

Naval Construction Programs—Mobilisation

Department of Defence

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Canberra ACT

14 May 2018

Dear Mr President
Dear Mr Speaker

The Australian National Audit Office has undertaken an independent performance audit in the Department of Defence titled *Naval Construction Programs—Mobilisation*. The audit was conducted in accordance with the authority contained in the *Auditor-General Act 1997*. Pursuant to Senate Standing Order 166 relating to the presentation of documents when the Senate is not sitting, I present the report of this audit to the Parliament.

Following its presentation and receipt, the report will be placed on the Australian National Audit Office's website—<http://www.anao.gov.au>.

Yours sincerely



Grant Hehir
Auditor-General

The Honourable the President of the Senate
The Honourable the Speaker of the House of Representatives
Parliament House
Canberra ACT

AUDITING FOR AUSTRALIA

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Summary and recommendations

Background

1. The Australian Government's *2016 Defence White Paper* committed \$89 billion for new Royal Australian Navy (Navy) ships and submarines and to develop a permanent naval shipbuilding industry in Australia. The Government's continuous naval shipbuilding program includes:

- (a) a rolling acquisition of submarines, with construction commencing from 2022 to 2023 as part of the Future Submarine program;
- (b) a continuous build program for major surface combatants, commencing with the Future Frigate program from 2020; and
- (c) a continuous build program for minor naval vessels, commencing with two Offshore Patrol Vessels in South Australia from 2018, and transferring to Western Australia in 2020.

2. The White Paper identified that in addition to delivering the individual capabilities required by the Navy, the continuous naval shipbuilding program seeks to generate economic growth and sustain Australian jobs.¹

3. The Government's *Naval Shipbuilding Plan* (the Plan) was released on 16 May 2017. The Plan outlines how Defence will deliver the naval capabilities outlined in the *2016 Defence White Paper* and develop a national shipbuilding enterprise in Australia. The Plan 'provides the Government's vision of an Australian naval shipbuilding enterprise and details the investment that the Government will make in delivering on its commitment to that enterprise'.²

Rationale for undertaking the audit

4. Defence's mobilisation of its naval construction programs was selected for audit due to its cost; significance to future Defence capability; longevity; national scope; and the significant implementation risks involved. In addition, early examination of the Plan is intended to provide assurance to the Parliament on the extent to which implementation to date supports achievement of the Plan. This audit is the third in a series of performance audits on recent naval shipbuilding programs. Other recent audits are: the *Air Warfare Destroyer Program* and the *Future Submarine—Competitive Evaluation Process* undertaken in 2014 and 2017 respectively.³

Audit objective, criteria and scope

5. The objective of the audit is to assess the effectiveness to date of the Department of Defence's planning for the mobilisation of its continuous shipbuilding programs in Australia.

6. The high-level audit criteria are:

- Defence has developed an integrated approach to the mobilisation of its shipbuilding programs;

1 Department of Defence, *2016 Defence White Paper*, 2016, p. 21.

2 Department of Defence, *Naval Shipbuilding Plan*, 2017 p. 14.

3 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program* and ANAO Audit Report No. 48 2016–17 *Future Submarine—Competitive Evaluation Process*.

- Defence has developed fit-for-purpose plans for each of its shipbuilding programs, which address key requirements, schedules and enablers; and
 - Defence has commenced mobilisation activities in accordance with relevant plans and government decisions.
7. The audit scope is limited to key planning and mobilisation activities for the naval shipbuilding programs. The audit does not seek to provide assurance on the detailed management and progress of individual programs and platforms.

Conclusion

8. Defence continues to work towards effective planning and mobilisation to deliver the Australian Government's *Naval Shipbuilding Plan*. Successful implementation will depend on actively managing the high to extreme levels of associated risk. While the key elements for success have been identified through the *Naval Shipbuilding Plan*—focussing on infrastructure, workforce, the industrial base, and a national approach—progress in the planning and delivery of those key elements is mixed. High-level governance arrangements to coordinate and advise on implementation of the Plan are still evolving. Defence is currently meeting scheduled milestones to deliver the Offshore Patrol Vessel, Future Frigate and Future Submarine construction programs, although each program is still at an early stage.

9. Defence has identified the key elements for a successful continuous shipbuilding enterprise. The Australian Government identified four key program enablers in its 2017 *Naval Shipbuilding Plan*—infrastructure, workforce, the industrial base, and a national approach. Implementation of the Plan is based on 'guiding principles' adopted by the Government, which were informed by lessons learned from previous Australian shipbuilding programs including the Collins Class submarine and Hobart Class Destroyer. The guiding principles focus on achieving productivity, the selection of mature ship designs⁴, limiting unique Australian design changes, and adopting an integrated approach to design and construction.

10. At this early stage, the effectiveness of governance arrangements cannot be established. In response to internal governance reviews, Defence appointed a senior responsible officer for the Plan in early 2018. A framework of senior advisory and coordinating committees has also been established.

11. Defence's planning and mobilisation activities relating to the four key enablers of the *Naval Shipbuilding Plan* remain a work in progress. Specifically:

- short term shipbuilding infrastructure requirements have been identified and construction of infrastructure has commenced, with longer term requirements under development;
- a workforce plan for the naval construction programs as a whole is currently under development, however, the cost-effectiveness of Defence's approach to maintaining a shipbuilding workforce between the end of the Hobart Class Destroyer build and the new surface ship programs has not been established;

4 The Future Submarine is not subject to military-off-the-shelf design constraints. This reflects the Government's policy that the Future Submarine will be a developmental acquisition.

- the broad areas of industrial reform required to achieve productive and cost-effective naval construction programs have been identified, but there has been no decision how these reforms might be achieved; and
 - initial activities have commenced towards adopting a national approach.
12. Defence is currently meeting scheduled milestones for the naval construction programs, noting that each program is in its early stages. Over time, Defence has advised the Government of the high to extreme risks the shipbuilding programs present. Certain risks are now being realised, including the progress of the Offshore Patrol Vessel through second gate approval without detailed sustainment costs and finalised commercial arrangements.
13. Defence has not updated its cost assumptions for its naval construction programs to reflect the earlier design and build milestones for its surface ships and the decision to build the Future Submarine in Australia.

Supporting findings

Establishing the key elements for success and governance frameworks

14. Elements of a successful continuous shipbuilding program have been identified. The Government's 2017 *Naval Shipbuilding Plan* identifies four key enablers for a successful continuous shipbuilding program: infrastructure, workforce, the industrial base, and a national approach. Several of the Government's 'guiding principles' for implementing the *Naval Shipbuilding Plan* aim to address significant issues that have affected previous naval construction programs including design maturity, integrating the design/production framework, limiting unique Australian design changes, and productivity.
15. At this early stage, the effectiveness of governance arrangements cannot be established. In response to two reviews of governance conducted in 2017, for delivery of the *Naval Shipbuilding Plan*, Defence appointed a senior responsible officer (Deputy Secretary) in early 2018. Defence has also established several senior committees to facilitate information sharing and coordination within government. An external advisory board has also been established. A range of issues identified in the first governance review remain to be resolved.

Infrastructure, workforce, the industrial base, and a national approach—the four key enablers

16. In respect to infrastructure planning and construction, Defence:
- has determined the core physical infrastructure required for the construction of its surface ship fleets—the Offshore Patrol Vessel and Future Frigate—at the Osborne (south) shipyard in South Australia. However, Defence is still working to determine elements of the core IT infrastructure. Construction commenced on the shipyard upgrade in late 2017, and the current forecast is that construction will be completed to meet the future frigate construction milestones;
 - is in the process of finalising its requirements for the Henderson Shipyard in Western Australia, including infrastructure requirements for the Offshore Patrol Vessel; and

- is in the early stages of determining its infrastructure plans for the Future Submarine build at the Osborne (north) shipyard, noting that the submarine is in its conceptual design phase.

17. In respect to the management of infrastructure at the Osborne shipyard in South Australia, the Government has established a new entity, Australian Naval Infrastructure (ANI) to manage assets, develop program infrastructure, provide precinct services, and manage common user facilities.

18. Defence has not determined industry workforce requirements for the naval construction programs. Defence is currently developing a workforce plan to address labour and productivity requirements across the naval construction programs. The plan was due to be finalised in December 2017, but had not been finalised as at 15 February 2018. Defence has undertaken initial workforce planning for the Osborne surface ship operation, which is due to commence construction of the first Offshore Patrol Vessel in the second half of 2018. The assumptions of Defence's current workforce planning activities are not based on a cost-benefit analysis. In particular, whether maintaining the shipbuilding workforce between the Hobart Class Destroyer and follow-on surface-ship builds is the most cost-effective way of establishing the naval shipbuilding enterprise.

19. Defence is in the process of establishing a Naval Shipbuilding College to provide training to future shipbuilding workers. The College will be established in three phases between 2018 and 2023 and cost estimates for the first phase have risen from \$25 million to \$62 million (approximately 2.5 times the original cost estimate). Ongoing operational costs for the College have not been considered, but will need to be met from shipbuilding project budgets.

20. Defence has identified the broad industrial issues that need to be addressed to achieve productive and cost-effective naval construction programs. There has been no Government decision on how these reforms might be achieved. The Government had planned to consider industrial-base reforms in late 2017, but these reforms had not progressed as at 26 March 2018. Defence advised that it will be developing performance metrics and productivity benchmarks for the Offshore Patrol Vessel build, and has engaged external consultants to develop performance measures for the Future Frigate build.

21. A number of steps have been taken, and activities initiated, in support of a national approach. These include engagement with the Government of South Australia on infrastructure arrangements at the Osborne shipyard, a tendering process to establish a Naval Shipbuilding College, and information campaigns directed to industry and other stakeholders.

Programming and risk management

22. Defence is currently on track to deliver the Offshore Patrol Vessel, Future Frigate and Future Submarine programs:

- a prime contractor has been selected for the design of the Offshore Patrol Vessel, with construction of the first vessel to commence in the second half of 2018;
- the Future Frigate is currently in its tender evaluation phase and is expected to proceed to second gate approval in mid-2018; and

- the Future Submarine is in the conceptual design phase and is expected to proceed to its preliminary design review milestone in 2020.

23. The design and build milestones for the Offshore Patrol Vessel were brought forward to help maintain the shipbuilding workforce from the end of the Hobart Class Destroyer build to commencement of the Future Frigate build. As a consequence of the compressed schedule, Defence has carried several risks into the Offshore Patrol Vessel acquisition. In particular, reliable sustainment cost estimates were not provided to the Government at second gate approval, and commercial arrangements between the selected ship builder and Australian shipbuilding firms had not been settled when the tender outcome was announced.

24. Defence has advised the Government of its assessment that the naval construction programs carry high to extreme risk. Key risks relate to the delivery of expected capability, program cost, ability to meet program schedules, and management of the industrial base. The *Naval Shipbuilding Plan* did not address the management of these risks in any detail. However, Defence advised the ANAO that these risks will be managed by the individual shipbuilding programs.

25. A key potential risk relates to any decision to integrate the Aegis Ballistic Missile Defense capability into the selected frigate, which would require significant development work and be a departure from the Government's guiding principle of minimising unique Australian design changes.

26. Defence analysed the cost of implementing its program of naval construction for the 2016 *Defence White Paper*. Since the publication of the White Paper, key assumptions informing the cost of the naval construction programs have changed: the Future Submarine will be built in Australia and the design and build schedule for surface ships has been brought forward (bringing forward expenditure). The potential addition of the Aegis Ballistic Missile Defense capability is a further relevant consideration. Defence has not revisited the White Paper cost assumptions.

