class in some detail last year.⁹⁸ Based on a 2034 or 2035 IOC, it's likely that four Collins boats will need to undergo life-of-type extensions just to ensure the fleet doesn't fall below six boats during the transition.

Even though the schedule seems to be extremely long compared to other conventional submarine projects, Defence has said that the project is adopting a low-risk approach to key technology, so only currently existing technologies will be used in the first batch. Therefore, Defence has said it will still use traditional lead-acid rather than lithium-ion batteries, despite the latter being used on a recently launched Japanese submarine. It isn't entirely clear how this philosophy is consistent with the decision to use a pump-jet propulsor, which has never been used on a conventionally powered submarine.⁹⁹

It also raises the question of how the design is being 'future-proofed' in order to adopt emergent technologies and capabilities, such as unmanned and autonomous systems, that are likely to mature before 2035. While it's wise to avoid the mistakes of the Zumwalt program, which relied on too many developmental technologies, does the future submarine program's low-risk approach to technology, while good for project management, push risk into the resulting capability delivered by the submarines?

The IIP gives the total provision as \$50 billion. Defence has stated that this is a constant figure (that is, it's not escalated to take inflation into account). Once out-turned to make it consistent with other IIP provisions (such as the future frigate's \$35 billion), it's around \$79 billion.¹⁰⁰ That's what happens to numbers when things go for a long time with inflation ticking away in the background. So far, the approved budget is \$5,959 million, of which \$779 million has already been expended. Planned expenditure for 2019–20 is \$758 million, up sharply from \$361 million in 2018–19.¹⁰¹

5.3 Programmatic elements

As discussed above, the shipbuilding enterprise is not just an aggregation of three shipbuilding projects, but an enterprise seeking to develop an enduring design and construction capability. This is enabled by a number of programmatic elements.

Structural separation of ASC

In October 2016, the government announced that ASC Pty Ltd would be separated into three entities. Australian Naval Infrastructure (ANI), a government-owned company, would build, own and manage the shipyards at Osborne in Adelaide. This is to ensure that the government rather than a foreign shipbuilder retains control of the shipyards, allowing it to build the design of its choice for future classes of vessels. ANI was established in March 2017 and is managing the construction of the shipyards. The funding for the shipyard construction is being provided by the government, but it isn't possible from the PBS to determine exactly what's being provided by Defence and what by the Department of Finance (the owner of ANI).

A second entity would continue to sustain the Collins-class submarines. This entity has retained the name ASC Pty Ltd. A third entity, ASC Shipbuilding, would complete the AWD as part of the AWD alliance.

The way things have turned out in the wake of the transfer of ownership of ASC Shipbuilding to BAE is a little different from that. ASC Shipbuilding was established. It became a subsidiary of BAE in December 2018 and took ASC's shipbuilding workforce with it. However, the contracts to complete the AWD and to build the first two OPVs as a subcontractor to Lueerssen, the prime that won the OPV contract, have stayed with ASC. In another wrinkle, ASC Shipbuilding provides the workforce back to ASC to conduct the AWD and OPV builds.

Shipyards

The redevelopment of the shipyards is not being conducted under the shipbuilding projects but is being managed by ANI and funded separately.

Defence has consistently said that the cost of construction/redevelopment of the surface vessel shipyard at Osborne South would be up to \$535 million. It hasn't revealed precise details or provided the annual cash flow in the PBS due to commercial-in-confidence reasons. It has said that expenditure in 2017–18 was \$50.09 million.¹⁰² Defence has also consistently reported that the Osborne South shipyard will be completed in time to support the commencement of prototyping activities for the future frigate in 2020. The shipyard is intended to have capacity for vessels up to destroyer size (around 10,000 tonnes). This would not include large amphibious vessels or replenishment ships, which are not part of the NSP.

Figure 5.6: A model view of the new Osborne South Precinct in Osborne, South Australia



Image © Commonwealth of Australia, Department of Defence, [online](#).

Ground works on the submarine yard at Osborne North commenced in December 2018, although design work will continue through 2020, with a ramp up to full production in the third quarter of that year. The first buildings are scheduled for completion in mid-2021, and the main production facilities in mid-2023.¹⁰³

Collins-class full-cycle dockings (i.e. a two-year long deep maintenance and upgrade process) currently occur in a facility at Osborne North. Defence has informed the Senate that at some point it will run out of room to do everything (that is, to build new submarines and conduct full-cycle dockings of Collins) at the submarine yard. Therefore, it has investigated moving full-cycle dockings to ASC's facility at Henderson in Western Australia.¹⁰⁴ ASPI has suggested previously that deferring a decision on the location of future full-cycle dockings is likely to hamper planning for the optimal design of the site for future submarine construction.

Workforce

A lot of different numbers have been referred to in relation to the shipbuilding enterprise, as direct (shipyard), indirect (supply chain) and sustainment workforce numbers get conflated. Estimates hearings have tended to confuse rather than clarify the issue. Nevertheless, there have been some relatively consistent numbers, some of which go back to the original RAND report, and those numbers are also used in the NSP. The NSP described a requirement for a total shipbuilding industry workforce of around 15,000 (p. 68) directly or indirectly employed across acquisition, sustainment and supply chains. Demand for construction workers would 'peak at around 5,200 in 2026' (p. 67).

All stakeholders agree that developing the industry workforce will be one of the biggest challenges, not just in setting up the NSP, but in ensuring a successful transition to the future fleet. The plan will be a failure if Defence can no longer sustain its legacy platforms because workers sustaining them have moved on to the construction of new platforms.

Defence appears to have put in considerable effort, often working in a whole-of-government way, to identify strategies to develop the necessary workforce. In February 2019, Defence released the *Naval shipbuilding strategic workforce discussion paper* to inform the development of a workforce strategy for the shipbuilding enterprise. It included a table that listed the number of jobs that government announcements had stated would be created in the construction of each project (see Table 5.2)

Table 5.2: Naval shipbuilding construction workforce

Program	Direct jobs	Indirect jobs
Guardian-class PPB	200	200
Arafura-class OPV	400	600
Hunter-class frigates	1,500	2,500
Attack-class submarines	1,100	1,700
Total	3,200	5,000

Source: *Naval shipbuilding strategic workforce discussion paper*, p. 7, [online](#).

The paper adds that these numbers did not contain 'the full predictions of prime contractors', so it isn't entirely clear what the relationship between its 3,200 and the NSP's 5,200, or whether the 5,200 has been revised downwards. It's important to remember that one of the main goals of implementing continuous naval shipbuilding was to bring down the premium of local shipbuilding through greater efficiency. From that perspective, a lower number is better than a higher one.

The paper highlighted that, overall, the required shipbuilding workforce is only a small part of Australia's and indeed Adelaide's workforce. Nevertheless, there were significant workforce risks:

- competition between shipbuilding firms for workforce (pp. 15–16)
- difficulties for smaller companies in the supply chain to retain workers as larger shipbuilders grow their workforce (p. 16)
- competition with the Navy and Defence for workforce (p. 17)
- ‘broader labour market factors pose the greatest risk for workforce shortages in naval shipbuilding over the medium to longer term’ (p. 22) because growth in adjacent industries could ‘draw workers away from naval shipbuilding’
- conversely, ‘naval shipbuilding could draw workers from other industries [which] could exacerbate skill shortages in other parts of the economy and would not be in Australia’s overall interests’ (p. 22).

There have been headlines about lay-offs from the AWD and the government has approved \$29.4 million in funding to transition skilled workers from the AWD project onto submarines,¹⁰⁵ but overall it appears the worst of the valley of death has passed. In fact, competition for skilled workers has started; ASC informed Senate estimates that it was already losing Collins sustainment staff to other shipbuilding activities.

However, the worst is yet to come in terms of building up the shipbuilding workforce; the discussion paper assesses that the years from 2022 to 2030 would be the period of greatest workforce risk (that is, precisely when construction of the first frigate and submarine is starting). In February 2019, Defence informed the Senate that there were around 1,000 shipbuilding positions currently undertaking shipbuilding construction between the AWD, Guardian class and OPV.¹⁰⁶ So there’s still a long way to go.

Naval Shipbuilding College

Clearly, the way to break the cycle of robbing Peter to pay Paul is to grow the skilled workforce. One measure being developed to help do that is the Naval Shipbuilding College (NSC).

Defence signed a contract with the Naval Shipbuilding Institute on 1 March 2018 to deliver the NSC.¹⁰⁷ According to Defence:

the Naval Shipbuilding Institute (NSI) was formed with the sole purpose of delivering the Naval Shipbuilding College. The NSI team consists of:

- Kellogg Brown & Root—a global professional services firm, with experience in delivering national capability, including Defence training; and
- Huntington Ingalls Industries—leading US shipbuilder, training and workforce developer.¹⁰⁸

The NSC is not a bricks-and-mortar educational institute, or even an e-learning institute. Defence explains:

The Naval Shipbuilding College is working with industry to define enterprise-level workforce and skills requirements, and with education and training partners to best reflect those requirements in education and training programs. This includes working closely with providers to incorporate curriculum enhancements at a delivery level, and with the Naval Shipbuilding Industry Reference Committee to consider any required changes to national training package qualifications.¹⁰⁹

According to Defence, the implementation strategy for the NSC involves three phases:

- Phase One (2018): Engagement with industry including development of a communications strategy, a career awareness program, a register of interest and a focus on increasing key entry level qualifications (particularly trades);
- Phase Two (2020): Increased focus on developing professional qualifications.
- Phase Three (2022): Development of a dedicated facility providing key shipbuilding courses near Osborne naval shipyard (if required).¹¹⁰

The ‘if required’ suggests that the NSC might not ever be a bricks-and-mortar institution delivering training if other educational institutions are meeting demand.

The ANAO reported that as of December 2017 the estimated costs for the first phase of the NSC had increased from \$25 million to \$62 million.¹¹¹

Development of a design capability

In response to a Senate estimates question on whether an indigenous capability to design and not just build naval ships will be achieved, Defence wrote:

The contract is binding on ASC Shipbuilding, and requires ASC Shipbuilding to achieve the five key contract objectives—including to maximise Australian Industry Capability and contribute to Continuous Naval Shipbuilding. Under the Head Contract, it is intended that ASC Shipbuilding will have an independent capability to modify and evolve the design of, and construct, future complex warships as required by the Royal Australian Navy, based on either the design of the Ships under the Head Contract or another reference ship design made available to ASC Shipbuilding.¹¹²

That seems to imply that, once ASC Shipbuilding reverts to the Australian Government after the future frigate project, it will not necessarily have the ability to design warships from scratch. Rather, it will have the ability to modify or evolve an existing design. The future frigate project was approved only last year, so it’s reasonable to assume there’s still some way to go to develop that design capability.

Similarly, the NSP’s goal with submarines appears to be to have the ability to design submarines with an international partner, rather than completely independently. It’s not quite clear how much design capability is enough to meet the NSP’s intent. So far, Defence has established a design facility at Naval Group’s shipyard in Cherbourg that allows Australian Government, Naval Group and Lockheed Martin design teams to work together. It was opened by then Prime Minister Turnbull in July 2017. Defence informed the Senate in April 2018 that 31 Australian Government project staff were working there.¹¹³

Around the time of the SPA signing, there was a spate of announcements relating to partnerships between ASC and Naval Group and its key subcontractors and suppliers. This suggests that Naval Group will be drawing on ASC expertise and knowledge of Australian supply chains and operating concepts and conditions in the design of the future submarine. This is certainly a good thing.

5.4 What’s it costing?

ASPI analysed the cost of the NSP in some detail in Chapter 6 of last year’s *The cost of Defence*. Overall, we argued that the capital cost of the shipbuilding plan would potentially be in the order of \$3–4.5 billion per year, putting pressure on Defence’s overall investment plan. Also, since all three streams were building vessels that were much larger, more complex and, in the case of future submarines, more numerous than those they were replacing, the future operating costs were potentially at least three times as great. While

some more information has emerged since then and the government has approved more funding, that doesn't alter last year's assessment. Therefore, we won't repeat that analysis here but will focus on what we've learned since then.

It's all about the cash flow

It's easy to get distracted by the big numbers in the shipbuilding projects, IIP provisions and approved budgets. However, we've previously argued that it makes little sense to talk about the total cost of the shipbuilding program. Since it's continuous, there's no end point, so there's no total. As one project winds down, another will ramp up to ensure continuity of production, workforce and, necessarily, cash flow. Therefore, it's more important to understand the cash-flow requirements of the program. Table 5.3 gives both total budgets and 2019–20 cash flows.