Recommendations

Recommendation no.1

Paragraph 4.41

That Defence, in line with a 2015 undertaking to the Government, determine the affordability of its 2017 *Naval Shipbuilding Plan* and related programs and advise the Government of the additional funding required to deliver these programs, or the Australian Defence Force capability trade-offs that may need to be considered.

Defence's response: *Disagreed.*

27. *Defence takes an enterprise approach for Naval Construction Programs. The shipbuilding provisions identified in the Integrated Investment Program are consolidated for Government to consider the Naval Construction Program affordability as each project is presented to Government.*

28. *Offsets are recommended to Government if there is a shortfall between the funding requirement and existing provision.*

Defence's response to the audit report

Defence acknowledges the findings contained in the Audit report on the *Naval Construction Programs - Mobilisation* and notes the recommendation that Defence determine the affordability of the 2017 *Naval Shipbuilding Plan* and its related programs, and advise Government of the additional funding required to deliver these programs, or Australian Defence Force capability trade-offs that may need to be considered.

Defence takes an enterprise approach to its Naval Construction Programs. The shipbuilding provisions identified in the Integrated Investment Program are consolidated to enable Government to consider the affordability of the Naval Construction Program as each project is presented to Government. Offsets are recommended to Government if there is a shortfall between the funding requirement and existing provision. Consequently, Defence disagrees with the ANAO's recommendation.

The Government has set an ambitious agenda for the creation of a national naval shipbuilding enterprise. In the ten months since the release of the Government's Naval Shipbuilding Plan, Defence has progressed the key policy initiatives and critical milestones outlined in the Plan in a timely and coordinated national effort.

As identified in the Plan, most far-reaching Government policy initiatives will take time to develop and mature. Defence, in close collaboration with other Commonwealth agencies and State and Territory Governments, is taking an active and agile approach to transforming Australia's naval shipbuilding industry to ensure the long-term sustainability of this strategic national asset.

Implementation of the Plan is subject to unprecedented levels of oversight and accountability, including six-monthly reviews by Government and independent oversight by the Government's Naval Shipbuilding Advisory Board.

The Government's strategic and coordinated approach to Australia's Defence industry also supports the Naval Shipbuilding Plan. The Government has a clear vision for Australia's Defence industry, and is putting in place the policies and initiatives to ensure that the Defence industry can help meet our capability needs and support Australia's naval shipbuilding enterprise.

Already, Australian industry is being involved earlier in the development of capabilities, and greater support has been made available for industry to support maximisation of Australian industry participation in major capital equipment projects, such as shipbuilding projects. Defence has also completed substantial work on the policies that will shape and support the development of Australia's Defence industry. This includes the Defence Export Strategy released on 29 January 2018 and the forthcoming Defence Industrial Capability Plan and the Defence Skilling and STEM Strategy, whose implementation will be aligned with the Naval Shipbuilding Plan. These initiatives will further strengthen Australia's Defence industrial base and support the Government's enterprise approach to shipbuilding.

Audit findings

1. Background

Introduction

1.1 The Australian Government's *2016 Defence White Paper* committed \$89 billion for new Royal Australian Navy (Navy) ships and submarines and to develop a permanent naval shipbuilding industry in Australia. The Government's continuous naval shipbuilding program includes:

- (a) a rolling acquisition of submarines, with construction commencing from 2022 to 2023 as part of the Future Submarine program;
- (b) a continuous build program for major surface combatants, commencing with the Future Frigate program from 2020; and
- (c) a continuous build program for minor naval vessels, commencing with two Offshore Patrol Vessels in South Australia from 2018, and transferring to Western Australia in 2020.

1.2 The White Paper identified that, in addition to delivering the individual capabilities required by the Navy, the continuous naval shipbuilding program seeks to generate economic growth and sustain Australian jobs.⁵

Naval Shipbuilding Plan

1.3 The Government's *Naval Shipbuilding Plan* (the Plan) was released on 16 May 2017.⁶ The Plan outlines how Defence will deliver the naval capabilities outlined in the *2016 Defence White Paper* and develop a national shipbuilding enterprise in Australia. The Plan states that it 'is the largest, most complex and technically difficult advanced manufacturing challenge this nation has ever contemplated'.⁷ The Plan 'provides the Government's vision of an Australian naval shipbuilding enterprise and details the investment that the Government will make in delivering on its commitment to that enterprise'.⁸

1.4 The Plan is based on four enablers:

- a modern, innovative, and secure naval shipbuilding and sustainment infrastructure;
- a highly capable, productive, and skilled naval shipbuilding and sustainment workforce;
- a motivated, innovative, cost-competitive, and sustainable Australian industrial base, underpinned initially by experienced international ship designers and builders who transfer these attributes to Australian industry; and
- a national approach to delivering the *Naval Shipbuilding Plan*.⁹

1.5 The Plan identifies that the enterprise will not be solely reliant on Australian Defence contract work and will pursue export opportunities in niche markets.¹⁰

5 Department of Defence, *2016 Defence White Paper*, p. 21.

6 This is the third naval shipbuilding plan developed by the Australian government this century. The prior reports were *Naval Shipbuilding and Repair Sector Strategic Plan*, 2002 and *Submarine Industry Skills Plan: A Plan for the Naval Shipbuilding Industry*, 2013.

7 Department of Defence, *Naval Shipbuilding Plan*, 2017, p. 19.

8 *ibid.*, p. 14.

9 *ibid.*, p. 12.

10 The *Defence Export Strategy* was released by the Government on 29 January 2018.

Navy's shipbuilding programs

1.6 The establishment of the naval shipbuilding enterprise is based on three naval shipbuilding programs: the Offshore Patrol Vessel, the Future Frigate, and the Future Submarine. These will co-exist with three significant current naval programs: the Hobart Class Destroyer (also known as the Air Warfare Destroyer) and the continuing sustainment of the Collins Class submarines and Anzac Class frigates.

Figure 1.1: SEA 1180—Offshore Patrol Vessel

SEA 1180—Offshore Patrol Vessel

- Number of vessels: 12
- Cost: \$3-4 Billion
- Country of design: Germany (Lürssen)
- Displacement per vessel: Up to 1800 tonnes



1.7 Twelve offshore patrol vessels will be built with the first-of-class expected to enter service in 2022. The vessel's primary role will be to undertake constabulary missions, maritime patrol and response duties. The first two vessels will be built at the Osborne shipyard in Adelaide with construction commencing in 2018, as construction on the Hobart Class Destroyer winds down. The remaining 10 vessels will be built in Western Australia, at the Henderson shipyard south of Fremantle, from 2020.

Figure 1.2: SEA 5000—Future Frigate

SEA 5000—Future Frigate

- Number of vessels: 9
- Cost: \$35 Billion
- Country of design: TBA
- Displacement per vessel: TBD



1.8 Nine frigates will be built with the first-of-class expected to enter service around 2027, replacing the existing Anzac Class frigates, and complementing the Hobart Class Destroyers. The frigates will incorporate anti-submarine warfare and air warfare capabilities, but will also contribute to border control and anti-piracy patrols when needed. The frigates will be built at the Osborne (south) shipyard in South Australia.

Figure 1.3: SEA 1000—Future Submarine

SEA 1000—Future Submarine

- Number of vessels: 12
- Cost: \$50 Billion
- Country of design: France (Naval Group)
- Displacement per vessel: TBD



1.9 Twelve submarines will be built with the first-of-class expected to enter service in the early 2030s, replacing the existing diesel-electric Collins Class Submarines. The submarine, will be designed by Naval Group of France, with Lockheed Martin Australia as the Combat System

Integrator. The submarine will be powered by conventional diesel-electric technology and will be built at the Osborne (north) shipyard in South Australia.

Navy's related programs

Figure 1.4: Sea 4000—Hobart Class Guided Missile Destroyer

SEA 4000—Hobart Class Guided Missile Destroyer

- Number of vessels: 3
- Cost: \$9 Billion
- Country of design: Spain (Navantia)
- Displacement per vessel: 7000 tonnes



1.10 Three Hobart Class Destroyers have been constructed by the AWD Alliance, of which ASC is a member, in conjunction with the Spanish shipbuilding firm, Navantia, at the Osborne (south) shipyard.¹¹ The first-of-class, HMAS Hobart, was commissioned on 23 September 2017 and the final ship, NUSHIP Sydney, is expected to be delivered in 2019. Defence has decided the retention of some key skilled workers from the Hobart Class Destroyer program is required in order to maintain continuity of shipbuilding in the Osborne shipyard and avoid expensive ramp-up costs and time consuming skilling of shipyard workers for the new program of shipbuilding.

Figure 1.5: Collins Class Submarine (Sustainment)

Collins Class Submarine (Sustainment)

- Number of vessels: 6
- Cost: \$3.5 Billion
- Country of design: Sweden (Kockums)
- Displacement per vessel: 3500 tonnes



1.11 The 2017 *Naval Shipbuilding Plan* requires the new shipbuilding programs to co-exist with the Collins Class submarine and surface-ship sustainment programs at the Osborne and Henderson shipyards. Navy currently maintains six diesel-electric Collins Class submarines. Further enhancements to the current submarine capability, as well as continuation of the sustainment effort, will continue into the 2040s. Full-cycle sustainment of the Collins Class submarine is undertaken by ASC at the Osborne (north) shipyard in South Australia, and shorter duration sustainment activities are undertaken at the ASC facility at the Henderson shipyard in Western Australia.

Shipyards

1.12 The continuous shipbuilding enterprise is heavily focussed on the Osborne shipyard in South Australia. All nine Future Frigates; 12 Future Submarines; and two of the 12 Offshore Patrol Vessels will be constructed at Osborne, with the remaining 10 Offshore Patrol Vessels to be constructed at the Henderson shipyard in Western Australia. On 12 October 2017, the Minister for Defence

¹¹ The AWD (Air Warfare Destroyer) Alliance also consists of the Commonwealth of Australia and Raytheon Australia.

Industry announced that an infrastructure upgrade to the Osborne South shipyard (for surface-ship construction only) would be undertaken at a cost of more than \$500 million.¹²

Rationale for undertaking the audit

1.13 Defence's mobilisation of its naval construction programs was selected for audit due to its cost; significance to future defence capability; longevity; national scope; and the significant implementation risks involved. In addition, early examination of the Plan is intended to provide assurance to the Parliament on the extent to which implementation to date supports achievement of the Plan. This audit is the third in a series of performance audits on recent naval shipbuilding programs. Other recent audits are: the *Air Warfare Destroyer Program* and the *Future Submarine—Competitive Evaluation Process* undertaken in 2014 and 2017 respectively.¹³

Audit objective, criteria and scope

1.14 The objective of the audit is to assess the effectiveness to date of the Department of Defence's planning for the mobilisation of its continuous shipbuilding programs in Australia.

1.15 The high-level audit criteria are:

- Defence has developed an integrated approach to the mobilisation of its shipbuilding programs;
- Defence has developed fit-for-purpose plans for each of its shipbuilding programs, which address key requirements, schedules and enablers; and
- Defence has commenced mobilisation activities in accordance with relevant plans and government decisions.

1.16 The audit has considered the following projects:

- SEA 1180—Offshore Patrol Vessel program;
- SEA 5000—Anti-Submarine Warfare Future Frigate program;
- SEA 1000—Future Submarine program;
- completion of the Hobart Class Destroyers currently under construction; and
- sustainment of Collins Class submarines.

1.17 The audit scope is limited to key planning and mobilisation activities for these programs. The audit does not seek to provide assurance on the detailed management and progress of individual programs and platforms.¹⁴

1.18 The audit method included a review of records and data held by Defence, particularly the Capability Acquisition and Sustainment Group, and the Royal Australian Navy. The ANAO also interviewed key Defence personnel.