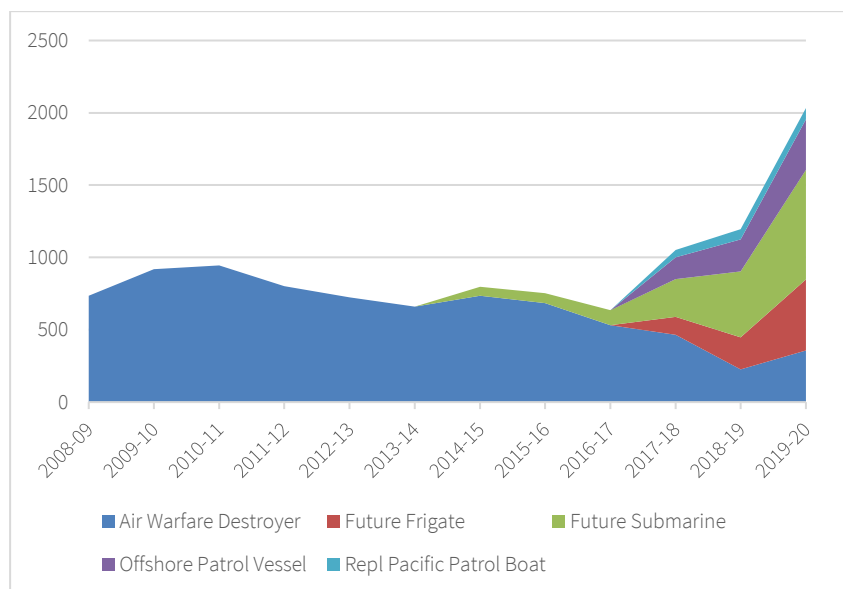
Table 5.3: Local shipbuilding project budgets

	IIP provision (\$ billion)	Approved budget to date (\$ million)	Expenditure to 30 June 2019 (\$ million)	2019–20 cash flow estimate (\$ million)
Air warfare destroyer (SEA 4000)	-	9,104	7,813	356
Future frigate (SEA 5000)	35	6,265	468	492
Offshore patrol vessel (SEA 1180)	-	3,725	360	349
Pacific patrol boat replacement (SEA 3036)	-	504	120	78
Future submarine (SEA 1000)	50 (constant) / 79 (out-turned)	5,959	779	758

Sources: PBS, IIP, advice from Defence.

Last year, we suggested that the program would reach around \$3.5–4 billion in annual cash flow by the early 2020s. In 2019–20, the program will exceed \$2 billion (Figure 5.7). And that's well before the two biggest projects in it—future frigates and submarines—start construction.

Figure 5.7: Local shipbuilding cash flow (nominal \$m)



Source: PBS.

We also suggested last year that Defence will have spent at least \$20 billion between the future frigate and future submarine projects before they achieve IOC (in around 2030 and 2035, respectively). Developments over the past year reinforce that judgement. For example, it's consistent with the statement by the head of

the Future Submarine Program to the Senate earlier this year that the budget to complete the design process would be ‘in the order of \$4.5 billion’.¹¹⁴

The approved budget for the Hunter class now stands at over \$6 billion, and that doesn’t include the acquisition of any ships. Similarly, the approved budget for the Attack class is also \$6 billion now, and that also doesn’t include the acquisition of any boats (although those sums are likely to include funding to acquire ‘long-lead’ items, such as motors and elements of the combat system that will be installed on vessels). Those amounts mean the future frigates and future submarines now have the third and fourth biggest approved budgets in Defence’s portfolio (behind the JSF and AWD).

Impact on the wider investment program

There’s little doubt that the shipbuilding program is putting cash-flow pressure on the rest of the investment program, and potentially more broadly across Defence. The ANAO has reported that the government’s initial decision in July 2015 to accelerate the build of the OPV and future frigate in an attempt to prevent a workforce valley of death added around \$5–6 billion to the ‘capital and operating program’ out to 2024–25. To offset this, Defence advised government that ‘a range of capability trade-offs would be necessary, including the cancellation, deferral, and reduction of scope and funding provisions for projects across the Defence portfolio.’¹¹⁵

The ANAO has also reported that ‘Defence was aware that there may be a need to adjust the funding profile for the Future Submarine Program by approximately \$6.9 billion to cover the period between 2019–20 and 2031–32, before the first submarine was completed.’¹¹⁶ That would mean more cancellations, deferrals, and reductions in scope and funding provisions for other projects.

The government and Defence haven’t published any information on what specific trade-offs were needed to free up the necessary cash. This may be a reason why the government has been reluctant to publish an updated IIP, as it would show the extent of project delays and reductions.

That’s not the totality of the Navy’s investment cash-flow needs

We should note that the five projects covered here aren’t the full extent of Defence’s naval investment portfolio. Several very substantial upgrade projects on Anzac frigates and Collins submarines are listed in the PBS, as well as the build in Spain of the Navy’s replenishment ships. Those total a further \$547 million in 2019–20. The Navy’s combat helicopter project adds \$113 million to that. In addition, there are weapons projects such as the upgrade of the Navy’s SM-2 missiles and development and acquisition of the upgraded evolved Sea Sparrow missile, which don’t make the cut for the PBS’s top 30 table.

The IIP also programs additional future acquisitions of the SM-6, an advanced air-defence and ballistic missile defence missile, a future naval strike weapon, and so on. In addition, there are the ‘glue’ capabilities that integrate these systems, such as satellite communications, data links, electronic warfare capabilities, maritime test ranges and so on. In short, the \$3.5–4 billion annual cash flow needed for the local shipbuilding program is only part of the picture.

What does it mean?

In summary, the component elements of the NSP have made substantial progress. Not surprisingly, the least complex elements—the OPV and surface shipyard construction—have made the most progress. The way forward for the future frigate program is clearer with the selection of the Type 26 and the establishment of the commercial arrangement between BAE and ASC Shipbuilding. The revision of the frigate project’s schedule mitigates risk, but of course means IOC has moved to the right. The signing of the SPA assuages

some concerns about the Future Submarine Program, and Defence is adamant that it remains on schedule. Over the past year, the schedules for both frigates and submarines have crystallised and, even if IOC for both is still a long way off, at least we know what we're planning for.

But risks remain. They include developing the workforce necessary for the new projects while preserving the workforce needed to sustain and upgrade legacy capabilities. Both the frigate and the submarine projects still have substantial technical issues to resolve. The cash flow necessary for three major shipbuilding projects is putting a strain on Defence's capital budget.

But perhaps the biggest risk is something we haven't discussed, and that's capability risk. Will the projects deliver the capability the ADF needs when they arrive and in the years beyond? We examine that risk and consider hedging strategies to address it in the next chapter.

Chapter 6: How to hedge in maritime (and other) capability

Key points

- Manned combat vessels are designed to counter all likely threats. Because threats are proliferating, manned vessels are increasingly complex and expensive.
- As a result, they cannot be procured in large numbers, making them too valuable to risk losing.
- Unmanned and autonomous systems employing artificial intelligence offer the potential to break out of this cycle as well as provide an advantage over those who don't.
- Defence needs to invest more heavily in developing such systems as a hedge against future platforms becoming unaffordable or obsolete.
- Those systems need to be integrated not just into future platforms but also into Defence's legacy platforms, which will need to serve far into the future.

6.1 Will the Naval Shipbuilding Plan deliver the required capability?

Fast, cheap, good—pick two

There's a guideline in the business world: 'Fast, cheap, good—pick two.' In the defence context, 'cheap' means equipment at a price point at which you can afford enough of it to meet your requirements. In other words, cheap equals 'many'—that is, mass. Unfortunately, when it comes to the development and acquisition of military systems, just getting one of the three can be challenging.

The core of the problem is that it's increasingly difficult to deliver 'good'. As threats proliferate, systems get more complex so that they can defend themselves against all of them. The evolution of the future frigate is a case in point; we have an antisubmarine frigate that's also become an air warfare destroyer so it can defend itself against air threats. It will likely need to evolve further to cope with new threats like hypersonic weapons. Designing and building complex things takes a lot longer than for simple things. And, of course, they cost a lot more. There's also the risk that the compromises involved in being able to do many things reasonably well mean the system can't do any of them as well as a system optimised to do just one, i.e. the Swiss army knife conundrum.

Because of this, Western navies have been shrinking as the emphasis on good has outweighed cheap. There have been attempts to break out of the cycle. The US Navy's littoral combat ship program sought to prioritise cheap and fast, but that meant it delivered something that wasn't very good. It couldn't defend itself and didn't pose much of a threat to the enemy. It was intended to take a flexible, multi-role approach in order to overcome the mass problem by switching in and out of tailored modules for specific roles. It turned out that this meant it wasn't very good at any role. So, first, the modular approach was abandoned, and now it appears acquisition of further vessels will be too, well short of the originally planned number of ships.¹¹⁷

Similarly, the Royal Navy's attempt to develop a cheap frigate, the Type 31, has run aground on the rocks of affordability. One of the key measures of 'good' is 'can defend itself against likely threats', and you can't do that on the cheap.

On occasion, programs don't even deliver one of the three. The US Navy's DDG 1000 Zumwalt-class destroyer is the current poster child. It's not fast, having not entered service despite the program starting 18 years ago. It's not good; it was designed to provide naval gunfire support in littoral operations, but it appears that two key elements of its gun system, namely the gun and the round it fires, may not ever work, and the US Navy is desperately searching around for another role for it. And it's certainly not cheap. After development and procurement costs soared, the navy cut planned quantities back from 32 to just three. That means each of those three will cost about US\$8.5 billion. And ship 3 may get cannibalised to deliver ships 1 and 2. It's possible to spend US\$25 billion and not get anything much for it.¹¹⁸

This isn't to say Australia's Naval Shipbuilding Plan is heading the way of the Zumwalt. But before we get too smug, we should note that should the future submarine program deliver on its current schedule it will still be 25 years after the program started. Nearly all the Collins boats will need a 10-year life-of-type extension and most will be in their forties by the time the Attack class replaces them. It's not going to be fast. But will it be good or cheap?

Will the Naval Shipbuilding Plan deliver good and cheap?

That's a difficult question. There are different ways to answer it. There's no evidence that the platforms will not deliver against the original capability requirements. One assumes that the preferred designs were selected in large part because they provided the best options to meet those requirements. But, since we're not getting 'fast', will those capability requirements still be valid when the first vessels are delivered, and then throughout their service lives?

On a platform versus platform basis, the future frigate and future submarine are likely to be as good as anything they're up against. Undersea warfare is an area of military technology where the US has an advantage over China and is likely to retain it for some time to come. By virtue of being able to draw on US weapons and combat management systems as well as 'best of breed' European technologies and our own homegrown innovations, the Attack class and Hunter class will be very capable.

It's difficult to say that they're cheap, if cheap equates to mass. Through massive investment, the Navy is bucking the trend of shrinking numbers in other Western militaries. The Royal Australian Navy will likely have more Type 26 frigates than the Royal Navy. But even this investment doesn't really give the Navy mass, particularly if it has to operate without the US. Under the three or four to one rule of thumb (you need three or four platforms to sustain one on operations), the Navy's fleet of 12 major surface combatants will sustain three or four ships at sea. It's hard to see how this can protect Australia's sea lines of communication. Similarly, 12 future submarines will probably at best sustain an ongoing presence of two boats in the areas far offshore where Australia's submarines are designed to operate.¹¹⁹

And that's without accounting for combat losses. When you have very few platforms, the risk of losing even a small number becomes prohibitive. And it's getting much more dangerous out there.

It's getting more dangerous out there

Many commentators have noted the proliferation of anti-ship cruise missiles (ASCMs) both globally and in our region. Even non-state actors have used them successfully to sink or disable ships (such as Hezbollah in Lebanon and the Houthis in Yemen).

ASCMs are essentially kamikazes. US Navy and RAN ships were nearly overwhelmed by waves of kamikazes in the later stages of the war against Japan, despite the dominance the allied navies and air forces had achieved over the Imperial Japanese Navy. Like kamikazes then, ASCMs now are essentially a cheap, disposable asymmetric

weapon that can be deployed in mass—something China understood well in developing its anti-access/area-denial strategy.¹²⁰

Already much of the complexity and cost in designing and building warships is to enable them to defend themselves against ASCMs. For example, the future frigate's radars, AEGIS combat management system, vertical launch cells and evolved Sea Sparrow and SM-2 missiles carried in the cells are there to defeat ASCMs. That task is going to become even more challenging with the deployment of anti-ship ballistic missiles (which China has already done), hypersonic missiles that can potentially overcome any existing defences, and electromagnetic rail guns that can fire extremely fast projectiles great distances (both of which are under development in China and the West).

It's likely that defences of varying degrees of effectiveness will be developed to counter those threats, but installing them on warships will necessarily increase their complexity and hence their cost and schedule. So, preserving 'good' will have further impacts on 'fast' and 'cheap'. Moreover, the focus on defensive measures to ensure survivability has meant our vessels have limited offensive power. The AWD project spent nearly \$9 billion getting eight Harpoon anti-ship missiles to sea, so there's also a major opportunity cost in terms of being able to deliver other effects.

And for all that, the battle between a warship seeking to defend itself against those seeking to disable it with anti-ship missiles is a bit like the calculus in counterterrorism. The ship must get it right every time, but the side launching missiles against it only needs to get lucky once. And the value-for-money calculus is similarly asymmetrical—a \$1 million missile versus a \$2 billion ship.

Do we need to rethink the balance between 'cheap' and 'good'?

Defence's focus on 'good' at the expense of 'cheap' may be valid when:

- the RAN essentially plugs into larger, generally US-led taskforces and mass is provided by the US
- it needs to provide only a small number of vessels for any particular task
- it can rely on technological superiority provided by access to US and other Western systems, enhanced by superior training and readiness
- losses are unlikely.

But it can't be assumed that those conditions will continue to hold.

Can unmanned and autonomous systems break out of the vicious cycle?

Emphasising 'cheap' won't break the cycle. We've seen from the US littoral combat ship and UK Type 31 frigate programs that focusing on cheap means you get something that's not good. In particular, it's something that's not good at protecting its crew. And that gets at the heart of the problem: designing systems that keep their precious cargo of humans alive is difficult and expensive.

So, taking humans out of the platform has advantages. You don't need to design the platform to keep them alive in hazardous environments like the undersea domain. You don't need to incorporate space, weight, power or fuel to support them. You can design unmanned systems for performance that would kill humans, whether it's high-G turns, ocean depths or extended endurance. So unmanned systems can achieve the same or greater performance (such as speed or range) than bigger manned platforms. They certainly can achieve much greater

presence, particularly if they can go to ‘power down’ on station and be reactivated when necessary. There’s nobody on board you need to feed while the platform waits on the bottom.

Because you don’t need to defend the crew, you don’t need to design the platform to defeat all potential threats. Therefore, its design can focus on doing one thing well rather than making compromises to allow it to do a lot of things poorly and avoid the Swiss army knife conundrum. Things designed to do one task well with minimal compromises are generally better at doing that one thing than things designed to do many tasks.

Much of the cost of military platforms is due to the need to keep the crew alive, as is much of the complexity of design. Remove the crew, and the cost, risk and schedule needed to design and build the platforms decreases dramatically. That’s why new entrants such as Leidos, known as a data and intelligence company rather than a shipbuilder, have been able to build a reasonably sized unmanned surface vessel at a fraction of the cost of a manned ship. Because cost, schedule and risk decreases, the design cycle is faster, so unmanned and autonomous systems also have great potential to achieve ‘fast’ as well as ‘cheap’. That also means that they will improve much faster than manned systems.

Disadvantages

Clearly, there are disadvantages, which have been listed many times, to uninhabited autonomous systems.

Unmanned doesn’t necessarily help that much if not combined with autonomy. You may have removed people from the platform, but you still need just as many people—they’re just working from somewhere else (albeit in safety).

Certainly, autonomous and unmanned systems present ethical issues, but there are also ethical issues about continuing to put humans into lethal situations when there’s no need to, particularly if they don’t enhance capability.¹²¹

Unmanned and autonomous systems are unlikely to ever be completely autonomous. They’ll need to check back in to get updates on their missions. Since a primary role will be to collect surveillance data, they’ll need to transmit that back regularly. That data, which there will be lots of as sensors multiply, will need to be processed, analysed and used to develop courses of action. If autonomous systems are using weapons, there will need to be a command and control loop that a human sits in or on.

In short, autonomous and unmanned systems need a very robust, reliable command and control network than can resist disruptions such as jamming, spoofing, cyberattack or the destruction of key nodes like satellites. That network will need high levels of redundancy. In fact, the network is more central to the system than the platforms themselves, and likely to cost more than the platforms. Designing and delivering the network is certainly a non-trivial task. But it has to be created anyway, since modern manned platforms are already datacentric and have limited ability to function without the network; and that network is already being created.

In many cases, human presence on the ground (or water) will continue to be necessary. But it may be in lower threat environments where a human adds most value conducting border protection or disaster relief, and dealing with scared civilians or ethically complex situations. It’s not clear that in the future they will add much when trying to defeat a flight of missiles incoming from different directions at Mach 3. If humans do bring something to that fight, they might not need to be on the vessel targeted by that missile to do it. Rather they could be far away in safety. So it may well be that the OPV has a longer future than the future frigate.

The biggest challenge with autonomous systems appears to be trust. At what point will we trust them to reliably perform a role traditionally performed by a human? In fact, they may already be performing the role, but if we

don't trust them to perform, there will still be a need for the overhead of keeping people in the system. It takes time to develop trust, but it can be done.

Sustaining innovation versus disruptive innovation

It's important to avoid the potential trap of approaching unmanned systems as direct, like-for-like replacements for manned ships. To do so is a fundamental failure of imagination. It also runs the risk of being like organisations that ignored potentially disruptive innovations because those innovations couldn't immediately do the organisation's core business, as it saw it, better.¹²²

Autonomous systems offer great asymmetric potential. They might not be able to do a manned submarine's job better than a manned submarine, but they could complicate a submarine's operating environment to the point that its effectiveness is seriously degraded. Large numbers of small unmanned systems can get a lot of sensors into the water cheaply. Long-range underwater vehicles could stealthily deploy smart mines off an adversary's submarine bases, confining that very large investment to port. Large numbers of inexpensive autonomous systems could apply submarines' key strength back against them, that is, creating uncertainty about where the threats actually are.

Small unmanned vessels aren't direct competitors to the future frigate. Rather, they offer the potential to get a lot of sensors into the battlespace very cheaply (Figure 6.1).

Figure 6.1: Ocious's BlueBottle unmanned surface vessel



Source: *Autonomous Warrior 2018*, *SLDinfo.com*, 1 April 2019, [online](#).

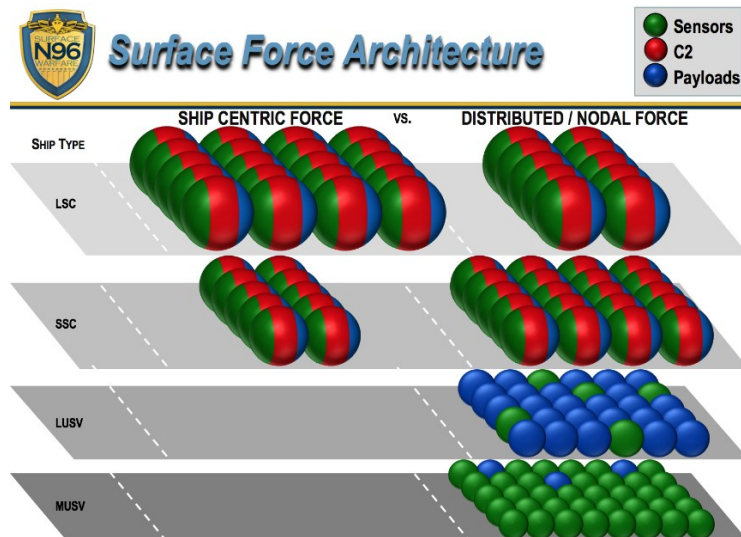
They also offer potential to augment the weaknesses in manned platforms' capabilities. Because they can focus on one particular task, they can do it more cheaply. For example, they could act as sensors out on picket duty far ahead of a manned ship or submarine, or as arsenal ships simply carrying missiles to compensate for manned ships' limited number of launch cells.

The near future is human-machine teaming

The US Navy is looking at ways to break out of the vicious affordability cycle by using unmanned systems. While it hasn't definitively given up on its hopes for a 355-ship fleet, it appears to have simultaneously realised that it can never reclaim the mass it formerly had by building manned ships, and it certainly can't achieve it over China, which can build at least as fast.

Therefore, it has adopted a hedging strategy involving autonomous systems. It's been experimenting with its large and medium unmanned surface vehicle programs for several years and has ordered more vessels, but they won't replace manned warships any time soon. Rather, a large number of relatively small USVs will allow a reduction in the number of manned vessels, as the distributed/nodal force depicted in Figure 6.2 illustrates.

Figure 6.2: US Navy's distributed/nodal force



Source: Megan Eckstein, 'Sea Hunter unmanned ship continues autonomy test as NAVSEA moves forward with draft RFP,' USNI News, 29 April 2019, [online](#).

It's important to note that even the small surface combatant in the US Navy's concept is still a large frigate roughly equivalent to our navy's future frigate.¹²³ As well, the US Navy will continue to operate its destroyers, which are bigger again, so it's not getting out of the manned ship business any time soon. Rather, its future model relies on manned and unmanned vessels teaming together. Unmanned vessels will provide increased numbers of sensors as well as payloads, such as weapons.

The ADF and autonomous systems

The ADF is exploring unmanned systems. For example, the Army has fielded microsurveillance UAVs down to the platoon level and is working with industry on the potential for UAVs to deliver logistics support in the field. It's also exploring small unmanned ground vehicles to support troops in the field, both in logistics roles and as platforms for sensors. At the moment, the Army's efforts appear to be focused on unmanned, rather than autonomous, systems. Overall, they appear to support rather than to replace humans.

The RAN has adopted a crawl, walk, run approach to fielding UAVs on its vessels. It's doing good work in getting systems to sea to learn how to use them and understand what they offer. It's also been experimenting with unmanned underwater vessels (UUVs) for mine clearance for several years. It appears that through that work Defence has developed sufficient trust in autonomous systems to now have enough confidence to remove the human from the minefield. This is a major milestone.

The RAAF's efforts are mixed. Strangely, it currently doesn't operate any UAVs. It is acquiring large UAVs—the armed Reaper, well known through its performance in theatres such as the Middle East, and the unarmed Triton, a high-altitude, long-endurance maritime surveillance system. Both are providing significant capability enhancements to the ADF, but in some ways they're similar to traditional aircraft in being exquisitely capable yet exquisitely expensive. They remove the human from the battlefield, but still require substantial numbers of humans.

While this aspect of the Air Force's engagement with UAVs seems rather conservative, the recent launch of Boeing's autonomous Wingman, developed in Australia, seems extremely audacious and a bold leap into human-machine teaming in the realm of air combat. Despite the high-profile launch ceremony, details on what the operating concept is are a little thin. But there's clear evidence that the Air Force is thinking about future human-machine teaming through concepts such as augmented intelligence.¹²⁴

Overall, the ADF probably gets a mixed scorecard and that's because, from the outside at least, autonomous systems don't seem to be a high priority. A lot of the effort is funded by the services' Minors Program and Innovation Hub grants. In the grand scheme of things, that's not a lot of money. Minors are about \$123 million in total this year and only part of that is going on emergent technologies. Innovation Hub funding is about \$64 million per year. No doubt there are a lot of smart people in Defence who are looking at this challenge already. Is it enough? Evidence of a shift in the IIP is thin. It's hard to know the extent to which Defence's plan already incorporates substantial investment in autonomous systems when there hasn't been an update to the IIP in over three years.

6.2 How to not to hedge

It seems unwise to put all our eggs in the one basket of low numbers of exquisitely expensive manned platforms—but considering the cash flow and schedule of the future submarine and frigate projects, we seem rather close to doing that. It would be wise to hedge.

Double down on doubling down

On the spectrum of hedging options, there are two extremes we should probably avoid. One is doubling down on the current strategy. This would involve spending more to get the future frigates and submarines more quickly. By investing more in the design (and potentially accepting a little more risk), the build could be accelerated. More investment could also accelerate the delivery drumbeat from one vessel every two years possibly even to one a year. That would get improved capability sooner, but it would still have the limitations we have discussed.

This approach would cost a lot. If Defence has a cash-flow problem already, this would make it much worse. And it wouldn't break the vicious cycle of exquisitely complex yet exquisitely expensive manned platforms. It wouldn't create more mass in the long run, and it wouldn't solve the problem of putting humans into an increasingly dangerous environment.

Cancel the manned megaprojects now

At some point, manned combat vessels will be obsolete. So, another approach at the other end of the spectrum of options would be to get ahead of the curve and cancel the future frigates and submarines right now. That would free up a lot of resources to put into unmanned systems. Essentially, we would rely on legacy platforms to get us through the transition to a force entirely of unmanned vessels. Theoretically, putting those resources into the development of unmanned systems and the network that enables them would reduce the length of that transition.

Obviously, the disadvantage to this is that we don't know when unmanned systems will be mature enough to do everything we need them to. We don't know whether the combined power of manned systems complemented by autonomous ones might prove to be the right answer in the longer term. There will almost certainly be a tipping point to much greater reliance on autonomy, but we don't know when. It would be a very brave Chief of the Defence Force who recommended this to the government any time soon. But we will need to make the decision to turn off further construction of manned systems at some point, and many people looking at this

issue think it will be well before we get to the end of the Future Submarine Program. It's important that when the time comes the decision is made on capability grounds, not industry grounds.

But Defence has set a precedent. It has already decided to retire its manned minehunters and replace them with autonomous systems (operated from a manned support vessel) around the mid-2020s.

Limit the size of the megaprojects

One might think that deciding now to limit the future submarine fleet to, say, six boats to save money could help manage affordability and free up resources to hedge. But it won't. Construction of boat 7 won't start until around 2035, so it won't have any impact on cash flow for another 15 years or so. It's not a useful hedging strategy right now.

6.3 How to hedge

There are, however, things that Defence can do to hedge, in order to ensure that it will have the capability it needs both before the future platforms arrive and after.

Ensure that future manned platforms are future-proofed

Defence needs to ensure that platforms currently being designed and built are designed for human-machine teaming. The designs of the Arafura-class OPV and Hunter-class frigate already have potential for that. The Arafura class is well suited to deploy small UUVs and USVs. It has a flight deck that can support containerised UAVs of the kind that the Navy is already experimenting with. The Hunter class has a utility space that could be used for a wide range of purposes. In fact, that's the beauty of the design—it has space that could be used for anything. Of course, the Navy will need more than just physical space to integrate future systems into human-machine teams, but at least the designs have potential.