12 The Hon. C Pyne MP, (Minister for Defence Industry), '600 Construction Jobs to be created as Lendlease Selected to Build Osborne South Shipyard', media release, 12 October 2017.

13 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program*; and ANAO Audit Report No. 48 2016–17 *Future Submarine—Competitive Evaluation Process*.

14 In addition, Appendix 2 of the audit report summarises the ANAO's analysis of the *Future Submarine Design and Mobilisation Contract* having regard to the Senate Order for Departmental and Agency Contracts. The analysis was undertaken at the request of (now former) Senator Nick Xenophon.

1.19 The audit was conducted in accordance with the ANAO auditing standards at a cost to the ANAO of approximately \$577 746.

1.20 The team members for this audit were Alex Wilkinson, Sonia Pragt, Zak Brighton-Knight and David Brunoro.

2. Establishing the key elements for success and governance frameworks

Areas examined

This chapter considers whether Defence has identified the key elements for a successful continuous shipbuilding enterprise and established a fit-for-purpose governance framework.

Conclusion

Defence has identified the key elements for a successful continuous shipbuilding enterprise. The Australian Government identified four key program enablers in its 2017 *Naval Shipbuilding Plan*—infrastructure, workforce, the industrial base, and a national approach. Implementation of the Plan is based on ‘guiding principles’ adopted by the Government, which were informed by lessons learned from previous Australian shipbuilding programs including the Collins Class submarine and Hobart Class Destroyer. The guiding principles focus on achieving productivity, the selection of mature ship designs¹⁵, limiting unique Australian design changes, and adopting an integrated approach to design and construction.

At this early stage, the effectiveness of governance arrangements cannot be established. In response to internal governance reviews, Defence appointed a senior responsible officer for the Plan in early 2018. A framework of senior advisory and coordinating committees has also been established.

Have the key elements of a successful continuous shipbuilding program been identified?

Elements of a successful continuous shipbuilding program have been identified. The Government’s 2017 *Naval Shipbuilding Plan* identifies four key enablers for a successful continuous shipbuilding program: infrastructure, workforce, the industrial base, and a national approach. Several of the Government’s ‘guiding principles’ for implementing the *Naval Shipbuilding Plan* aim to address significant issues that have affected previous naval construction programs including design maturity, integrating the design/production framework, limiting unique Australian design changes, and productivity.

The 2017 *Naval Shipbuilding Plan*

2.1 The overarching policy and direction-setting document for the naval shipbuilding enterprise is the *Naval Shipbuilding Plan*. The Plan is a high-level document which sets out the Government’s delivery strategy. The Plan is based on four key enablers:

- a modern, innovative, and secure naval shipbuilding and sustainment infrastructure;
- a highly capable, productive, and skilled naval shipbuilding and sustainment workforce;

15 The Future Submarine will not be subject to military-off-the-shelf design constraints. This reflects the Government’s policy that the Future Submarine will be a developmental acquisition.

- a motivated, innovative, cost-competitive, and sustainable Australian industrial base, underpinned initially by experienced international ship designers and builders who transfer these attributes to Australian industry; and
- a national approach to delivering the *Naval Shipbuilding Plan*.

2.2 The Plan states that:

Brought together as the ***Australian naval shipbuilding enterprise***, these four key enablers will see Australia develop the sovereign Australian capability to deliver affordable and achievable naval shipbuilding and sustainment through an Australian industrial base that is reformed, secure, productive and cost-competitive.¹⁶

The guiding principles of the *Naval Shipbuilding Plan*'s implementation

2.3 The Government's 'guiding principles' for the implementation of the *Naval Shipbuilding Plan* are based on analysis undertaken for Defence by the RAND Corporation in 2015 (the 2015 shipbuilding analysis).¹⁷ The principles include:

- establishing a consistent production and build demand;
- selecting a mature design at the start of the build and limiting the amount of changes once production starts;
- limiting the amount of unique Australian design changes;
- introducing a continuous build philosophy for naval surface combatants and a different in-service model based on retention of vessels for no more than 25–30 years;
- ensuring a well-integrated designer, builder and supplier team;
- ensuring there is visionary leadership provided by company management; and
- developing a productivity based culture of continuous improvement.¹⁸

2.4 Several of the Government's guiding principles address the significant issues experienced by Defence in its previous shipbuilding programs:

- Design maturity: The ANAO's 2014 audit of the Hobart Class Destroyer program (Air Warfare Destroyer) highlighted that immaturity in the destroyer's detailed design had a significant impact on the program's cost, productivity, and schedule.¹⁹ Similarly, the Collins Class submarine construction was affected by an immature design with only 10 per cent of design drawings completed when construction commenced.²⁰
- Limiting the amount of Australian design changes: Australian design changes affect design maturity and therefore add to design risk.

16 Department of Defence, *Naval Shipbuilding Plan*, 2017, p. 13.

17 See *Australia's Naval Shipbuilding Enterprise Preparing for the 21st Century*, RAND Corporation, Santa Monica, California, 2015.

18 Department of Defence, *Naval Shipbuilding Plan*, 2017, pp. 105–106.

19 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program*, pp. 169–208.

20 RAND Corporation, *Learning from Experience Volume IV Lessons from Australia's Collins Class Submarine*, 2011, p. xix.

- Well integrated designer, builder and supplier team: The initial lack of integration in the Hobart Class Destroyer's designer, builder and supplier team limited the ability of the program to manage risks and reduce costs.²¹
- Developing a productivity based culture of continuous improvement: The Hobart Class Destroyer and Collins Class submarine build programs experienced significant productivity issues.²² Productivity issues continued into the Collins Class sustainment operation, prompting a series of reviews.²³

Has Defence implemented fit-for-purpose governance and coordination arrangements to oversee the mobilisation of its shipbuilding programs?

At this early stage, the effectiveness of governance arrangements cannot be established. In response to two reviews of governance conducted in 2017, for delivery of the *Naval Shipbuilding Plan*, Defence appointed a senior responsible officer (Deputy Secretary) in early 2018. Defence has also established several senior committees to facilitate information sharing and coordination within government. An external advisory board has also been established. A range of issues identified in the first governance review remain to be resolved.

2.5 To inform the governance arrangements for the *Naval Shipbuilding Plan*, two governance reviews have been conducted and several oversight and coordination committees have been established.

Reviews of governance

2.6 In 2017, two reviews were conducted to examine the governance and management arrangements for the shipbuilding program.

2.7 The first review was completed by a member of the Government's Naval Shipbuilding Advisory Board.²⁴ The review highlighted the following key issues for the management and governance of the shipbuilding programs:

- a. The complexity of the submarine, frigate, and infrastructure projects demand significantly more capable program management structures than most previous Australian projects.
- b. There is urgent need to provide additional clarity of roles, responsibilities, and accountabilities, both in and around the Program Offices.
- c. Standard operating procedures or at least a standard operating model would be extremely helpful in the smooth operation of these complex program offices.

21 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program*, p. 39.

22 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program*, pp. 137, 146, 245, 250–276.

23 Five reviews have been conducted since 2012. The first was *Study into the Business of Sustaining Australia's Strategic Collins Class Capability*, November 2012, pp. 57–58; and the most recent was *Study into the Business of Sustaining Australia's Strategic Collins Class Capability, Beyond Benchmark*, May 2016, p. 2.

24 The development of the Naval Shipbuilding Advisory Board was announced in December 2016. The Board was created to provide expert independent advice to Government on all aspects of naval shipbuilding. The Board is made up of 10 members and is chaired by Professor Donald Winter.

- d. There is a significant deficit of experience and expertise in both acquisition/contractual matters and in the engineering and production processes.
- e. The diverse set of technologies represented by shipbuilding and combat systems development will have significant implications for program office staffing.
- f. The changing role of the Royal Australian Navy as a 'parent Navy' will have significant impact on the relationship with the Capability Acquisition and Sustainment Group and their role in acquisition.

2.8 The second review, commissioned by Defence in mid-2017, found a requirement for increased coordination, stating that:

Governance exists at a program level, however, the success of the Naval Shipbuilding Plan requires coordination between Chief of Navy, Government, Industry, and associated Defence bodies as all participants need to act in a coordinated manner to deliver the program on time and to meet Defence needs. Independent, planned and frequent reporting as well as effective coordination of stakeholders needs to be managed in a well-defined overarching governance structure that would encompass both existing governance (specific enterprise programs) as well as supporting naval building capabilities.

2.9 To address the findings of these reviews, in early 2018, Defence established a new senior position—Deputy Secretary Naval Shipbuilding. The new position will report directly to the Secretary and Chief of the Defence Force, and will be Defence's senior responsible officer for the delivery of the *Naval Shipbuilding Plan*. The Deputy Secretary Naval Shipbuilding has responsibility for:

- naval shipbuilding projects and relevant sustainment activities;
- delivery of the four key enablers; and
- Defence's contribution to the 'national endeavour'.

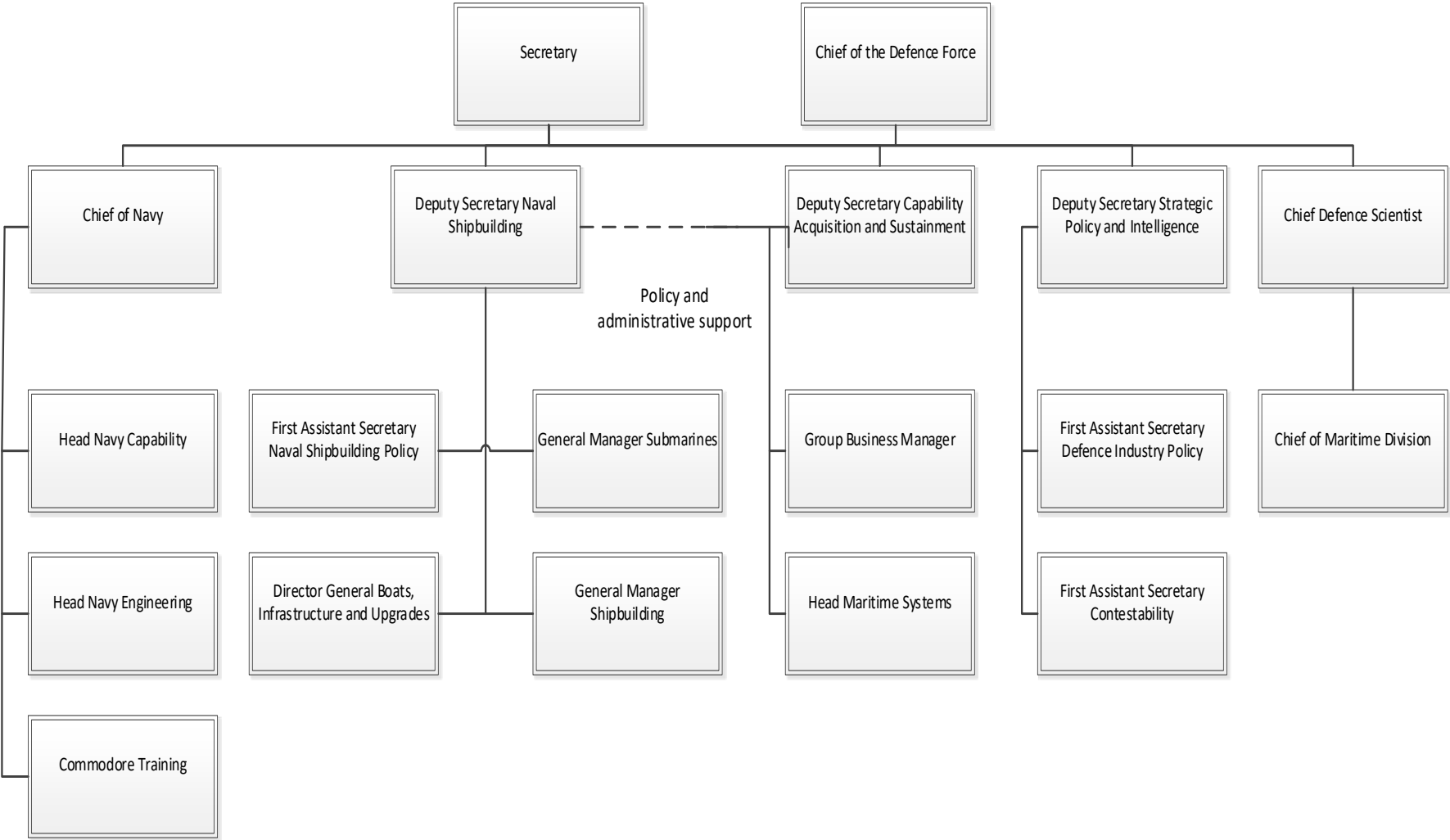
2.10 In October 2017, Defence advised the Minister for Defence Industry that the new Deputy Secretary level position would:

Strengthen the enterprise-level approach within the Defence portfolio to every aspect of the Naval Shipbuilding Plan's implementation and reporting, including the substantial policy work remaining to be brought forward for Government consideration.