That may not entirely be the case with the Attack-class submarine. The current strategy is to use only currently mature technologies in the first batch of boats. Future technologies will be incorporated in later batches. That seems sensible. It's important to limit the number of new things to control risk—a rerun of the long and winding JSF development story is not what we need. The batch or block build strategy parallels the US Navy's approach to the Virginia class, which has evolved over time to incorporate new technologies. But if the basic design isn't suited for evolution, for example by preserving space and weight and considering how to launch and recover future systems of different sizes, it will limit what can be done in the future.

Moreover, we will only have Batch 1 boats (plus legacy Collins) until the early 2040s, so even Batch 1 needs to be designed to incorporate autonomous systems and emergent technologies. We can't wait until some time in the 2040s for the first submarine that has something other than current technologies on it to finally show up.

The new government needs to assure itself that the design of all future platforms, and the Attack-class submarine in particular, are being future-proofed so that they can readily incorporate future technologies. In the case of artificial intelligence, it's hard to class what is already in widespread use commercially as 'future technology'.

Build advances in autonomy and artificial intelligence into existing platforms

Many of the technologies that will enable future autonomous platforms have utility for our current manned platforms. Since we'll be reliant on those legacy platforms for many years to come, it's essential that we continue to enhance them through the integration of those technologies during the transition to future platforms. For example, artificial intelligence (AI) that optimises the performance of combat management systems to defeat air

and missile threats has as much utility to an Anzac frigate as it does to a potential future autonomous platform. AI that can optimise a 'swarm' of USVs can also be used to optimise the mission profile of legacy ships and aircraft, and, in the light of the small number of manned platforms in the ADF, it's probably even more important to optimise their mission profiles.

The government also needs to assure itself that the programs that will extend current platforms such as the Anzac and Collins class out through the transition to the future platforms are conceptualised as opportunities to develop, test and incorporate future technologies.

We do want science experiments

Defence must get beyond its deeply ingrained mentality of 'We don't want any science experiments.' In fact, that's exactly what it needs. One of Defence's two main innovation programs, the Innovation Hub, restricts itself to funding projects that seek to deliver an identified solution. Again, this runs the risk of following the path of good organisations that missed disruptive innovations until it was too late because they focused on incremental improvements in how they currently did their core business.

Defence needs to invest in projects the outcome of which isn't known. That's why something like an Australian version of the US Defense Advanced Research Projects Agency (DARPA) is vital, as we discuss in Chapter 7. There are a lot of potential models for what it could look like, but it has to sit outside the Department of Defence. Defence is exploring unmanned systems. The trap with this is that if it is seen merely as a fall-back or hedging strategy, not the main game, it will be treated as second best and resourced accordingly. When the traditional 'too big to fail' platform projects run short of cash or people, the innovation space will be raided.

Put more money into innovation

We are happily putting \$4.5 billion into the design of the future submarine. Yet all of Defence's innovation programs are less than half a percent of Defence's annual budget. Why are we so hesitant to invest more heavily in innovation, particularly in unmanned and autonomous systems employing AI that almost certainly are the future?

The NSP is probably putting significant cash-flow pressure on Defence's investment budget, as we have discussed, but that doesn't justify failing to invest in the technologies that will be central to war-fighting in the future.

Think programs, not projects

In recent years, Defence has focused on treating capability as programs, not just projects. This is a very good thing. Prioritisation and funding decisions for individual platforms and subsystems only make sense when they're seen as part of a broader capability program. Defence has restructured its investment program and capability development processes to address this.

The problem is that the big dollars are still in the big projects in the Major Capital Investment Program. At the moment, innovation programs are less than 1% of Defence's budget, whereas the overall capital investment budget is around 30%. If Defence wants to take innovation seriously, it needs to tap into those dollars. One of the constant suggestions from the defence industry on how to improve defence industry policy is to have a clear path from innovation and experimentation to actual acquisition funding.

As an example, SEA 1000, the future submarine program, could be regarded as an undersea capability program. Several billion of its \$50 billion budget could be quarantined to develop and acquire complementary autonomous undersea systems. This might reduce the capability of the submarine itself, but generate a greater

overall undersea warfare effect. It would also make SEA 1000 'self-hedging' to an extent in addressing capability risk and obsolescence.

Don't delay

The best strategy is likely to be a combination of these hedging measures, but Defence needs to get more serious about it now and not defer additional investment in innovation until after a potential White Paper or strategic review. As Steven H Walker, the head of DARPA, recently said, 'the key to autonomy, particularly in the ocean, is getting out and experimenting, testing how these things work.'¹²⁵

Chapter 7: After the election

7.1 Election issues

The government's election policies

During the election campaign in the area of defence, the Coalition essentially ran on its record of increasing funding and spending it.¹²⁶ And it's a very solid record, so why not? As we've noted, the government has delivered the funding promised in the *2016 Defence White Paper* and record amounts of cash are going out the door to industry. But that basically meant the platform was a shopping list that was largely unchanged from the White Paper, albeit adjusted in accordance with some announcements that pre-dated the election.

The government made a few additions to the shopping list during the election. As we've discussed in Chapter 5, the replacements for the Navy's minehunters have been advanced, transitioning it faster from having manned ships in the minefield to autonomous and unmanned systems able to operate at a distance from non-specialist platforms. There was a surprise announcement about building 30 self-propelled howitzers in Geelong. We hope there's more to this plan than the guns themselves, as there's no way to economically set up a production line just for 30 vehicles, and self-propelled howitzers don't really seem to be one of the 10 strategic industrial capability priorities for which paying a premium for domestic production is justified on strategic grounds.

2% of GDP versus the White Paper's fixed funding line

One issue around funding that would be useful for the government to clarify is the fundamental issue of 2% of GDP versus the 2016 White Paper funding line. The election platform refers to 'restoring defence spending to 2% of GDP' by 2021–22. But what comes after that? As we have noted in Chapter 2, the White Paper line grows past 2% and reaches around 2.2% by the end of the forward estimates and stays there for the remainder of the decade until 2025–26. The difference between 2% and 2.2% may not sound like much, but in dollar terms the difference reaches \$5 billion per year and \$22.4 billion in total over the rest of the decade.

The funding line in PBS 2019–20 keeps rising past 2% out to 2022–23, so it appears the government is still planning to stick to the White Paper funding line, but it would be useful for the defence industry and the public to know whether that's still the target. If the government has adjusted it downwards to something closer to 2%, it will cause Defence planners a major headache.

7.2 The post-election policy agenda

Money is important. But the election platform was a little short on, well, policy. Certainly, an election campaign probably isn't the ideal environment to publicly hash out key questions of strategic policy relating to things like the rise of Chinese power and the US alliance. But, as Chapter 1 suggested, serious consideration of those questions can't be put off.

ASPI has recently published *Agenda for change 2019: strategic choices for the next government*, which is a volume of essays identifying key strategic and security challenges and proposing policies to address them.¹²⁷ We won't repeat that work here, but we will extract some common threads that recur in those essays that are of relevance to the defence budget and capability.

A new White Paper

Addressing the rise of Chinese power and the alliance is the place of strategic policy work set out in statements such as white papers. It's probably time for a new one that breaks out of the old mould and really engages with

what a powerful and increasingly aggressive Chinese state means for us and for the alliance. We can't keep saying we've failed to anticipate the pace of growth in China's economy, military and overall power and not draw relevant policy conclusions.

If the recommendations of the First Principles Review have been delivered, Defence should have the information and tools needed to produce a new Defence White Paper faster than it's previously taken. But the First Principles Review won't provide what Peter Jennings's essay suggests is in shortest supply—imagination. Lateral thinking and a willingness to break the rules of the policy bubble are essential. The world hasn't followed the expected narrative since the end of the Cold War. Our thinking and public policy shouldn't either.

If the government is concerned that the optics of a new Defence White Paper signal a change of course, or that the old one got it wrong, then just call it a 'strategic update'.

Are we getting the right force?

The government is spending a lot on acquiring capability, but the next White Paper needs to confirm whether it's the right capability. The force presented in the *2016 Defence White Paper* is largely the same as that outlined in its 2009 predecessor. A lot has changed in the world since then.

The White Paper force is one that to a large degree is designed to plug into a US-led coalition. The new White Paper needs to state whether this is still the goal. Essentially, it needs to identify what we really need to be self-reliant in (that we can actually achieve) and what we can rely on allies and partners for. It needs to be pragmatic; the ADF can't be structured to do everything itself, so hard decisions about prioritisation are necessary.

Emergent technologies

Many of the essays in *Agenda for change 2019* argue that more substantial investment is required in emergent technologies, such as autonomous and unmanned systems, space and artificial intelligence. These capabilities should be regarded as the main game, not something we should dabble in with whatever funding and effort is left over from the megaprojects building traditional manned platforms. Those platforms themselves will at some point become irrelevant if they don't incorporate those emergent technologies. Defence has innovation programs, but they're just the tip of what we need to be doing.

Concepts and frameworks for using new technologies, not to mention trust in them, can only be created and tested by experience using new systems. This needs to move to a level greater than just trials, tests or experiments.

An Oz DARPA

Lessons learned from the private sector repeatedly demonstrate that large organisations focused on doing their core business better can't also push disruptive innovations that challenge and change that core business in uncomfortable ways. Even though those disruptive innovations can blow their core business away, the best run organisations have great trouble anticipating, fostering and adopting them. So the organisations themselves are blown away.

One way to get around this is to set up separate entities whose sole purpose is to develop disruptive innovations. The US's Defense Advanced Projects Research Agency (DARPA) has been extraordinarily successful in developing disruptive technological innovations. Many contributors to *Agenda for change 2019* say it's time to try something similar here. But it has to sit outside Defence. Otherwise its focus will inevitably be restricted to incremental improvements that help Defence do its current business a little better.

Industry policy

There's widespread support in industry for the government's Defence Industry Policy, particularly since it's backed up by dollars. Granted, it's taking both Defence and its industry partners time to fully think through the potential of the concept of industry as a fundamental input to capability as well as to improve some of the ingrained cultures that have hampered a truly productive relationship. But it's going in the right direction.

Kate Louis's essay offers suggestions for further improvement. Following up on industry primes' Australian industry capability plans is essential to ensure local industry is getting the investment it needs to develop the indigenous industry capabilities that Defence needs. Getting industry involved earlier in the force design process will get the best minds in Defence and industry solving problems. Also, as discussed already, we need greater investment in local industry and academia to foster the innovation necessary to maintain the ADF's capability edge.

We believe that the Defence Export Strategy could consider pursuing markets for low cost, consumable Australian systems. Australian industry can do this well, plus it would support the ADF's own requirements.

Towards a better conversation around capability and investment

Kate's essay makes a further point that should be considered more fully. Industry and commentators have repeatedly noted that the Integrated Investment Program that accompanied the *2016 Defence White Paper* contained less information than the Defence Capability Plan that preceded it. Even basic information such as project names and numbers are missing, let alone crucial information on scope or requirements. The more detailed online version and the frequent updates promised in the White Paper have never eventuated, so there's no way to know whether the schedule information is still relevant. It's hard for industry to make plans and invest to ensure it has the ability to meet Defence's requirements if it doesn't know what they are or when Defence will need solutions.

There's a deeper problem here. Defence consistently presents its 10-year (or longer) White Paper plans to government as 'fully costed', and government in turn presents them to the Australian public as 'fully costed'. The force contained in those plans is supposedly designed to perfectly meet Australia's future military requirements, and Defence's funding has been precisely set to deliver and support that force. In this construct, any deviation from the plan can only be seen as a failure, whether it's a delay to project schedules, an adjustment to scope, or the inclusion of additional requirements in the plan.

But Defence and the government are only setting themselves up for failure because there's no way the investment plan can be fully costed. Nobody can know their exact requirements years in advance, so you certainly can't know the solution that meets those requirements. And if you can't know the solution, you can't know what it costs. Industry understands this, which is why its own investment plans don't extend more than a few years into the future. In fact, corporate planning cycles have shortened in light of rapid disruptive change.

As the old saying goes, the best plan doesn't survive first contact with reality. White papers and investment programs are no different. What's important is not delivering a fossilised plan, but having the ability to adjust the plan as necessary. If that means delaying some projects because funds are needed to meet emerging priorities, that should be explained to industry and the public, rather than hidden from them. It seems particularly strange to argue that we live in an increasingly uncertain world, yet cling to a fiction that we can develop a 10-year plan to deal with it that won't require frequent adjustment.

So there's a need for a better, more mature conversation about capability and investment between the government, Defence, industry and the public. If the government and Defence truly do see defence industry as a

trusted partner, they need to let it know how, when and why the investment plan has changed as well as seek its perspectives on what changes are needed and how they can be delivered. There's a role here for the media, too, in contributing to a better conversation. If changes to the investment plan are merely opportunities for 'gotcha' headlines about project delays or poor planning, the government and Defence will continue to be reluctant to share information about those changes.