2.11 The Deputy Secretary Naval Shipbuilding will have a specific mandate to provide a strong strategic centre to deliver further policy advice for the *Naval Shipbuilding Plan* and maintain an enterprise approach to naval shipbuilding within Defence, as well as further development arrangements with external Government and non-government stakeholders in the naval shipbuilding enterprise. Defence has commenced regular updates to the Government on the progress of implementing the *Naval Shipbuilding Plan*.

2.12 Figure 2.1 maps Defence's new shipbuilding organisational structure.

Figure 2.1: Defence Shipbuilding organisational structure—October 2017



Source: Department of Defence.

Committee arrangements

2.13 The Government and Defence have established a number of Committees to contribute to the coordination and implementation of the *Naval Shipbuilding Plan*. These include the:

- *Naval Shipbuilding Coordination Group*—chaired by the Defence Secretary and responsible for coordination and knowledge sharing across Defence on all matters related to the *Naval Shipbuilding Plan*, the delivery of the naval capabilities, and the four key enablers;
- *Interdepartmental Committee on Shipbuilding*²⁵—responsible for coordination and knowledge sharing across the Commonwealth on all matters related to the Plan, including the four key enablers;
- *Secretaries Committee on Shipbuilding*²⁶—coordinates whole of government advice and resources to support the delivery of the *Naval Shipbuilding Plan*; and
- *Naval Shipbuilding Advisory Board*—appointed by the Government to provide expert external advice to the Government on all aspects of naval shipbuilding.

2.14 These committee arrangements establish a framework for the sharing of information within government, and coordinating official advice to the Government. In addition, the Naval Shipbuilding Advisory Board provides external advice to the Government.

25 Members of the Committee include representatives from: the Department of Defence; Department of Education and Training; Department of the Prime Minister and Cabinet; Department of Infrastructure, Regional Development and Cities; Department of the Treasury; Department of Finance; Department of Industry, Innovation and Science; and Department of Home Affairs. The Committee first met in August 2016.

26 Members of the Committee include: Secretary of the Department of the Prime Minister and Cabinet (Chair); Secretary of the Department of Defence; Chief of the Defence Force; Secretary of the Department of Finance; Secretary of the Department of Industry, Innovation and Science; Secretary of the Department of Education and Training; and Secretary of the Department of Infrastructure, Regional Development and Cities.

3. Infrastructure, workforce, the industrial base, and a national approach—the four key enablers

Areas examined

This chapter considers whether Defence has planned and commenced mobilisation for the four key enablers for delivering the *Naval Shipbuilding Plan*.

Conclusion

Defence's planning and mobilisation activities relating to the four key enablers of the *Naval Shipbuilding Plan* remain a work in progress. Specifically:

- short term shipbuilding infrastructure requirements have been identified and construction of infrastructure has commenced, with longer term requirements under development;
- a workforce plan for the naval construction program as a whole is currently under development, however, the cost-effectiveness of Defence's approach to maintaining a shipbuilding workforce between the end of the Hobart Class Destroyer build and the new surface ship programs has not been established;
- the broad areas of industrial reform required to achieve productive and cost-effective naval construction programs have been identified, but there has been no decision how these reforms might be achieved; and
- initial activities have commenced towards adopting a national approach.

3.1 As discussed, the *Naval Shipbuilding Plan* is based on four key enablers:

- a modern, innovative, and secure naval shipbuilding and sustainment infrastructure;
- a highly capable, productive, and skilled naval shipbuilding and sustainment workforce;
- a motivated, innovative, cost-competitive, and sustainable Australian industrial base, underpinned initially by experienced international ship designers and builders who transfer these attributes to Australian industry; and
- a national approach to delivering the *Naval Shipbuilding Plan*.

Has Defence planned and commenced its required infrastructure for the naval shipbuilding enterprise?

In respect to infrastructure planning and construction, Defence:

- has determined the core physical infrastructure required for the construction of its surface ship fleets—the Offshore Patrol Vessel and Future Frigate—at the Osborne (south) shipyard in South Australia. However, Defence is still working to determine elements of the core IT infrastructure. Construction commenced on the shipyard upgrade in late 2017, and the current forecast is that construction will be completed to meet the future frigate construction milestones;
- is in the process of finalising its requirements for the Henderson Shipyard in Western Australia, including infrastructure requirements for the Offshore Patrol Vessel; and
- is in the early stages of determining its infrastructure plans for the Future Submarine build at the Osborne (north) shipyard, noting that the submarine is in its conceptual design phase.

In respect to the management of infrastructure at the Osborne shipyard in South Australia, the Government has established a new entity, Australian Naval Infrastructure (ANI) to: manage assets, develop program infrastructure, provide precinct services, and manage common user facilities.

Osborne shipyard

3.2 The Osborne shipyard, located near Adelaide South Australia, is primarily used for full cycle docking of the Collins Class Submarine, and the consolidation of the Hobart Class Destroyer blocks (most of which were constructed in a distributed shipyard model). Defence identified in 2016 that the Osborne and Henderson shipyards²⁷ do not have the capabilities considered necessary for a modern shipyard.²⁸

3.3 To deliver the required infrastructure, the Commonwealth will invest approximately \$775 million in the Osborne shipyard to fund the development of a common user shipbuilding facility, the purchase of additional land, and redevelop surface ship infrastructure. In May 2017, the Commonwealth and South Australian Governments signed a Memorandum of Understanding for the transfer of land and operational assets from the South Australian Government to the Commonwealth.

Management of infrastructure activities

3.4 On 11 October 2016, the Government announced that it would separate ASC Pty Ltd into three individual Government owned entities, each responsible for one of Shipbuilding, Infrastructure, and Submarine Sustainment. Prior to this separation of entities, ownership, access and usage rights for the shipbuilding infrastructure at Osborne existed under what Defence

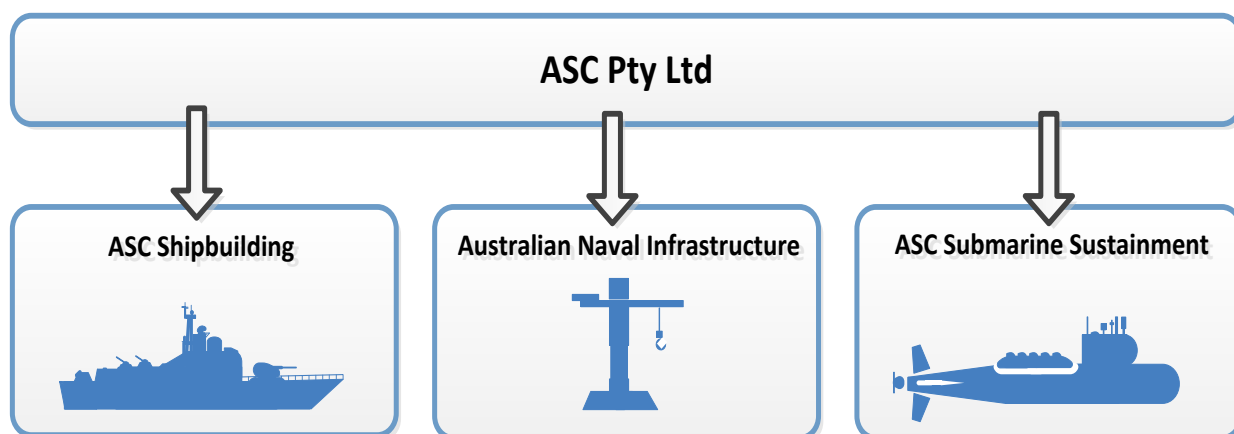
27 The Henderson Shipyard is located south of Perth in Western Australia and will be the primary site for the Offshore Patrol Vessel build.

28 Department of Defence, *Osborne Shipyard Redevelopment—Major Surface Combatant Infrastructure*, October 2016, p. 8.

regarded as complex arrangements between ASC, the Commonwealth and South Australian Governments. In September 2016, Defence advised the Government that full access to the existing and future shipyard infrastructure was required to implement the continuous naval construction program, and in the interim, this could be achieved by transferring ownership of these assets to a new government owned entity formed from the separation of ASC.

3.5 The separation of ASC is outlined in Figure 3.1.

Figure 3.1: Separation of ASC Pty Ltd



Source: ANAO.

3.6 On 26 March 2017, phase one of the separation was completed with the establishment of the infrastructure entity, Australian Naval Infrastructure Pty Ltd (ANI). ANI, acting as a Public Non-Financial Corporation, is now the owner of the shipbuilding and submarine sustainment land and critical infrastructure located at Osborne. ANI is a Government Business Enterprise and reports to two joint Shareholder Ministers: the Minister for Finance and the Minister for Defence Industry. ANI has received funding from the Federal Government for the development of shipyard infrastructure. Once the surface ship construction commences, ANI will primarily be funded through lease revenue from shipbuilders.

3.7 ANI's primary role is to support the national shipbuilding and submarine programs in line with the Commonwealth's continuous shipbuilding policy. ANI's operations cover four broad activities:

- landlord and asset management;
- developer of program infrastructure;
- provider of precinct services; and
- common user facilities management.

Design of the Osborne Shipyard

3.8 In September 2016, Defence commissioned Odense Maritime Technology (OMT) to assess the upgrades that were needed for the current infrastructure available at Osborne to deliver the Future Frigate program. OMT provided:

- concept drawings for the proposed yard layout, including identification of the location of major facilities and storage areas;
- a listing of anticipated major facilities, equipment and services that would be required;
- production flow of the shipyard illustrating the production workflow from the receipt of materials, through various states of production until the delivery of the ship; and
- associated rough-order-of-magnitude costs.

3.9 OMT provided recommendations to Defence to develop an efficient world class shipyard. Recommendations focussed on building an effective, skilled, and efficient workforce; and engaging Australian shipbuilders to become more design focussed through implementing modelling software that would enable a better understanding of ship design and create efficiency. OMT also recommended the use of robotics within the shipyard as a way of further improving the efficiency of the shipyard and reducing costs. Defence used the OMT recommendations to inform the infrastructure tender documentation for the redevelopment of the Osborne shipyard. ANI advised the ANAO in February 2018 that the capacity for automation has been included in the Osborne (south) shipyard's design. Automation has also been considered in Defence's initial analysis for its Workforce Plan, currently under development.