There's an opportunity now to reset the conversation. If the government intends to keep meeting its White Paper funding commitments, it will be able to say that adjustments to the plan aren't driven by reductions in the funding envelope. Rather, they are considered, necessary measures to adapt the plan to changing circumstances. And that's a good thing.

Appendix 1: Long-term tables

Table A1.1: Defence budget—nominal and real increases, 1999–2000 to 2025–26 (\$m)

	Nominal budget	Nominal increase	Real budget (2019–20 baseline)	Real increase	% of GDP
1999–2000	12,033	8.3%	20,159	5.7%	1.82%
2000–01	12,319	2.4%	19,467	–3.4%	1.75%
2001–02	13,191	7.1%	20,266	4.1%	1.75%
2002–03	14,216	7.8%	21,205	4.6%	1.78%
2003–04	15,439	8.6%	22,488	6.0%	1.79%
2004–05	16,224	5.1%	23,075	2.6%	1.76%
2005–06	17,547	8.2%	24,181	4.8%	1.76%
2006–07	19,140	9.1%	25,617	5.9%	1.76%
2007–08	19,993	4.5%	25,888	1.1%	1.70%
2008–09	22,689	13.5%	28,491	10.1%	1.80%
2009–10	25,480	12.3%	31,269	9.8%	1.96%
2010–11	24,432	–4.1%	29,078	–7.0%	1.73%
2011–12	26,381	8.0%	30,690	5.5%	1.76%
2012–13	24,437	–7.4%	27,797	–9.4%	1.59%
2013–14	26,132	6.9%	28,939	4.1%	1.64%
2014–15	30,023	14.9%	32,689	13.0%	1.85%
2015–16	31,151	3.8%	33,454	2.3%	1.88%
2016–17	32,000	2.7%	34,136	2.0%	1.83%
2017–18	34,926	8.0%	36,181	6.0%	1.89%
2018–19	37,566	7.6%	38,258	5.7%	1.94%
2019–20	38,742	3.1%	38,742	1.3%	1.93%
2020–21	41,791	7.9%	40,808	5.3%	2.01%
2021–22	45,623	9.2%	43,464	6.5%	2.10%
2022–23	49,693	8.9%	46,187	6.3%	2.19%
2023–24	52,877	6.4%	47,947	3.8%	2.21%
2024–25	55,733	5.4%	49,304	2.8%	2.21%
2025–26	58,742	5.4%	50,699	2.8%	2.21%

Current budget year	PBS 2019–20 forward estimates	2016 White Paper funding line
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Table A1.2: Defence full-time personnel numbers, 1999–2000 to 2022–23

Year	Navy	Army	Air Force	ADF total	APS	Defence total
1999–2000	12,887	24,089	14,051	51,027	16,417	67,444
2000–01	12,396	24,488	13,471	50,355	16,292	66,647
2001–02	12,598	25,012	13,322	50,932	16,819	67,751
2002–03	12,847	25,587	13,646	52,080	18,385	70,465
2003–04	13,133	25,446	13,455	52,034	18,303	70,337
2004–05	13,089	25,356	13,368	51,813	17,753	69,566
2005–06	12,767	25,241	13,143	51,151	18,079	69,230
2006–07	12,690	25,525	13,289	51,504	19,467	70,971
2007–08	12,935	26,611	13,621	53,167	20,391	73,558
2008–09	13,182	27,833	14,066	55,081	20,041	75,122
2009–10	13,828	29,339	14,530	57,697	20,058	77,755
2010–11	14,207	30,253	14,624	59,084	20,648	79,732
2011–12	14,054	29,697	14,243	57,994	21,818	79,812
2012–13	13,760	28,928	13,919	56,607	21,534	78,141
2013–14	13,862	28,568	13,934	56,364	20,496	76,860
2014–15	14,070	29,366	14,076	57,512	19,342	76,854
2015–16	14,232	29,635	14,194	58,061	18,071	76,132
2016–17	14,077	30,314	14,289	58,680	17,269	75,949
2017–18	13,818	30,410	14,247	58,475	17,407	75,882
2018–19	14,143	30,223	14,299	58,665	16,010	74,675
2019–20	14,776	30,821	14,493	60,090	16,272	76,362
2020–21	14,825	30,997	14,763	60,585	16,195	76,780
2021–22	14,946	31,125	14,956	61,027	16,167	77,194
2022–23	15,078	31,216	15,108	61,402	16,163	77,565

Note this does not include ADF reservists.

Sources: Defence annual reports to 2017–18; PBS from 2018–19.

Table A1.3: Defence Capital Investment Program, 1999–2000 to 2022–23 (\$m)

Year	Major Capital Equipment	Capital Facilities	ICT Investment	Minors	Other Investment	Total	Total (2019–20 real \$)
1999–2000	2850	216			23	3,089	5,201
2000–01	2702	341			370	3,413	5,420
2001–02	2,483	275			235	2,993	4,620
2002–03	2,571	352			546	3,470	5,201
2003–04	2,746	386			620	3,751	5,491
2004–05	3,323	393			602	4,318	6,172
2005–06	3,888	430			722	5,041	6,981
2006–07	4,019	653.4			925	5,597	7,529
2007–08	4,030	570			829	5,429	7,064
2008–09	3,234	861			741	4,836	6,102
2009–10	5,159	1,504			626	7,289	8,989
2010–11	4,838	1,211			883	6,932	8,291
2011–12	4,208	997			739	5,944	6,949
2012–13	3,357	1,019			276	4,652	5,317
2013–14	3,558	1,222	355	118	1,009	6,262	6,969
2014–15	6,081	1,303	400	101	754	8,638	9,452
2015–16	6,565	1,082	490	88	1,056	9,281	10,017
2016–17	6,786	1,451	862	53	1,212	10,364	10,996
2017–18	7,289	2,137	245	62	1,058	10,790	11,233
2018–19	8,063	1,911	559	57	0	10,590	10,822
2019–20	8,688	2,093	864	123	0	11,768	11,768
2020–21	10,966	2,316	839	216	0	14,337	14,000
2021–22	12,824	2,977	880	290	0	16,970	16,167
2022–23	14,580	3,155	1,005	296	0	19,035	17,692

Sources: Defence annual reports to 2011–12; PAES from 2012–13 to 2018–19; PBS from 2019–20.

Table A1.4: Defence Cooperation Program, 1999–2000 to 2019–20 (\$m)

Year	PNG	South Pacific	Southeast Asia	Other regional activities	Defence International Training Centre	Total	Total (2019–20 real \$)
1999–2000	7.7	21.1	23.7	2.3	0.0	54.8	91.8
2000–01	15.4	16.8	24.7	3.7	0.0	60.6	95.8
2001–02	27.7	17.5	29.7	4.7	0.0	79.6	122.2
2002–03	9.4	22.5	25.8	1.5	3.4	62.6	93.4
2003–04	14.5	25.0	26.4	0.7	3.9	70.6	102.8
2004–05	13.9	25.7	30.1	1.5	3.7	74.9	106.6
2005–06	19.2	36.6	21.0	2.3	3.8	82.9	114.2
2006–07	14.2	33.4	21.3	2.9	3.9	75.8	101.4
2007–08	12.2	35.9	20.6	4.4	4.4	77.6	100.4
2008–09	12.3	47.3	25.2	3.6	4.2	92.7	116.4
2009–10	11.6	43.6	21.6	3.8	4.1	84.6	103.8
2010–11	9.5	35.5	17.4	4.8	4.2	71.4	84.9
2011–12	11.5	29.9	18.1	6.3	5.3	71.1	82.7
2012–13	20.0	31.3	17.0	5.9	5.1	79.2	90.1
2013–14	23.7	35.4	14.7	5.8	4.9	84.6	93.7
2014–15	25.1	37.6	13.6	5.2	4.9	86.4	94.1
2015–16	38.9	42.2	16.0	6.5	4.2	107.8	115.8
2016–17	29.1	43.6	15.2	5.8	4.5	98.3	103.8
2017–18	34.1	54.7	17.6	6.1	4.9	117.5	121.7
2018–19	39.2	82.3	20.2	7.2	4.7	153.6	156.5
2019–20	40.9	82.4	21.8	9.4	4.7	159.2	159.2

Note: There are no forward estimates figures in PBS 2019–20.

Sources: Defence annual reports to 2017–18; PBS from 2018–19.

Appendix 2: Has the government met its defence funding commitments?

In my initial analysis¹²⁸ of the 2019–20 defence budget,¹²⁹ I suggested that in the four budgets since the 2016 Defence White Paper the actual funding that the government has provided to Defence has come remarkably close to its White Paper commitment. In the interests of full disclosure and accountability, I should note that in ASPI’s 2018–19 *The cost of Defence* budget brief I stated the opposite; that is, that the government had fallen short of its commitment.¹³⁰ So which is it?

Let’s first look at what the commitment is. While a lot of attention is paid to the government’s commitment to increase the defence budget to 2% of GDP by 2020–21, the White Paper also presented a 10-year fixed funding line to avoid the defence budget going up and down as GDP predictions fluctuated. It stated that ‘this de-coupling from GDP forecasts will avoid the need to have to regularly adjust Defence’s force structure plans in responses to fluctuations in Australia’s GDP.’¹³¹

In essence, the government guaranteed funding stability so Defence could get on with delivering the future force. Table A2.1 shows what the first four years of the White Paper funding model look like (page 180).

Table A2.1: White paper funding model (\$ million)

	2016–17	2017–18	2018–19	2019–20	Total
White Paper funding	32,374	34,199	36,769	39,086	142,428

Historically, governments don’t have a great record of meeting their White Paper funding commitments. We’ve now reached the final year of the 2016–17 Budget’s forward estimates period. That was the budget that immediately followed the 2016 White Paper and started the delivery of its commitments. That means we have a four-year body of evidence to examine what the picture looks like this time around.

The first thing that changes our analysis from last year is the fact that the appropriation for the Defence portfolio (that is, both the Department of Defence and the ASD) has changed. If we compare PBS 2018–19 with PBS 2019–20,¹³² the allocation has increased by a total of \$1,882 million in 2018–19 and 2019–20 (Table A2.2). So we should bear in mind that 2019–20’s funding could still change.

Table A2.2: Defence funding—PBS 2018–19 versus PBS 2019–20 (\$ million)

	2018–19	2019–20
Allocation in PBS 2018–19	36,356	38,070
Allocation in PBS 2019–20	37,566	38,742
Increase	1,210	672

But answering the question is not quite as simple as comparing Defence’s actual funding presented in successive PBS to the White Paper line. That’s because lots of variations to Defence’s funding occur. Some can be neutral in effect even if the numbers are big; others are the result of the government deciding to reprioritise and move funds into or out of Defence. The variations for Defence are laid out in tables in the PBS and mid-year PAES.

To give a complete picture, we need to take all variations into account. Last year, we only took supplementation for operations into account, which resulted in an incomplete assessment.

So, the second factor that changes our analysis is that this time we have gone through *all* variations in the Defence PBS and PAES since the White Paper. At least, we’ve gone through all of the ones that are made public;

the PBS and PAES include variations that are marked ‘not for publication’ for either security or commercial reasons and for which no numbers are given.

Table A2.3 shows the total visible variations for the Defence portfolio.

Table A2.3: Total variations to the Defence budget since the 2016 White Paper (\$ million)

	2016–17	2017–18	2018–19	2019–20	Total
Foreign exchange adjustments	–548	–724	–192	–90	–1,554
Supplementation for operations	652	850	752	704	2,958
Reprofiling	–500	1,000	414	–714	200
All other variations	–49	–221	–240	–251	–761
Total variations	–445	905	734	–351	843

This list doesn’t factor in the transfer of \$1.67 billion over 2018–19 and 2019–20 from Defence to ASD when the latter was established as a separate agency within the Defence portfolio. While these are a variation for the Defence *Department* budget, we are interested in a *portfolio* view because that’s what the White Paper presented, and those ASD funds remain within the portfolio.

If we adjust the original White Paper funding line to incorporate those variations, we get the figures in Table A2.4.

Table A2.4: Adjusted 2016 White Paper funding line (\$ million)

	2016–17	2017–18	2018–19	2019–20	Total
White Paper funding line adjusted for variations	31,929	35,104	37,503	38,735	143,271

For the government to meet its funding commitments, actual funding has to equal or exceed the adjusted White Paper funding line. And it comes pretty close (Table A2.5).

Table A2.5: Defence funding surplus against 2016 White Paper (\$ million)

	2016–17	2017–18	2018–19	2019–20	Total
White Paper funding line adjusted for variations	31,929	35,104	37,503	38,735	143,271
Actual allocation	31,999	34,926	37,566	38,742	143,233
Actual surplus against White Paper	70	–178	63	7	–38

It misses by only \$38 million total over the forward estimates (that’s 0.03%), and most of that was in 2017–18. The other three years were a little over. By historical standards, that’s very good.

It’s reasonable to ask whether the variations are legitimate. So let’s look at them a little more closely, starting with Table A2.3.

Foreign exchange adjustments preserve Defence’s buying power on a no–win, no–loss basis, so even the reduction of \$1.5 billion isn’t effectively a budget cut. The nearly \$3 billion in operational supplementation covers the cost of operations beyond Defence’s usual activities and is also no–win, no–loss, so it’s not effectively a budget increase.

The reprofiling of funds simply moves money forward or back. We haven’t seen any of the big reprofiling of money out into the distant future that has sometimes occurred in the defence budget. In fact, over the four years

we're looking at, Defence comes out a little ahead in reprofiling terms. So, despite some big numbers, all three of those categories are essentially neutral.

That leaves \$761 million in other variations. This is where things get a little subjective. They can be broken down as shown in Table A2.6.

Table A2.6: Other defence budget variations (\$ million)

	2016–17	2017–18	2018–19	2019–20	Total
Cybersecurity (PBS 2016–17)	–24	–34	–33	–32	–122
Public sector transformation and the efficiency dividend (PAES 2016–17)	0	–58	–102	–130	–289
Department of Defence–efficiencies (PBS 2017–18)	–70	–72	–76	–86	–304
Remaining variations	44	–57	–30	–3	–46

Under the first of these measures, Defence had to provide \$122 million to fund the government's cybersecurity strategy. In PAES 2016–17, Defence had to give up \$289 million as an efficiency dividend, and in the 2017–18 Budget (page 79) Defence had to achieve \$304 million in efficiencies, mainly through 'reductions in the number of consultants and contractors'.¹³³ So that's a total of \$593 million in reductions to be funded through 'efficiencies'. The remaining \$46 million is small beer.

You can argue whether these variations are legitimate or just Defence being used as a cash cow to fund other government priorities. But cybersecurity is important, and many other agencies have had to accept previous efficiency rounds that Defence escaped.

Legitimate variations or not, actual funding missed the target by only \$38 million over four years, as noted in Table A2.5. But if you think the variations represent cash stripped out of the Defence budget, then the White Paper target should have been \$761 million higher. In that interpretation, actual funding fell short by \$799 million, or about 0.5%. Either way, though, actual funding is still extremely close to the White Paper target. Any Secretary of Defence or Chief of the Defence Force would be very happy with that outcome.

One limitation in this analysis is the variations marked 'not for publication'. Some of these could be quite large, such as equity injections into Australian Naval Infrastructure Pty Ltd (ANI), which was split off from ASC to build and manage the naval shipyards in Adelaide. The government has consistently given a cost of \$535 million for the frigate shipyard (the submarine yard will be additional to that), but it's not clear how much of that is being funded by Defence and how much by the Department of Finance, which owns ANI. So the analysis here isn't complete. These variations could also go some way to explaining the discrepancy between the White Paper and actual funding.

That caveat aside, from the evidence we can see, over the four budget years since the 2016 Defence White Paper, the government has delivered on its funding commitment.

(A version of this piece was previously published on ASPI's *The Strategist* blog, under the title 'Ponying up: has the government met its defence funding commitments?'.¹³⁴)

Appendix 3: Approved projects

Defence doesn't publish a comprehensive list of project approvals. The following tables list project approvals since the start of 2016–17 that ASPI has been able to identify through media releases, Defence annual reports, PAES and Austender. Some of the entries draw on more than one source. Where possible, we give the pass, funding and a description of the scope of the approval. Because the public 2016 Defence Integrated Investment Program did not provide project names or numbers, it isn't always possible to align an announcement with a particular project.

We've provided an excerpt from the relevant media release to give a sense of what was approved. If there's no scope description, it's because there was no media release and we've taken the approval from a list in the PAES or annual report.

The number of approvals we've been able to identify is much smaller than the number claimed by Defence in its annual report. We've done our best. It's not clear why the government and Defence don't provide this information to the public, who are paying for it after all, or to industry, which is now a fundamental input to capability and the valued partner that has to deliver the capability.

Table A3.1: 2016–17 approved projects

Environment	Number	Phase	Name	Pass	Approved funding	Scope
AIR	5349	6	Advanced Growler	1		Approval to enter E&D phase
AIR	5349	6	Advanced Growler	2		Approval to acquire anti-radiation missile warstocks
AIR	6103	1	Automatic Surveillance Broadcast for Hawk Lead-in fighter	0		
LAND	129	4	Tier 1 Unmanned Aerial Vehicle	2	\$101 m	Small unmanned aerial surveillance and reconnaissance capability
JP	2060	3	ADF Deployable Health Capability—Health Clinical Care	1		
LAND	19	7B	Short-range Ground-based Air and Missile Defence	1	<\$100 m	Short-range ground-based air defence system to improve protection for deployed personnel
SEA	1778	1	Deployable Mine Countermeasures	?		
SEA	1179	1	Minehunter Coastal Service—Life Extension Program	?		
SEA	3035	1	Navy Training Pipeline Extension	?		
SEA	4000	3.3	AWD Operational Test and Evaluation	?		
SEA	1408	2	Torpedo Self-Defence	?		
SEA	1000	1B	Future Submarine Design and Construction	Other	>\$500 m	
–	–	–	Naval Shipbuilding Plan—public version	Other	n.a.	
DEF	799	1	Geospatial Intelligence Satellite Capability	2	\$500 m	'... improve Defence's access to commercial satellites to provide information to government agencies'

Environ- ment	Number	Phase	Name	Pass	Approved funding	Scope
JP	500	2A	Electronic Warfare Operations Support for Maritime and Land Forces	2		'... electronic warfare equipment and infrastructure—significantly sharpening the ability of naval ships and army units to deal with threats emerging across the electronic warfare spectrum'
LAND	53	1BR	Nightfighting Equipment Replacement Program	2	\$100–500 m	
JP	157	1	Replacement National Support Base Aviation Refuelling Vehicles	2	\$150–200 m	'a new generation of aviation refuelling vehicles'
ESTATE	N2253		Garden Island (East) Critical Infrastructure Recovery Project Stage One	2	\$213 m	'Bayinguwa critical wharf works project at Garden Island Defence Precinct'
SEA	1439	6	Collins sonar system upgrade		\$100 m	'Thales Australia has been awarded a \$100 million contract to design a major sonar system upgrade for Collins class submarines.'
ICT	2287		Optus C1 satellite		\$40 m	'... reconfigure the C1 satellite to operate in an inclined orbit to reduce on-board fuel usage and extend the life of the satellite as far as 2027'
SEA	1000		Selection of Combat System Integrator			'Lockheed Martin Australia has been selected as the preferred Combat System Integrator for Australia's Future Submarine Program.'
ESTATE	C8940		Russell Office Precinct Upgrade R5 and R6 Midlife Upgrade		<\$100 m	
INV	1	2016	Defence Innovation Hub—governance, funding (2016) and launch		<\$100 m	
–	–	–	Collins Class Submarine Update		n.a.	
–	–	–	Naval Shipbuilding—Infrastructure and Workforce Matters		<\$100 m	
SEA	1180	1	Offshore Patrol Vessel—six-monthly update		n.a.	
AIR	5440	1	C-130J Block Upgrade Program	2		
LAND	154	2	Joint Counter Improvised Explosive Device Capability	2		
LAND	3025	1	Deployable Special Operations Engineer Capability	2		
SEA	1448	4B	Anzac Air Search Radar Replacement	2		

Table A3.2: 2017–18 approved projects

Environ- ment	Number	Phase	Name	Pass	Approved funding	Scope
AIR	7000	1B	Multi-mission UAS	2	\$1.4 b	One Triton aircraft, support systems, \$200 m cooperative program

Environment	Number	Phase	Name	Pass	Approved funding	Scope
LAND	9000	CAP	Chinook Capability Alignment Program	?		Deeper maintenance facility
AIR	6000	3	Weapons and Countermeasures	?		Warstocks of weapons and countermeasures (excluding air-to-air missiles)
JP	9347	1	Multiple Tactical Data Link Network	?		
LAND	200	2	Battlefield Command Systems (Tranche 2)	2	\$1.4 b	'Harris Communications Australia will deliver the tactical communications network, including encrypted radios, and Elbit Systems of Australia will enhance the Battle Management System software ...'
LAND	400	2	Mounted Combat Reconnaissance Capability	2	\$5.2 b	211 Boxer combat reconnaissance vehicles
LAND	400	3	Mounted Close Combat Capability	1		Up to 450 infantry fighting vehicles
SEA	1448	4B	Anzac Air Search Radar Replacement	2	\$400 m	'... air search radar upgrade will ensure Defence is able to adapt to modern and evolving air and missile threats'
SEA	2400	1	Hydrographic Data Collection Capability	?		Replace existing hydrographic survey capability. Meet legislated requirements of National Survey Function and introduce a Strategic Military Survey Function.
SEA	1000		Future Submarine Design and Construction		\$700 m	FSM combat system design, build and integration
SEA	5000		Future Frigate	2	?	Selection of BAE's Type 26 Global Combat Ship
AIR	5077	5A	Airborne Early Warning and Control Interoperability Compliance Upgrade		\$582.5 m	Upgrade E-7A Wedgetail combat identification sensors, tactical data link and communication and encryption systems
AIR	5431	3	Civil Military Air Traffic Management System	Other		Real cost increase
LAND	2110	1B	Chemical, Biological, Radiological and Nuclear Defence	2	\$238 m	'... the signing of contracts worth \$238 million with Leidos Australia... approximately 70,000 equipment items to support Defence's capability to detect and protect itself from toxic industrial chemicals and weaponised chemical, biological, radiological and nuclear agents'
			Future Artillery Ammunition		\$151.8 m	155-mm ammunition for lightweight towed howitzer
			RMAF Base Butterworth Upgrade	1	\$22 m	
ESTATE	J0109		Larrakeyah Barracks Redevelopment, Darwin	2	\$223 m	
ESTATE	N2238		Facilities to Support Naval Operations in the North			A new outer wharf for major surface combatants and submarines
AIR	2025	6	JORN Upgrade		\$1.2 b	'... significant upgrade to Australia's Jindalee Operational Radar Network (JORN) which detects and tracks air and maritime targets from Australia's northern approaches'

Environ-ment	Number	Phase	Name	Pass	Approved funding	Scope
SEA	1439		Collins ISCMMS			'... an updated Integrated Ship Control Management and Monitoring System (ISCMMS) for four Royal Australian Navy Collins class submarines'
SEA	1439		Improved submarine communications			'... improved submarine communications capability'
SEA	5000	1	Future Frigate (Combat Management System Selection)		'multi-billion'	AEGIS combat management system on future frigate with SAAB interface, SAAB combat management system on all other Navy surface vessels
SEA	1439	6	Collins sonar upgrade	2	\$542 m	'... significant sonar upgrades'
			Shoalwater Bay Training Area Remediation Project			'FK Gardner and Downer EDI Works Pty Ltd Joint Venture has been announced as the managing contractor to deliver the SWBTA Remediation Project'
SEA	1397	5B	Nulka Missile Decoy Enhancements	2	\$207 m	'Nulka will continue to be upgraded over the coming decades to keep pace with anti-ship missile technologies'
JP	2008	5B2	Satellite Ground Station		\$223 m	'... satellite ground station will be built at Kapooka in New South Wales along with an integrated network management system'
SEA	1180	1	Offshore Patrol Vessel	2		

Table A3.3: 2018-19 approved projects

Environ-ment	Number	Phase	Name	Pass	Approved funding	Scope
JP	2089	1	Integration of ISR			'... ensure the integration of selected intelligence, surveillance and reconnaissance (ISR) data and applications'
			Airborne electronic warfare capability	2	\$2.46 b	'... four modified Gulfstream G550 aircraft—to be designated the MC-55A "Peregrine"'
SEA	1354	1	Submarine Rescue Capability		\$255 m	'... sovereign air transportable Submarine Rescue Service capability'
			Howitzer and Mortar Ammunition		\$144.3 m	NOIA to supply mortar ammunition (\$81.6 m) and GD-OTS (Canada) to supply howitzer ammunition (\$62.7 m)
AIR	7003		Medium Altitude Long Endurance UAS			'... selection of the General Atomics MQ-9 Reaper variant as the system which best meets the capability requirements'
			Defence Fuel Transformation Program		\$127 m	'... targeted investments in the Defence fuel network to seize immediate opportunities to improve flexibility and increase the level of industry collaboration ...'
LAND	125	4	Integrated Soldier Systems		\$240 m	body armour, helmets, hearing and eye protection and load carriage equipment; as well as field equipment like water purifiers, helmet torches, storage bags, cooking gear, and sleeping bags
SEA	3035		Navy Training Pipeline Extension		>\$80 m	'... expansion and upgrade of its fleet of simulation trainers'

Environ- ment	Number	Phase	Name	Pass	Approved funding	Scope
LAND	121	5B	Medium-heavy trucks and trailers		\$1.4 b	'... 1044 additional new-generation medium and heavy trucks, 872 modules and 812 trailers'
ESTATE	N2253B		Garden Island (East) Critical Infrastructure Recovery Project Stage Two		\$294.9 m	Building construction and support and maintenance and repair services
ESTATE	0355		Australia-Singapore Military Training Initiative (ASMTI) Shoalwater Bay Training Area (SWBTA) Facilities Project		\$33.8 m	Building construction and support and maintenance and repair services
SEA	9000		Maritime Combat Helicopter Capability Assurance Program		\$414.7 m	Austender: MH-60R CAP SHARED COST COOP PROG
LAND	19	7B	Short-range Ground-based Air and Missile Defence	2	\$2.5 b	
JP	9711		Core Simulation Capability		\$897 m	
AIR	7000	1	Triton			Acquisition of a second Triton aircraft
SEA	1000		Future Submarine		Around \$3.8 b	Design contract signed

Notes

¹ Giuseppe Spatafora, 'The Jacksonian foundations of Trump's American foreign policy', *Oxpol*, 12 January 2018, [online](#).