3.10 Osborne is currently occupied by the Hobart Class Destroyer build and the Collins Class submarine sustainment operation. The required infrastructure for the new programs will have to be built around these existing operations or alternative options may need to be considered. Defence advised the Government in March 2017 that: 'building the necessary infrastructure and facilities, utilities and access, on the site while it is being utilised for other purposes will be challenging'.

Construction of surface ship infrastructure at the Osborne shipyard

3.11 On 12 October 2017, the Minister for Defence Industry announced that Lendlease had been selected as the managing contractor for the construction of the Osborne (south) Shipyard. The contract's target cost is \$457 million and will be completed in three phases. The contract defines these phases as:

- Mobilisation works: the initial earthworks, ground improvements and services locations and works connected with site mobilisation to be completed by 18 October 2018.
- Early works: piling works supporting the steel fabrication unit and assembly hall; block assembly hall; and block outfitting and erection hall to be completed by 18 October 2018.
- Main works: the remaining work elements appearing in Schedule 3 of the contract, with the final element to be completed by 29 November 2019. The work elements are listed in Appendix 1 of this Report.

3.12 Under the contract, Lendlease has accepted Defence's principal designer for the surface ship infrastructure upgrade. Timely completion of the shipyard infrastructure program is vital to implementation of the shipbuilding schedule. Infrastructure will need to be completed to a level that allows the Offshore Patrol Vessel to commence construction in the second half of 2018; and

the Future Frigate to commence construction in 2020.²⁹ The construction schedule for the surface ships is also dependent on the Hobart Class Destroyer build being completed on time. As at March 2018, Defence advised that the build was meeting its schedule.

3.13 Construction of the shipyard was planned to commence between 1 July and 31 December 2017 with a target start date to be as close as possible to 1 July 2017. The Department of Finance advised the ANAO in January 2018, that construction had commenced on the Osborne shipyard upgrade in late 2017.³⁰

Has Defence determined its workforce requirements?

Defence has not determined industry workforce requirements for the naval construction programs. Defence is currently developing a workforce plan to address labour and productivity requirements across the naval construction programs. The plan was due to be finalised in December 2017, but had not been finalised as at 15 February 2018. Defence has undertaken initial workforce planning for the Osborne surface ship operation, which is due to commence construction of the first Offshore Patrol Vessel in the second half of 2018. The assumptions of Defence's current workforce planning activities are not based on a cost-benefit analysis. In particular, whether maintaining the shipbuilding workforce between the Hobart Class Destroyer and follow-on surface ship builds is the most cost-effective way of establishing the naval shipbuilding enterprise.

Defence is in the process of establishing the Naval Shipbuilding College to provide training to future shipbuilding workers. The College will be established in three phases between 2018 and 2023 and cost estimates for the first phase have risen from \$25 million to \$62 million (approximately 2.5 times the original cost estimate). Ongoing operational costs for the College have not been considered, but will need to be met from shipbuilding project budgets.

Managing workforce demand

3.14 The 2015 shipbuilding analysis³¹ supporting the development of the *Naval Shipbuilding Plan* identified that Defence's schedule at the time for naval acquisitions would produce gaps in demand for shipyard production, facilities, services, and labour. The analysis forecast an immediate gap in demand would appear between the wind-down of the Hobart Class Destroyer program from 2017, and the start of the Future Frigate program in 2020. A long term gap would arise when the production of the Future Frigate fleet ends in 2038.³² Figure 3.2 sets out the labour demand projections for Australia's naval shipbuilding workforce from 2014–2035 presented in the analysis.

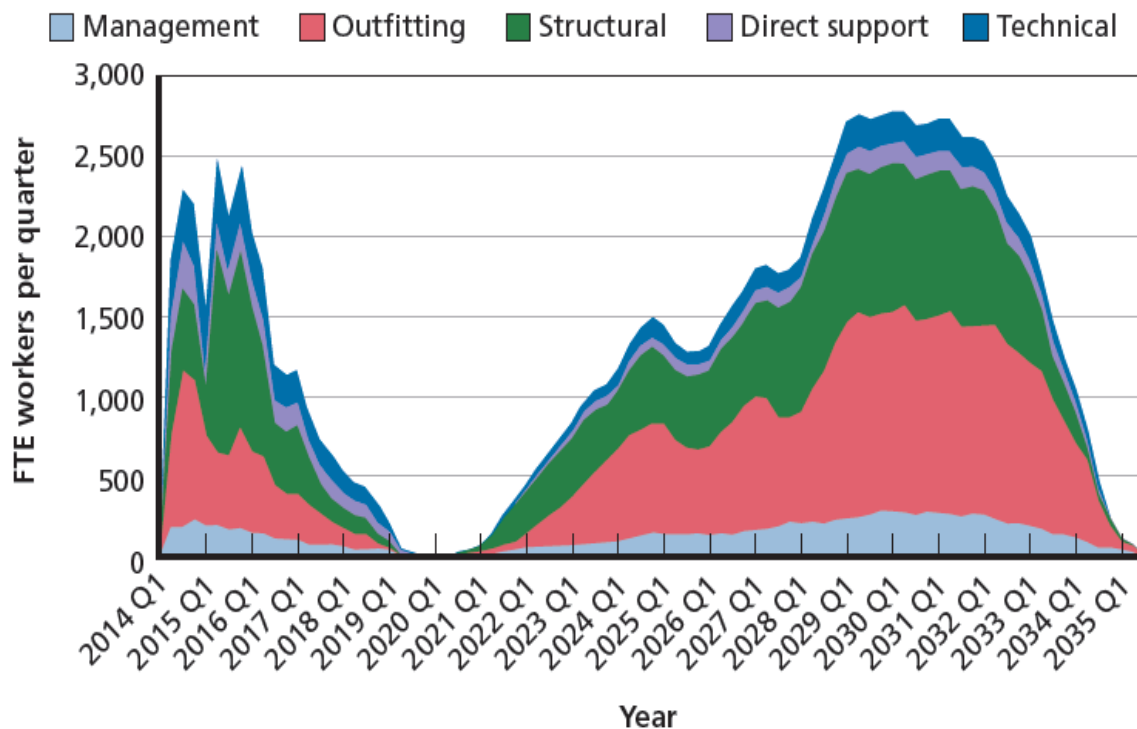
29 Scheduling is examined in Chapter 4 of this audit report.

30 As ANI is a Government Business Enterprise, the Department of Finance holds the portfolio responsibility.

31 The analysis was discussed in paragraphs 2.3 and 2.4 of this audit report.

32 Department of Defence, *Naval Shipbuilding Plan*, 2017, p. 110.

Figure 3.2: 2015 shipbuilding analysis of the workforce profile for building Air Warfare Destroyers and SEA5000 projects



Source: RAND Corporation, *Australia's Naval Shipbuilding Enterprise*, 2015.

3.15 On these projections, from 2020 the shipbuilding workforce in Australia would be reduced to almost zero as the Hobart Class Destroyer workforce declines, before being required to 'ramp up' to around 2700 skilled personnel in approximately eight years to meet the requirements of the Future Frigate program.

3.16 To avoid the reduction in skilled workers identified in Figure 3.2, the 2015 shipbuilding analysis recommended that Defence bring forward the Offshore Patrol Vessel program build to 2017. This was intended to provide a cost-effective transition between the Hobart Class Destroyer program and the commencement of the Future Frigate program in 2020. Defence was not confident of the ability of the Offshore Patrol Vessel program to mitigate the reduction in skilled workers and in 2015 advised the Government that its analysis had concluded that the Offshore Patrol Vessel would not materially influence the 18 month gap between the completion of the Destroyers' construction and the commencement of the Future Frigate project. Defence further advised that bringing the Offshore Patrol Vessel project forward could adversely impact capability and cost.

3.17 In August 2015, the Government committed to move forward the commencement of the Offshore Patrol Vessel construction to 2018, one year later than the 2015 shipbuilding analysis recommended; and to commence Future Frigate construction in 2020.³³ As at September 2017, Defence's production schedule for the new surface-ship fleet forecasts the Offshore Patrol Vessel

33 The Hon. T Abbott MP and the Hon. K Andrews MP, (Prime Minister and Minister for Defence), 'The Government's plan for a strong and sustainable naval shipbuilding industry', media release, 4 August 2015.

program to commence production in 2018. The first Future Frigate will commence construction with prototyping activities in 2020.³⁴

3.18 Further Defence analysis in July 2017 confirmed Defence's 2015 advice to the Government that a reduction in the shipbuilding workforce could not be avoided. The analysis identified that bringing forward the Offshore Patrol Vessel build, and building the first two vessels at the Osborne Shipyard, has not mitigated the decline in workforce demand. The analysis indicated that the Offshore Patrol Vessel program will have a:

Limited, positive impact to addressing the shortfall in resources or 'valley of death' principle as was identified in the 2015 RAND Report, *'Australia's Naval Shipbuilding Enterprise – Preparing for the 21st Century'* ... The resource requirements to build an Offshore Patrol Vessel are less than those required for the DDG [Hobart Class Destroyer] or the Future Frigate.

3.19 The ANAO made several requests to Defence on how the current schedule of shipbuilding would address the gap in the demand for labour between the wind-down of the Hobart Class Destroyer build and the commencement of the Future Frigate build. Defence was unable to provide any information in addition to that available in the 2015 and 2017 analyses noted above.

3.20 There is no evidence that a cost-benefit analysis was undertaken to inform the decision to bring forward the surface ship build programs with the aim of maintaining the worker base. Defence relied heavily on the 2015 shipbuilding analysis, but this analysis does not reflect the current shipbuilding program which now includes an Australian build for 12 submarines. The 2015 analysis states that:

This analysis focuses solely on the industrial base responsible for producing and sustaining surface vessels. While submarine production and sustainment relies on some of that industrial base, our charter from [Defence] was to restrict our examination to the industries upon which naval surface forces depend.³⁵

3.21 In December 2017, the Minister for Finance and the Minister for Defence Industry announced the retention of 200 workers from the Hobart Class Destroyer build, by transferring the workers to the Collins Class sustainment operation. These workers will move to support Collins Class submarine sustainment work and undertake training and upskilling to support the naval construction programs. In addition, as many as 100 scholarships would be offered to workers to support opportunities to upskill in other roles such as operations management, computer aided design, engineering, and supply chain fields.³⁶

3.22 The Collins sustainment operation at the Osborne shipyard has experienced significant productivity issues, and between 2014 and 2016 Defence was advised that the operation achieved improvements which put it in a position to achieve the benchmarked performance by mid-2017.³⁷ The transfer of up to 200 workers from the Hobart Class Destroyer build—which itself experienced significant productivity issues³⁸—to the Collins sustainment operation has the potential to

34 See paragraph 4.18 of this report.

35 *Australia's Naval Shipbuilding Enterprise Preparing for the 21st Century*, RAND Corporation, Santa Monica, California, 2015, p. 3.

36 Senator the Hon. M Cormann and the Hon. C Pyne MP, (Minister for Finance and Minister for Defence Industry), 'Government secures 200 new jobs at Osborne, totaling 1200 this year', media release, 11 December 2017.

37 See footnote 23.

38 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program*, pp. 251–257.

negatively impact the productivity improvements reportedly achieved between 2014 and 2016. Productivity is discussed further in paragraphs 3.36–3.39 below.

3.23 In December 2017 the Government decided that the retention of the 200 workers at Osborne will be funded from the existing Offshore Patrol Vessel, Future Frigate and Future Submarine budgets. In March 2018, Defence advised the ANAO that:

Funding for the 200 workers at Osborne was not/is not funded by OPV, Future Frigate or Future Submarines.