² Eric Levitz, 'Voters want an "America First" foreign policy (just not Trump's)', *New York Magazine*, May 7, 2019, [online](#).

³ As Churchill said, those who fail to learn from history are doomed to repeat it.' If there's any lesson to be learned from the past decades of US military intervention in the Middle East, it's don't let John Bolton set your foreign policy.

⁴ Congressional Budget Office, *An analysis of the Navy's fiscal year 2019 Shipbuilding Plan*, US Government, Washington DC, October 2018, [online](#); Congressional Budget Office, *Costs of building a 355-ship navy*, US Government, Washington DC, April 2017, [online](#).

⁵ Congressional Budget Office, *The cost of replacing today's air force fleet*, US Government, Washington DC, December 2018, [online](#).

⁶ Congressional Budget Office, *Updated Budget projections: 2019 to 2029*, US Government, Washington DC, May 2019, [online](#).

⁷ Congressional Budget Office, *Updated Budget projections: 2019 to 2029*, US Government, Washington DC, May 2019, [online](#).

⁸ Quoted in Lawrence H Korb, *What the FY 2020 defense budget gets wrong*, Center for American Progress, April 2019, [online](#).

⁹ 2017 Lowy Institute Poll, [online](#).

¹⁰ On the future of the alliance, see Michael Shoebridge's essay 'How to progress the US—Australia alliance in a time of great power competition' in Marcus Hellyer (ed.), *Agenda for change 2019: strategic choices for the next government*, ASPI, Canberra, 2019, [online](#).

¹¹ 2017 Lowy Institute Poll, [online](#).

¹² For an excellent overview of the fourth industrial revolution, particularly in the military context, see Peter Layton, *Prototype warfare, innovation and the fourth industrial age*, Air Power Development Centre, Canberra, 2018.

¹³ For an overview, see Martin Callinan et al., *Defence and security R&D: a sovereign strategic advantage*, ASPI, Canberra, January 2019, [online](#).

¹⁴ Unfortunately for Putin, it's very unlikely that it will be Russia.

¹⁵ Trade data is taken from the Department of Foreign Affairs and Trade, *Composition of trade 2017–18*, January 2019, [online](#).

¹⁶ If trade deficits are a bad thing that needs to be countered by tariffs, it's time to start a trade war with the US—Australia had \$27 billion trade deficit with the US in 2017–18.

¹⁷ Australian Government, *Budget 2019–20*, Budget paper no. 1, 2–21 and 2.22.

¹⁸ UN Development Programme, *Human development indices and indicators: 2018 statistical update*, UN, 2018, [online](#).

¹⁹ UN, *World happiness report 2019*, UN, 20 March 2019, [online](#).

²⁰ *2019 Index of Economic Freedom*, Heritage Foundation, 2019, [online](#).

²¹ Although, France, the highest taxing country (based on tax revenue as percentage of GDP) is only the 25th happiest country, suggesting that any correlation is not direct.

²² *World economic and financial surveys: World Economic Outlook Database*, International Monetary Fund, October 2018, [online](#).

²³ Incidentally, if only 20% of the dollars that Australians spend on travel and tourism overseas was spent here, it would keep an additional \$10 billion here every year, more than compensating for our defence 'balance of payments' deficit.

²⁴ Department of Defence (DoD), *Portfolio Budget Statements (PBS) 2019–20*, Australian Government, 2019, [online](#).

²⁵ According to Defence, the funds were spent in the following way: 'Mr Groves: ... there was \$200 million for the Joint Strike Fighter, \$100 million for Triton, \$80 million for A1R 555—the airborne intelligence, surveillance, reconnaissance and electronic warfare system... There's \$125 million for P-8s; \$25 million for Growlers; \$10 million for LAND 154 Phase 4, which is the counter improvised explosive device capability; \$40 million for maritime explosive ordnance; and \$40 million for maritime infantry spares and repairable subsystems.' Foreign Affairs, Defence and Trade Legislation Committee, *Estimates*, 5 April, 13.

²⁶ As discussed in last year's *The cost of Defence*, we have changed the way ASPI presents Defence funding. Previously, we included funding such as own-source revenue (that is, funding Defence received in return for providing goods and services to its own members or other organisations) as well as some other adjustments in the top level number. While all of those adjustments were taken from the PBS and arguably presented a more complete number, in the interests of simplicity we now use the current year appropriation—a number that the reader can easily identify in the PBS (it's in Table 1, serial 4). This is also the number that the Minister for Defence refers to in the Budget night media release and the number against which 2% of GDP and the White Paper funding line (including ASD's funding) is assessed. This is a slightly smaller number than under the previous ASPI approach. We now use the Defence appropriation in our analysis for all years back to 2016–17 (that is, the first budget year of the 2016 White Paper), but we have not adjusted historical figures before then.

²⁷ Marcus Hellyer, 'Ponying up: Has the government met its defence funding commitments?', *The Strategist*, 16 April 2019, [online](#).

²⁸ Australian Government, *Budget paper no. 2: Budget measures 2019–20*, 2019, [online](#).

²⁹ That's still a \$105 million overspend but, against a prediction of nearly \$11.8 billion, it's pretty good.

³⁰ ASPI derives personnel costs from the employee payments line of the PBS and annual report's 'Budget departmental net cost of service (cash)' table, which this year is PBS Table 40.

³¹ Aficionados of defence budgeting policy may have noticed that the 'Future sustainment costs' line of Table 5 disappeared in PBS 2018–19 and has not returned this year. This is what was previously termed 'Net personnel and operating costs', or NPOC. The First Principles Review, for better or worse, recommended that this concept no longer be used, and it appears that Defence has followed through with implementation. The funding under that line of the sustainment program has now been assigned to the relevant capability managers (that is, funding for future land projects is now held under Army sustainment).

³² In fact, the First Principles Review of Defence said there shouldn't be one.

³³ NATO treats facilities spending separately to equipment, so if it were rolled into equipment to make an apples-to-apples comparison with Australia, their capital spending would look a couple of percent better. Also, NATO countries include things like military pensions, which inflates their personnel spend. But an equipment target of 20% is still well below where Australia is at and where it is heading.

³⁴ The Defence appropriation as a percentage of government payments is 7.5%.

³⁵ *Budget 2019–20: Budget strategy and outlook*, Budget paper no. 1 2019–20, 5–10.

³⁶ The 2019–20 Defence portfolio (the department and the Australian Signals Directorate) appropriation divided by 25,337,173, which was the Australian Bureau of Statistics' population clock prediction for Australia's population on 16 April 2019.

³⁷ Note that this table doesn't include \$816 million in 'own-source revenue', as that isn't part of the departmental appropriation. Including it increases the total by only 2.4%.

³⁸ Own-source revenue is essentially reimbursement to the department from customers for goods and services provided, whether it be fuel to allies visiting for exercises or meals and accommodation to ADF members.

³⁹ We deliberately state 'Defence' rather than 'ADF', as the contribution of Defence civilians on operations is often overlooked. Defence civilians serve in a number of roles on operations, including as intelligence analysts and policy advisers. PBS 2019–20 (page 28) also lists an additional seven small operations that are not included in this table.

⁴⁰ It should be noted that service personnel costs are attributed to their parent service rather than the group where they are posted, so this means the personnel costs of groups that have a large number of embedded service personnel (such as Strategic Policy and Intelligence, Australian Defence Force Headquarters, and CASG) are understated.

⁴¹ Technically, this number only includes projects that have reached second pass at this point in time, so the number is not that same as the 'Major capital investment' line in PBS Table 4 (\$8,687.9 million), as the latter number also includes the 2018–19 spend on projects that are not yet approved but will be approved over the course of the year.

⁴² That is a lot, but it isn't without precedent. The F/A-18 A/B 'classic' Hornet project spent over 40% of the capital equipment budget at its peak spend.

⁴³ The number in PBS 2019–20 is \$289 million, but that doesn't include the most recent government approvals. The full figure of \$758 million was provided by Defence.

⁴⁴ The total in PBS Table 57 is \$1,804.5 million, which differs from Table 4 at \$2,093.0 million. The difference could be projects that are not yet approved but will still spend money in 2019–20.

⁴⁵ Katherine Ziesing, 'ADM's top 40 defence contractors 2018', *Australian Defence Magazine*, December 2018 – January 2019, 27(1):29, [online](#).

⁴⁶ Austender, *Entity reports for complying with the Senate Order on procurement contracts and use of confidentiality provisions*, Australian Government, [online](#).

⁴⁷ Scott Morrison, speech, 8 November 2018, [online](#).

⁴⁸ Royal Australian Navy, *HMAS Choules*, [online](#).

⁴⁹ 'Sale of *Skandi Protector*', media release, DoF Group, 30 November 2015, [online](#).

⁵⁰ Australian Border Force, 'Ocean Protector boosts Australia's border protection', news release, 1 March 2016, [online](#).

⁵¹ As Vice Chief of Defence Force explained, 'To fund the provisions for the south-west Pacific measures, what we looked at was: there were some estate impacts, some capability equipment impacts and some of our training systems. They involve generally re-profiling, so moving money around or some adjustments in time frames.' Senate Foreign Affairs, Defence and Trade Legislation Committee, *Estimates*, 20 February 2019, 13–16. In reply to Senator Wong's question on notice for more details on what got reprioritised to find the funding, Defence submitted the generic response that 'The reprioritisation of the Integrated Investment Plan (IIP) was undertaken as part of the 2018–19 Mid-Year Economic and Fiscal Outlook Bi-Annual IIP Update, and addressed government priorities by identifying offsets to fund initiatives in the South West Pacific and South East Asia. Defence reprioritises both the approved and unapproved major capital program on a regular basis to implement the Government's priorities and meet cashflow and industry requirements' (portfolio question no. 11).

⁵² The total personnel number is derived by adding permanent ADF, a pro-rated Reserve number giving a full-time equivalent, and APS. The original data is in the 2017–18 Defence annual report, Table 7.12.

⁵³ Letter from Rebecca Skinner, Acting Secretary, DoD, to Eric Abetz, Chair, Senate Standing Committee on Foreign Affairs, Defence and Trade (Legislation Committee), 22 March 2019, [online](#).

⁵⁴ Australian National Audit Office (ANAO), *Defence's implementation of the First Principles Review*, report no. 34, 2017–18, Australian Government, Canberra, 2018.

⁵⁵ It's still not clear why the PBS is structured around two outcomes while the Corporate Plan is structured around two purposes. The outcomes and purposes generate similar or even identical performance criteria/measures, which are then assessed differently in the annual report.

⁵⁶ Noting that the annual report only gives actual achievement against the revised PAES target, not the original PBS target. The PAES often revises the target downwards, so the underachievement can be greater than the annual report indicates.

⁵⁷ In 2016–17, Defence hit 97.4% of its permanent force recruitment targets and still gave itself only a 'partially achieved'. In this area at least, it seems that nothing short of perfection is required.

⁵⁸ DoD, Response to question on notice no. 56, Portfolio question number: 61, 2018–19 Budget estimates: Foreign Affairs, Defence and Trade Committee, Defence Portfolio, 4 July 2018.

⁵⁹ ANAO, *ANZAC class frigates—sustainment*, report no. 30, 2018–19, Australian Government, Canberra, 2019, 39.

⁶⁰ Incidentally, having HMAS *Perth* out of service for two years wasn't mentioned in the 2017–8 annual report, PAES 2017–18 or PBS 2018–19.

⁶¹ Since Defence nowhere provides actual outcomes, we can't say where Defence ended up. The revised PAES estimate is the best we have to go with.

⁶² US Government Accountability Office, *F-35 aircraft sustainment: DOD needs to address substantial supply chain challenges*, April 2019, [online](#). ASPI analysed this issue in Marcus Hellyer, 'Buddy, can you spare some spares? Sustainment challenges for the F-35', *The Strategist*, 15 May 2019, [online](#).

⁶³ Jamie Freed, 'Lockheed expects F-35 flying costs will take time to come down: executive', *Reuters*, 27 February 2019, [online](#).

⁶⁴ 'Land 400 Phase 2: Australian Government inspects first Australian Boxer vehicle at Rheinmetall in Kassel, Germany', media release, Rheinmetall Defence, 29 March 2019, [online](#).

⁶⁵ DoD, *LAND 400 Phase 3: indicative timeline*, Australian Government, no date, [online](#).

⁶⁶ ANAO, *Army's Protected Mobility Vehicle—Light*, report no. 6, 2018–19, Australian Government, Canberra, 11 September 2018, [online](#).

⁶⁷ It's not entirely clear whether protected vehicles such as Hawkei are part of the 'Land combat vehicle and technology upgrade' sovereign industrial capability priority, one of 10 in the Defence Industrial Capability Plan ([online](#), p. 37). Technically, they aren't combat vehicles in Defence's use of the term, and the only vehicle specifically mentioned in the plan is the combat reconnaissance vehicle, which will be the Boxer, so that would suggest that there's no requirement to design and produce protected vehicles in Australia. However, the government may find it unpalatable to allow the Bendigo production line to close down at the end of Hawkei's build.

⁶⁸ ANAO, *Major projects report*, p. 140.

⁶⁹ It's not clear if this still involves Chinese ownership.

⁷⁰ The ANAO *Major projects report* also covers two other phases of SEA 1439 and the heavyweight torpedo project, all of which have been running for a long time and whose annual cash flow is much lower.

⁷¹ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 104, portfolio questions no. 112, 2018–19 Budget estimates, response dated 13 July 2018.

⁷² ANAO, *Multi-Role Helicopter Program*, report no. 52, 2013–14, June 2014, [online](#).

⁷³ Based on ASPI's analysis of flying hours and cost in the PBS and Defence annual report.

⁷⁴ Over the past seven years, the cost has averaged around \$30,000 per flying hour. This year, Defence is aiming for around \$26,000. Seahawk Romeo costs are around \$18,000 per hour. We can't calculate a cost of the Chinook directly, as it has never been in the top 30 sustainment products, but that means its total cost is less than \$55 million, so at 2,200 hours last year and 2,400 this year it can't be more than \$25,000 per hour. This does raise the question of why Defence doesn't acquire more Chinooks, since they are the only helicopter in the ADF inventory that can transport the Army's M-777 howitzers or its 1,110 Hawkeis.

⁷⁵ ANAO, *Defence's management of its Projects of Concern*, report no. 31, 2018–19, [online](#).

⁷⁶ DoD, *Naval Shipbuilding Plan*, Australian Government, Canberra, 2017, [online](#).

⁷⁷ John Birkler, John F Schank, Mark V Arena, Edward G Keating, Joel B Predd et al., *Australia's naval shipbuilding enterprise: preparing for the 21st century*, RAND Corporation, Santa Monica, 2015, [online](#).

⁷⁸ Major surface combatants include vessels such as frigates and destroyers. These are around 8,000 tonnes. Minor war vessels include patrol vessels ranging from patrol boats to the offshore patrol vessels at nearly 1,800 tonnes, hydrographic ships and mine warfare vessels. None of the streams includes vessels such as amphibious or replenishment at sea ships, which are around 20,000 tonnes and up.

⁷⁹ ANAO, *Future Submarine—Competitive evaluation process*, report no. 48, 2016–17, Australian Government, Canberra, [online](#).

⁸⁰ ANAO, *Naval construction programs—mobilisation*, report no. 39, 2017–18, Australian Government, Canberra, [online](#).

⁸¹ Robbin Laird, 'Shaping an integrated at sea force: the case of the new build Australian off-shore patrol vessels', *SLDinfo.com*, 15 December 2019, [online](#).

⁸² Liberal Party of Australia, 'Boost for WA economy and jobs with new naval commitment', media release, 29 April 2019, [online](#).

⁸³ DoD, 'Offshore patrol vessels: project description', Australian Government, Canberra, 2019, [online](#).

⁸⁴ CASG's website doesn't appear to have a page describing SEA 1778.

⁸⁵ Marise Payne, 'Joint media release: Prime Minister, Minister for Defence and Minister for Defence Industry: New approach to naval combat systems', 3 October 2017, [online](#).

⁸⁶ Marise Payne, 'NUSHIP Sydney capability upgrade to occur at Osborne', media release, 26 March 2019, [online](#).

⁸⁷ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 117, portfolio question no. 125, 2018–19 supplementary budget estimates, response dated 12 February 2019.

⁸⁸ DoD response to Finance and Public Administration Committee, Finance portfolio, question on notice no. 3, portfolio question no. F003, 2018–19 additional estimates, response dated 4 April 2019.

⁸⁹ Various sources such as Coalition campaign material state that the \$35 billion future frigate project had achieved second-pass approval, suggesting that all \$35 billion in funding had been approved. That is not reflected in the PBS.

⁹⁰ Reported in ANAO, *Naval construction programs—mobilisation*, paragraph 4.15.

⁹¹ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 36, portfolio question no. 43, 2018–19 supplementary estimates, response dated 12 February 2019. The concept of prototyping was also discussed at Senate estimates on 24 October 2018: 'Rear Adm. Dalton: Prototyping is a standard part of naval construction; it's done quite commonly. We saw it in the United Kingdom with the Queen Elizabeth Class aircraft carrier. In a brand new shipyard, you want to make sure that the designer-builder's computer system is compatible with all the computer-controlled machines. You want to be able to build skills in the workforce in that new shipyard before you start construction on the actual ship itself. We're planning to build five ship blocks as part of the prototyping activity. Depending on how those blocks go, we'll start off with relatively simple ship blocks without a lot of curves in them. The fifth block that we will build will be a very complex block, to build the skills and the workforce, to test the flows through the new shipyard and to test the connection

between the designer's systems and the shipyard systems. If that build of that fifth block goes well, there is a reasonable chance that we will be able to incorporate that into the first ship.'

⁹² ANAO, *ANZAC class frigates—sustainment*, report no. 30, 2018–19, Australian Government, Canberra, 18 March 2019, [online](#).

⁹³ Assuming the two-year drumbeat continues, the first replacement for the AWDs will arrive in 2047, at which point in time HMAS *Hobart*, the first AWD, will be 30 years old.

⁹⁴ Marcus Hellyer, 'In for the long haul (part 1): good news and bad news about the frigate transition', *The Strategist*, 1 April 2019, [online](#); Marcus Hellyer, 'In for the long haul (part 2): Can the Anzacs remain relevant?', *The Strategist*, 4 April 2019, [online](#); Marcus Hellyer, 'In for the long haul (part 3): How far can you push an Anzac?', *The Strategist*, 9 April 2019, [online](#).

⁹⁵ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, portfolio question no. 56, 2018–19 budget estimates, response dated 13 September 2019.

⁹⁶ An outline of what the SPA covers is provided in the DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 125, portfolio question no. 126, 2018–19 additional estimates, response dated 27 March 2019.

⁹⁷ There was much speculation in the media about deep differences of opinion on everything from philosophy, to intellectual property, transfer of technology, Australian industry content, and contract break payments.

⁹⁸ Marcus Hellyer, *Thinking through submarine transition*, ASPI, Canberra, 8 October 2018, [online](#).

⁹⁹ Defence also has not been able to provide a compelling plain English explanation to counter the arguments of some analysts who have suggested that expecting a conventionally powered submarine to perform better with a pump-jet than with a traditional propeller defies the laws of physics.

¹⁰⁰ Marcus Hellyer, 'Senate estimates, submarine escalates', *The Strategist*, 6 June 2018, [online](#).

¹⁰¹ The numbers for approved budget and estimated spend for the year in PBS 2019–20 are significantly smaller, as they don't include the latest government approvals. The updated figures were provided by Defence.

¹⁰² DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 90, portfolio question no. 97, 2018–19 supplementary budget estimates, response dated 13 February 2019.

¹⁰³ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 95, portfolio question no. 96, 2018–19 additional estimates, response dated 27 March 2019.

¹⁰⁴ For example, Senate Foreign Affairs, Defence and Trade Legislation Committee, *Estimates*, 20 February 2019, 45.

¹⁰⁵ Senate Foreign Affairs, Defence and Trade Legislation Committee, *Budget estimates*, 29 May 2019, 43–44.

¹⁰⁶ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 70, portfolio question no. 77, 2018–19 supplementary estimates, response dated 11 February 2019.

¹⁰⁷ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 27, portfolio question no. 28, 2018–19 additional estimates, response dated 26 March 2019.

¹⁰⁸ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 24, portfolio question no. 27, 2018–19 budget estimates, response dated 12 September 2018.

¹⁰⁹ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 2, portfolio question no. 2, 2018–19 supplementary budget estimates, response dated 3 January 2019.

¹¹⁰ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 14, portfolio question no. 14, 2018–19 budget estimates, response dated 12 September 2018.

¹¹¹ ANAO, *Naval construction programs—mobilisation*, report no. 39, 2017–18, Australian Government, Canberra, 2018, paragraph 3.31.

¹¹² DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 118, portfolio question no. 126, 2018–19 supplementary estimates, response dated 14 February 2019.

¹¹³ DoD response to Foreign Affairs, Defence and Trade Committee, Defence portfolio, question on notice no. 18, portfolio question no. 19, 2017–18 additional estimates, response dated 13 April 2018.

¹¹⁴ Senate Foreign Affairs, Defence and Trade Legislation Committee, *Budget estimates*, 5 April 2019, 21.

¹¹⁵ ANAO, *Naval construction programs—mobilisation*, paragraph 4.37.

¹¹⁶ ANAO, *Naval construction programs—mobilisation*, paragraph 4.39.

¹¹⁷ On the littoral combat ship, see Congressional Research Service, *Navy Littoral Combat Ship (LCS) Program: background and issues for Congress*, 17 May 2019, [online](#).

¹¹⁸ On the Zumwalt, see US Government Accountability Office, *Weapon systems annual assessment: limited use of knowledge-based practices continues to undercut DOD's investments*, GAO-19-336SP, 7 May 2019, 105–106, [online](#); Congressional Research Service, *Navy DDG-51 and DDG-1000 Destroyer programs: background and issues for Congress*, 17 May 2019, [online](#).

¹¹⁹ You could argue that the Arafura-class OPV project is delivering all three: it's happening pretty quickly, we're getting quite a lot of them for the money, and they'll be very good patrol vessels. You could also argue that that's because Defence is adhering to a very restricted definition of 'good'; that is, they have no ability to defend themselves against missile or torpedo threats.

¹²⁰ This analogy is made in Walker D Mills, 'Autonomous pickets for force protection and fleet missile defense', Center for International Maritime Security, 8 May 2019, [online](#).

¹²¹ Solomon Birch, 'The battlefield is no place for soldiers', *The Strategist*, 21 May 2019, [online](#).

¹²² On sustaining innovation versus disruptive innovation, see Clayton Christensen, *The innovator's dilemma: when new technologies cause great firms to fail*, Harvard Business Review Press, 1997.

¹²³ Some of the contenders for the US Navy's Small Surface Combatant Program were also contenders in the competitive evaluation process for our future frigate.

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- ¹²⁴ See for example the Air Force's 'Plan Jericho—At the Edge', [online](#).
- ¹²⁵ Otto Kreisher, 'DARPA director praises Navy's aggressive use of autonomous sea hunter', *Seapower*, 1 May 2019, [online](#).
- ¹²⁶ See the Liberal Party's defence and security election platform: *A safer Australia. A secure future. Our plan to protect Australia and keep Australians safe*, [online](#).
- ¹²⁷ Marcus Hellyer (ed.), *Agenda for change 2019: strategic choices for the next government*, ASPI, Canberra, 2019, [online](#).
- ¹²⁸ Marcus Hellyer, 'Boring is the new black: defence budget 2019–20', *The Strategist*, 3 April 2019, [online](#).
- ¹²⁹ *Portfolio Budget Statements 2019–20*: Budget related paper no. 1.4A: Defence portfolio, [online](#).
- ¹³⁰ Marcus Hellyer, *The cost of Defence: ASPI defence budget brief 2018–2019*, ASPI, Canberra, 24 May 2018, [online](#).
- ¹³¹ DoD, 2016 Defence White Paper, Australian Government, Canberra, 2016, [online](#).
- ¹³² *Portfolio Budget Statements 2018–19*: Budget related paper no. 1.4A: Defence portfolio, [online](#).
- ¹³³ *Budget 2017–18: Budget measures*, Budget paper no. 2, 2017–18, [online](#).
- ¹³⁴ Marcus Hellyer, 'Ponying up: has the government met its defence funding commitment?', *The Strategist*, 16 April 2019, [online](#).

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Acronyms and abbreviations

4IR	fourth industrial revolution
ADF	Australian Defence Force
AI	artificial intelligence
ANAO	Australian National Audit Office
ANI	Australian Naval Infrastructure
APS	Australian Public Service
ASCM	anti-ship cruise missile
ASD	Australian Signals Directorate
AWD	air warfare destroyer
CASG	Capability Acquisition and Sustainment Group
CPI	Consumer Price Index
DARPA	Defense Advanced Projects Research Agency (US)
E&IG	Estate and Infrastructure Group
GDP	gross domestic product
ICT	information and communications technology
IFV	infantry fighting vehicle
IIP	Integrated Investment Plan
IOC	initial operating capability
JSF	Joint Strike Fighter
LHD	landing helicopter dock
NATO	North Atlantic Treaty Organization
NSC	Naval Shipbuilding College
NSP	Naval Shipbuilding Plan
OECD	Organisation for Economic Co-operation and Development
OPV	offshore patrol vessel
PAES	Portfolio Additional Estimates Statement
PBS	Portfolio Budget Statement
PPP	public–private partnership
R&D	research and development
SPA	strategic partnering agreement
UAV	unmanned aerial vehicle
UUV	unmanned underwater vessel