3.24 Defence did not provide any evidence as to how these positions will be funded. Nor did Defence provide costing and productivity analysis to the ANAO demonstrating the effect of transferring 200 additional positions to the Collins Class submarine sustainment program. In March 2018, Defence advised the ANAO that:

As the Air Warfare Destroyer Program continues to wind down, 200 employees with valuable naval constructions skills will become available commencing in financial year 2017–18. Without suitable opportunities in naval construction programs, these skilled personnel will transition out of the sector, increasing the challenges of establishing a suitable workforce for upcoming programs.

Rather than lose these personnel from the shipbuilding sector, the Future Submarine Program has been investigating with ASC opportunities to progressively transition AWD [Air Warfare Destroyer] staff into ASC submarines. Augmented by the 200 from the Air Warfare Destroyer Program, there would be a larger pool of personnel within ASC from which up to 50 would be able to compete for roles working as industry secondees within the Program office. Initial work indicates that up to an additional 70 personnel could be engaged in courses in computer-aided-design, supply chain management, engineering, shipyard operations, and a gifted leader program commencing in the latter half of financial year 2017–18. The remaining personnel will be needed for continued work within the Collins Sustainment Program, noting the need to prepare and execute forthcoming upgrades to the Collins Class submarines and Life-of-Type-Extension activities.

Workforce requirements for the new build programs

3.25 Defence is currently developing a workforce plan to address the workforce requirements for its ship and submarine construction programs, and sustainment programs. As at 22 January 2018, the workforce plan had not been finalised, despite the Offshore Patrol Vessel achieving second gate approval in November 2017 and the Future Frigate program scheduled to achieve second gate approval in April 2018.³⁹

3.26 Defence has commissioned some initial workforce analysis studies for the shipbuilding programs. The analysis was based on demand for workers at the Osborne shipyard in South Australia which is where the bulk of ship and submarine construction will occur.

3.27 The analysis estimated the demand for labour across occupational groups during the ‘ramp-up’ period of the naval construction programs (Table 3.1). The analysis estimated that during the ‘ramp-up’ period (2020–2028), an additional 4141 persons would be required across all occupational groups, with the largest demand within skilled trades.

39 Second gate approval involves government approval to proceed to acquisition, Department of Defence, *Interim Capability Life Cycle Manual* (2016), p. 4, paragraph 1.4(b).

Table 3.1: Demand for labour across shipbuilding occupational groups

Occupational group	Total new employees demand over ramp-up period	Ramp-up period			
		Start (Year)	End (Year)	Length (Years)	Average yearly demand
Professional					
Professional Management and Business Operations	224	2020	2026	6	37
Professional Engineering and Project Management	47	2020	2028	8	6
Semi-professional					
Semi-professional business operations	252	2020	2026	6	42
Semi-professional technical	280	2021	2026	5	56
Skilled Trades					
Fitters	472	2020	2027	7	67
Fabrication	1133	2020	2027	7	162
Electrical	625	2021	2028	7	89
Heating, ventilation and cooling	187	2021	2028	7	27
Other outfitting	250	2021	2028	7	36
Labourers					
Non-trade support	671	2021	2027	6	112
Total	4141	2020	2028		

Source: RAND Corporation, *Developing the Workforce for Australia's Continuous Shipbuilding Program*.

3.28 The analysis does not address a key element of the shipbuilding plan—developing workforce at the Henderson shipyard, which will deliver all but the first two vessels of Navy's new Offshore Patrol Vessel program. The Offshore Patrol Vessel program faces a range of workforce risks and requires an efficient transition from Osborne in South Australia to Henderson in Western Australia, after the construction of the second vessel, to meet Navy's schedule requirements.⁴⁰ Defence was unable to provide the ANAO with any analysis of how it plans to address these workforce risks, but advised the ANAO that the transition of the workforce from Osborne to Henderson is the responsibility of the successful Offshore Patrol Vessel tenderer, Lürssen.

Naval Shipbuilding College

3.29 As part of the *Naval Shipbuilding Plan*, a Naval Shipbuilding College will be established in Adelaide to provide skilled workers to the naval construction programs. The College will be established in three phases:

- First Phase—2018: a focus on key, entry-level trade qualifications to address the demand in trade and structural outfitting qualifications. The College would establish contractual

⁴⁰ These requirements include reducing the pressure on the current Armidale class patrol vessels which are nearing the end of their life-of-type.

relationships with Registered Training Organisations across Australia to deliver these trade qualifications, customised to naval shipbuilding and advanced manufacturing. As shipbuilders will not require these workers until 2020⁴¹, Defence envisaged that the Maritime Technical College will arrange with Group Training Organisations across Australia to recruit apprentices and secure practical training and experience.

- Second Phase—2020–21: The second phase aims to increase the throughput of key trades, and increase the capacity of higher education institutions to provide engineering and naval architecture qualifications.
- Third Phase—2022–23: The third phase will establish a training facility at the Osborne shipyard.⁴²

3.30 In 2017, Defence, in conjunction with the Department of Education and Training, undertook a tender process to select an organisation to deliver the first phase of the Naval Shipbuilding College. In April 2018, the Government announced that the Naval Shipbuilding Institute, a joint venture between Kellogg Brown & Root and Huntington Ingalls Industries, has been selected as the preferred tenderer.⁴³

Naval Shipbuilding College funding

3.31 Initial cost estimates developed in February 2017 for the first phase of the College were up to \$25 million. As at December 2017, the estimated cost of the first phase had increased to \$62 million (approximately 2.5 times the original cost estimate). These establishment costs have not been accounted for in the *Defence Integrated Investment Program* and will need to be absorbed by the Defence budget or additional funding provided. Ongoing operational costs have also not been considered, with Defence advising the Government that ongoing operational costs will have to be met by the Future Submarine, Future Frigate and Offshore Patrol Vessel projects.⁴⁴

Has Defence identified the industrial base reforms required to achieve productive and cost-effective naval construction programs?

Defence has identified the broad industrial issues that need to be addressed to achieve productive and cost-effective naval construction programs. There has been no Government decision on how these reforms might be achieved. The Government had planned to consider industrial-base reforms in late 2017, but these reforms had not progressed as at 26 March 2018. Defence advised that it will be developing performance metrics and productivity benchmarks for the Offshore Patrol Vessel build, and has engaged external consultants to develop performance measures for the Future Frigate build.

41 Construction of the Future Frigate will formally commence in 2020.

42 Department of Defence, *Naval Shipbuilding Plan*, 2017, pp. 74–76.

43 The Hon. C Pyne MP, Senator the Hon. Simon Birmingham and the Hon. Karen Andrews MP, (Minister for Defence Industry, Minister for Education and Training and Assistant Minister for Vocational Education and Skills), 'Naval shipbuilding college to meet naval shipbuilding needs', media release, 3 April 2018.

44 Paragraphs 4.37–4.41 examine the current budget projections for the construction programs.

3.32 The Government's *Naval Shipbuilding Plan* states that:

Brought together as the Australian naval shipbuilding enterprise, these four key enablers will see Australia develop the sovereign Australian capability to deliver affordable and achievable naval shipbuilding and sustainment through an Australian industrial base that is reformed, secure, productive and cost-competitive.

The cost of building naval ships in Australia was 30–40 per cent greater than the United States benchmarks and even greater against some other naval shipbuilding nations. ... RAND judged that the premium could be reduced if both Government and industry were prepared to reform.⁴⁵

3.33 The Osborne shipyard in South Australia has experienced significant cost, schedule, productivity, and quality issues across its Hobart Class Destroyer build⁴⁶ and Collins Class submarine sustainment operations.⁴⁷ Osborne is currently Australia's only major naval construction shipyard and its current main tenant is the Government Business Enterprise, ASC.⁴⁸

3.34 Defence has recognised the challenges faced in reforming the industrial base centred on the Osborne shipyard. It has identified that changes relating to infrastructure, management culture, productivity, and workforce skills are required. In March 2017 Defence advised the Government that the risks of achieving reform to the industrial base included:

- the concurrent activities in the Osborne shipyard;
- the workforce challenges including expanding the skills base, maintaining this skills base between builds, and managing this workforce transition through a potentially sensitive industrial relations climate at Osborne; and
- controlling the costs of the builds.

3.35 Defence's advice to the Government did not address how the reforms might be achieved. Defence advised the ANAO in March 2018 of several future initiatives focussing on the shipbuilding industrial base including:

- establishing a Steering Group with relevant Commonwealth departments and agencies to coordinate development of the Defence Industry Skilling and STEM [science, technology, engineering and mathematics] Strategy;
- Defence is scheduled to undertake a Defence Industry Skilling Survey over March–April 2018 to help establish a baseline for the assessment of defence industry's immediate skilling requirements, workforce issues and recruitment strategies;
- the Centre for Defence Industry Capability (CDIC) currently supports companies to improve their business skills. Industry Development Projects will also be undertaken to

45 Department of Defence, *Naval Shipbuilding Plan*, p. 14.

46 These issues were discussed in the ANAO audit of the Hobart Class Destroyer Build, ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer Program*.

47 The sustainment of the Collins Class submarine has been subject to continuous review since 1999, commencing with the *Report to the Minister for Defence on the Collins Class Submarine and related matters* (McIntosh Review); and most recently a series of five reviews undertaken between 2012 and 2016—*Study into the Business of Sustaining Australia's Strategic Collins Class Submarine Capability* (the Coles Review).

48 Recent changes to ASC were discussed in paragraphs 3.4–3.7 of this audit report.

support the development of sector-wide needs that have been identified from within industry through the Centre for Defence Industry Capability;

- the Defence Industrial Capability Plan will outline the Government's vision to build a robust, resilient, internationally competitive and reformed Australian defence industry base that is better able to help meet Defence capability requirements. The Plan is due to be released during the first half of 2018⁴⁹; and
- the Defence Industry Participation Policy is due for public release in mid-2018. The intent of the policy is to tailor the Australian Industry Capability model across materiel and non-materiel procurement of \$4 million and above to provide maximum opportunity for Australian industry at a national and local level.

Productivity

3.36 As discussed, productivity has been a major issue for Australian naval shipbuilding and sustainment programs. The construction of the Hobart Class Destroyer at the Osborne Shipyard faced significant productivity issues resulting from an immature design, inexperienced workforce, inefficient transfer of design between the designer and builder, and an inefficient construction methodology.⁵⁰ The sustainment of the Collins Class submarine, predominantly at the Osborne Shipyard, has also experienced significant productivity issues, although a recent review has identified improvement.⁵¹

3.37 To help address the productivity issues faced by the Hobart Class Destroyer build, the ANAO made the following recommendation for future naval construction programs in its March 2014 audit of the Hobart Class Destroyer:

Recommendation No.3

The ANAO recommends that for future Australian Naval Construction programs, Defence monitor performance against a set of productivity metrics from the outset, so as to promote productivity, gauge the key factors influencing productivity and, where required, help bring about productivity improvements.⁵²

3.38 Defence agreed to this recommendation. Noting the early stages of each program, Defence advised the ANAO that it is currently addressing the recommendation. Defence advised the ANAO, in August 2017, that for the Offshore Patrol Vessel:

Under the Naval Shipbuilding Plan implementation, the Shipbuilding Taskforce is developing with industry broader shipbuilding performance metrics and productivity benchmarks.

Noting this future work under the Shipbuilding Plan, [the Offshore Patrol Vessel Program] is utilising [an external consultant's] basket of measures and the review of infrastructure to monitor and feedback to industry their measured performance.

49 ANAO Comment: The *Defence Industry Capability Plan* was released by the Australian Government on 23 April 2018 as this Audit Report was being prepared for tabling.

50 ANAO Report No. 22 2013–14 *Air Warfare Destroyer Program*, pp. 251–57.

51 *Study into the Business of Sustaining Australia's Strategic Collins Class Capability*, November 2012, pp. 57–58; and *Study into the Business of Sustaining Australia's Strategic Collins Class Capability, Beyond Benchmark*, May 2016, p. 2.

52 ANAO Report No. 22 2013–14 *Air Warfare Destroyer Program*, p. 257.

3.39 Defence also advised that a consultancy had been commissioned to develop a range of performance measures for the Future Frigate program.

Is Defence adopting a national approach to delivering the *Naval Shipbuilding Plan*?

A number of steps have been taken, and activities initiated, in support of a national approach. These include engagement with the Government of South Australia on infrastructure arrangements at the Osborne shipyard, a tendering process to establish a Naval Shipbuilding College, and information campaigns directed to industry and other stakeholders.

3.40 The *Naval Shipbuilding Plan* states that:

A national endeavour is required to deliver the Naval Shipbuilding Plan because the Plan will require contributions, support and engagement from all of Australia's States and Territories, from many sectors of the Australian industrial base, and from many other sectors of the Australian community, including research and development and education and training sectors as well as the union movement and professional associations.

In the absence of a coordinated, national approach, it would be likely that each of the naval shipbuilding projects, their industry partners and suppliers would compete with each other, and with other Defence and national projects for resources and talent. Such competition would only raise the cost to the nation of achieving the capability that is needed.⁵³

3.41 Efforts towards a national approach have included working with the South Australian Government on the infrastructure requirements, as noted at paragraph 3.3, and working to establish a Naval Shipbuilding College, as noted at paragraph 3.29.

3.42 Defence has also commenced two national initiatives to attract industry and skilled workers to the shipbuilding programs:

- a \$20 million national advertising campaign identifying the potential opportunities available in the naval construction program; and
- industry 'roadshows' and briefings to provide information to potential suppliers and service providers about the opportunities available within the naval construction program.

3.43 Industry 'roadshows' were held by both the future submarine and ships divisions during 2016 and 2017. A total of 12 industry briefings were conducted for the future submarine program while 15 briefings were held for the ships division.⁵⁴

3.44 More broadly, the Government announced on 15 February 2018 a national seminar series *Introduction to the Defence Market*. The series aims to inform business about opportunities in the Defence market.

53 Department of Defence, *Naval Shipbuilding Plan*, 2017, p. 19.

54 The roadshows cost \$106 500 and \$165 934 respectively.

4. Programming and risk management

Areas examined

This chapter considers whether Defence is on track to deliver its naval construction programs, and whether it has identified and is managing its naval construction risks.

Conclusion

Defence is currently meeting scheduled milestones for the naval construction programs, noting that each program is in its early stages. Over time, Defence has advised the Government of the high to extreme risks the shipbuilding programs present. Certain risks are now being realised, including the progress of the Offshore Patrol Vessel through second gate approval without detailed sustainment costs and finalised commercial arrangements.

Defence has not updated its cost assumptions for its naval construction programs to reflect the earlier design and build milestones for its surface ships and the decision to build the Future Submarine in Australia

Areas for improvement

The ANAO has made one recommendation aimed at establishing the affordability of the shipbuilding program and advising the Government accordingly.

Is Defence on track to deliver its shipbuilding programs to meet Government's present and future capability requirements?

Defence is currently on track to deliver the Offshore Patrol Vessel, Future Frigate and Future Submarine Programs:

- a prime contractor has been selected for the design of the Offshore Patrol Vessel, with construction of the first vessel to commence in the second half of 2018;
- the Future Frigate is currently in its tender evaluation phase and is expected to proceed to second gate approval in mid-2018; and
- the Future Submarine is in the conceptual design phase and is expected to proceed to its preliminary design review milestone in 2020.

The design and build milestones for the Offshore Patrol Vessel were brought forward to help maintain the shipbuilding workforce from the end of the Hobart Class Destroyer build to commencement of the Future Frigate build. As a consequence of the compressed schedule, Defence has carried several risks into the Offshore Patrol Vessel acquisition. In particular, reliable sustainment cost estimates were not provided to the Government at second gate approval, and commercial arrangements between the selected ship builder and Australian shipbuilding firms had not been settled when the tender outcome was announced.

Current status of the shipbuilding programs

4.1 Defence is concurrently managing three significant naval construction programs, while implementing the Government's broader naval construction industry policy objectives. As at 16 February 2018:

- the Offshore Patrol Vessel achieved second gate approval in November 2017 with Lürssen selected as the successful prime contractor⁵⁵;
- the Future Frigate program was in its tender evaluation stage. Second gate approval was forecast for mid-2018; and
- the Future Submarine program is in the conceptual design phase. Its next major milestone is the preliminary design review milestone in 2020. The program is expected to meet this milestone.

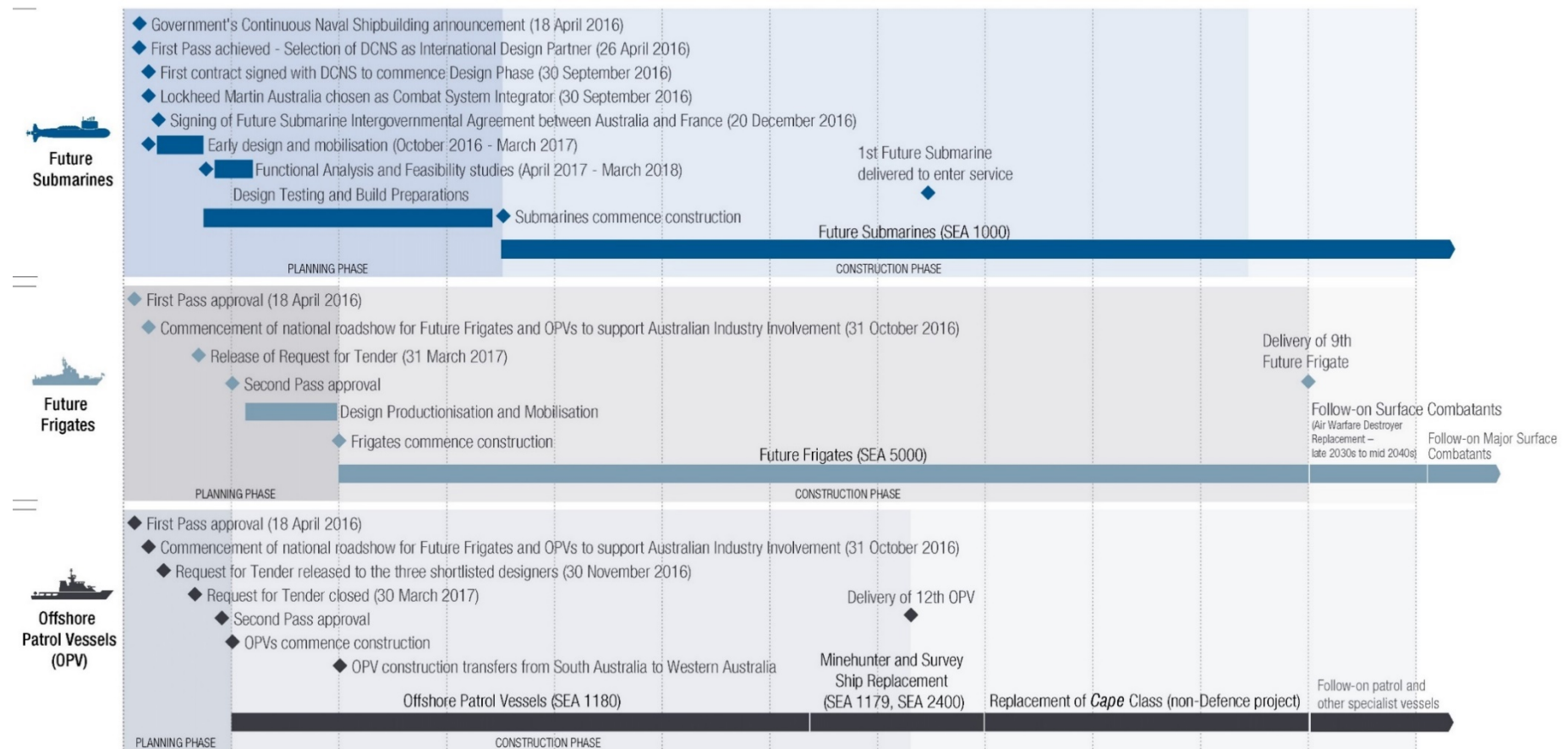
Offshore Patrol Vessel and Future Frigates

4.2 To maintain a degree of continuity of shipbuilding between the wind-down of the Hobart Class Destroyer build from 2017, and the commencement of the Offshore Patrol Vessel and Future Frigate builds, Defence has brought forward the design and construction milestones for these two new surface ship fleets by two years and three years respectively.⁵⁶ Figure 4.1 illustrates the design and construction schedule for the three major shipbuilding programs.

55 The contract was signed with Luerssen Australia Pty Ltd a subsidiary of Lürssen of Germany

56 This is in line with the 2015 shipbuilding analysis which provided the option of bringing forward the build of the Offshore Patrol Vessel to 2017 from 2020–21 to potentially provide a transition of the shipbuilding workforce between the Hobart Class Destroyer program and the commencement of the Future Frigate build, which at the time of the analysis, was forecast to commence in 2020. The analysis forecast that if Defence were to start the construction of the Offshore Patrol Vessels by the end of 2017, between 400 and 500 shipyard workers could be retained throughout the years separating the end of the Hobart Class Destroyer construction and the commencement of the Future Frigate program (*Australia's Naval Shipbuilding Enterprise, Preparing for the 21st Century*, RAND Corporation, Santa Monica, California, 2015, p. xxix)

Figure 4.1: Implementation schedule for Future Frigates; Offshore Patrol Vessels; and Future Submarines



Source: Department of Defence, *Naval Shipbuilding Plan*. Outlines are not indicative of final design.

4.3 To achieve success in the context of this design and construction schedule for the Offshore Patrol Vessel and Future Frigate, Defence will need to have regard to the lessons learned from the Navy's most recent major shipbuilding program, the Hobart Class Destroyer. This program incurred cost and schedule overruns and productivity and quality shortfalls, as a result of immaturity in the detailed design documentation process.⁵⁷ The ANAO stated in its 2014 audit of the program, that for future shipbuilding programs:

Looking forward, for programs such as the Future Frigates (SEA 5000) and the Future Submarine (SEA 1000), the design process, and subsequent design and production reviews need to be effective in working through a range of fundamental issues relating to design and construction. Proposed designs, and construction and delivery schedules, need to be thoroughly assessed to confirm that there is sufficient time to conduct adequate pre-production systems engineering processes including Preliminary Design Reviews, Critical Design Reviews, Detailed Design Reviews and Production Readiness Reviews ... Construction should commence only when the infrastructure, resources and construction data are stable enough to allow production to commence within manageable cost and schedule risk profiles.⁵⁸

4.4 The design and construction schedules for the new surface ship programs pose a significant challenge to Defence. Completion of the necessary systems engineering processes—including stable design infrastructure and resource plans—before construction commences is necessary to establish manageable cost and schedule risk profiles. Defence advised the ANAO in March 2018 that: 'Defence have moved to a prototype/construct model in order for future frigates to mitigate this risk.'

Offshore Patrol Vessel Program

4.5 On 24 November 2017, the Government announced that the German company Lürssen, was selected as the successful bidder for the design and build of Australia's new Offshore Patrol Vessel fleet.⁵⁹ Lürssen was selected to design and build 12 Offshore Patrol Vessels, with the first two vessels to be built at the Osborne shipyard in South Australia, utilising the existing ASC Hobart Class Destroyer workforce. The remaining 10 vessels will be built at the Henderson shipyard in Western Australia with Civmec (Forgacs Marine and Defence Pty Ltd) as the build partner. In its announcement of the Offshore Patrol Vessel tender outcome, the Government also identified that Austal, part of an unsuccessful tender bid with Fassmer, may form part of the Henderson build:

The project will then transfer to the Henderson Maritime Precinct in Western Australia where Lürssen will use the capabilities of Austal and Civmec to build ten Offshore Patrol Vessels, subject to the conclusion of commercial negotiations.⁶⁰

57 For example, the revision process led to costly and out-of-sequence rework in cases where construction work already undertaken no longer matched the design. ANAO Audit Report No. 22 2013–14, *Air Warfare Destroyer Program*, pp. 25–26.

58 ANAO Audit Report No. 22 2013–14, *Air Warfare Destroyer Program*, pp. 32–33.

59 The Hon. M Turnbull MP (Prime Minister of Australia), Press Conference with Minister for Defence and Minister for Defence Industry, 24 November 2017, available from <<https://goo.gl/B5MKEo>>, [accessed 15 January 2018].

60 The Hon. M Turnbull MP, Senator the Hon. M Payne and the Hon. C Pyne MP, (Prime Minister of Australia, Minister for Defence and Minister for Defence Industry), 'Hundreds of Australian jobs created in Offshore Patrol Vessel project', media release, 24 November 2017. On 28 February 2018, Defence advised the Senate Committee on Foreign Affairs Defence and Trade that contracts had not been finalised between Lürssen, Civmec and Austal.

4.6 Lürssen's design was assessed as the most able to satisfy the Navy's operating intent across the areas of operation, including tropical and Southern Ocean regions all year round. Defence assessed the Lürssen option as compliant against all essential capability requirements and considered the design to be most suited to the border protection role. Defence considered that:

- Lürssen presents a low risk to achieving a 2018 construction commencement date as the design presented by Lürssen is mature and is based on a proven vessel that is already in service; and
- the design proposed by Lürssen is one that can be produced in Australia using current tools, processes and design personnel. Lürssen plans to start construction with a design that is 100 per cent complete which may reduce the likelihood of rework and schedule delays.

4.7 The transition to Western Australia in 2020 is considered to present a 'medium risk' to Defence as Lürssen's shipbuilding partner in Western Australia, Civmec (Forgacs Marine and Defence Pty Ltd), has not previously built an entire naval ship.⁶¹ Lürssen proposes to pair experienced German staff with Australian counterparts throughout the build, providing the means to transfer shipbuilding skills and knowledge to Australian industry.

4.8 Construction of the first Offshore Patrol Vessel will commence in late 2018, with the final vessel scheduled to be delivered in 2030. The Government approved an acquisition cost of \$3.58 billion (out-turned) to be funded from Defence's *Integrated Investment Program* capital provision. The contract with Lürssen is for a value of \$2.83 billion (out-turned). Defence advised the ANAO in April 2018 the remainder of the approved acquisition cost, (approximately \$750 million out-turned), is for government furnished equipment, training equipment, project office costs, and extensions to the life of the Armidale Class Patrol Boats.

4.9 The compressed schedule for achieving second gate approval for the Offshore Patrol Vessel, by the fourth quarter of 2017, resulted in Defence carrying several risks into the acquisition. These relate to sustainment cost estimates and commercial arrangements for the build.

Sustainment costs

4.10 Defence's 2016 Interim Capability Lifecycle Manual identifies sustainment as 'a key driver in the acquisition process and therefore must be considered in the earliest planning stages'.⁶²

4.11 Defence provided rough-order-of-magnitude sustainment cost estimates to the Government at second gate approval. At the time, Defence advised that the Government it 'does not have a sustainment plan of sufficient fidelity to seek approval for sustainment costs.' Consequently, selection of the Offshore Patrol Vessel was not based on reliable whole-of-life cost estimates. Defence advised the Government it would develop support system specifications and conduct a tender for sustainment of the Vessel in the second quarter of 2018. Defence undertook to return to the Government in the final quarter of 2018 to present proposed sustainment costs for approval.

4.12 The progress of the Offshore Patrol Vessel program through second gate approval on the basis of rough-order-of-magnitude sustainment costs is contrary to the findings and recommendations of numerous external reviews and audits undertaken in Defence over the past

61 Forgacs constructed 37 of the 93 blocks which were assembled to build the Hobart Class Destroyers.

62 Department of Defence, *Interim Capability Life Cycle Manual* (2016), p. 73.

two decades.⁶³ The history of Defence acquisitions in Australia demonstrates that inadequate sustainment cost estimates at project approval have led to cost implications once the platform is in service.⁶⁴ By the time the Government is provided with reliable sustainment cost estimates for the Offshore Patrol Vessel, the first vessel will be under construction, with no option to consider alternative platforms if the sustainment costs of the vessels are above expectations.

4.13 In March 2018, Defence advised the ANAO that not providing reliable sustainment cost estimates to the Government:

... is not uncommon in shipbuilding programs. While tender quality prices are not available, reasonable estimates have been provided and a whole of life cost estimate was considered by Government at second pass for Offshore Patrol Vessel acquisition.

Commercial arrangements—Henderson shipyard build

4.14 As quoted in paragraph 4.5, the commercial arrangements between the designer and shipbuilders for the Henderson shipyard component of the build were not finalised at second gate approval. In addition to the commercial risk this creates, the Government's 'guiding principles' for the implementation of the *Naval Shipbuilding Plan* require a well-integrated design-build-supplier structure. Defence advised the Government of these risks and undertook to resolve these commercial issues in early 2018.

Future Frigate program

4.15 In late 2016, Defence conducted an internal review of the Future Frigate program. The purpose of the review was to examine the program's status, outlook and readiness to continue towards second gate approval in mid-2018. The review found that:

- the Future Frigate program is subject to several constraints associated with the accelerated schedule to enable a 2020 construction start;
- decision-making had been compressed to such a degree that a meaningful 2020 construction start was not achievable; and
- schedule compression presented such extreme risk that cost and schedule over-run was likely, and that to proceed on the current schedule had the potential for severe reputational damage to Defence and the Government.

4.16 The internal review provided two options, advising that the planned acquisition approach should be amended to:

- select a design in early 2017 to provide an additional 12 months to support infrastructure construction and equipment tests in order to achieve a meaningful construction start date of 2020; or

63 See *Defence Procurement Review 2003* (also known as the *Kinnaird Review*), p. 26; *Going to the Next Level, the report of the Defence Procurement and Sustainment Review* (2008) (also known as the *Mortimer Review*) p. 50; *Plan to Reform Support Ship Repair and Management Practices* (2011) (also known as the *Rizzo Review*) p. 35; and The Senate Foreign Affairs, Defence and Trade References Committee, Senate Committee Report, *Procurement procedures for Defence capital projects* (2012), p. 67. The ANAO has undertaken a number of audits identifying the consequences of inadequate sustainment cost estimates at second gate approval. An overarching examination of the issue of sustainment cost estimates for Defence acquisitions is provided in ANAO Audit report No. 6 2013–14, *Capability Development Reform*, Chapter 7.

64 See footnote 63, above.

- delay the selection of a design to allow for the optimum Future Frigate platforms to be considered, and the construction of infrastructure (A delay of this magnitude would be several years).

4.17 On 27 October 2016, Defence's General Manager Ships noted the options. Defence advised the ANAO in December 2017 that the Capability Manager Delegate considered the internal review on 28 October 2016, and agreed with its findings, but not the recommendations.

4.18 As an alternative to the two possible approaches identified in its internal review, Defence advised the Minister for Defence Industry on 31 January 2017 that the Future Frigate could commence construction in 2020 with 'prototyping activities'. The intent of the prototyping activities is to test the shipyard's tools and procedures, and train and qualify the shipyard workers. Although the intended prototyping activities had not been included in Defence's *Integrated Investment Program*, Defence advised the Minister that the cost associated with the prototyping will be recovered in the efficiencies gained during the Future Frigate build. Defence did not conduct any supporting analysis for this advice.

Has Defence identified and managed the risks associated with an integrated shipbuilding program?

Defence has advised the Government of its assessment that the naval construction programs carry high to extreme risk. Key risks relate to the delivery of expected capability, program cost, ability to meet program schedules, and management of the industrial base. The *Naval Shipbuilding Plan* did not address the management of these risks in any detail. However, Defence advised the ANAO that these risks will be managed by the individual shipbuilding programs.

A key potential risk relates to any decision to integrate the Aegis Ballistic Missile Defense capability into the selected frigate, which would require significant development work and be a departure from the Government's guiding principle of minimising unique Australian design changes.

Defence analysed the cost of implementing its program of naval construction for the *2016 Defence White Paper*. Since the publication of the White Paper, key assumptions informing the cost of the naval construction programs have changed: the Future Submarine will be built in Australia and the design and build schedule for surface ships has been brought forward (bringing forward expenditure). The potential addition of the Aegis Ballistic Missile Defense capability is a further relevant consideration. Defence has not revisited the White Paper cost assumptions.

Identifying risk

4.19 Defence first advised the Government in July 2015 that an Australian build of the Offshore Patrol Vessel, Future Frigate, and Future Submarine fleets carried 'extreme risk'. Prior to the release of the *Naval Shipbuilding Plan* in May 2017, Defence again advised the Government of the high to extreme risk of a concurrent Australian build strategy for the Offshore Patrol Vessel, Future Frigate and Future Submarine programs. Risks were identified in relation to capability, affordability under the assumptions of the *2016 Defence White Paper's Integrated Investment Program* and reform of the shipbuilding industrial base. Two immediate risks that Defence is encountering as its surface ship and submarine programs progress through design selection stages are design and cost risk.

Design risk

4.20 The design for the Offshore Patrol Vessel was selected in November 2017, and the design for the Future Frigate is scheduled to be selected in April 2018. The Government's guiding principles highlight the importance of design selection for the surface ship programs, including the selection of mature designs, with minimal changes to the design after construction commences. The guiding principles also indicate that the production model should consist of integrated designers, builders and suppliers.⁶⁵

Design selection—Offshore Patrol Vessel

4.21 The Offshore Patrol Vessel will be based on a mature design developed by Lürssen. However, as discussed above, at second gate approval in November 2017 Defence had not established the through-life support costings for this design. Moreover, the commercial arrangements to establish an integrated design-build-supplier production model for the Henderson shipyard component of the build had not been finalised. Consequently, these risks will be carried into the acquisition.

Design selection—Future Frigate

4.22 Prior to proceeding to its competitive evaluation process, the Government selected three potential designs. Defence's selection was informed by analysis undertaken by an external consultant, in cooperation with the Defence Science and Technology Group. Of the three frigate designs selected for the competitive evaluation process, two are currently established in-service frigates, and construction of the first-of-class frigate for the third design has recently commenced. Defence advised the ANAO in December 2017 that while the third design is not an in-service frigate, and was not considered mature at the time of selection, sufficient data was provided to Defence as part of the competitive evaluation process for this frigate's design to now be classed, by Defence, as mature.

4.23 In October 2017, the Government announced that:

The combat management system for Australia's fleet of nine Future Frigates will be provided by the Aegis Combat Management System, together with an Australian tactical interface, which will be developed by SAAB Australia.

This decision will maximise the Future Frigate's air warfare capabilities, enabling these ships to engage threat missiles at long range, which is vital given rogue states are developing missiles with advanced range and speed.⁶⁶

4.24 In response to ANAO enquiries as to whether the combat system would incorporate the Aegis Ballistic Missile Defense Capability, Defence advised the ANAO in March 2018 that 'whilst Aegis has a BMD [Ballistic Missile Defense] capability it has not been procured as such.' Defence further advised that:

Government made the call to have an Aegis Combat Management System that maintains an option for Government to include a BMD [Ballistic Missile Defense] capability. The actual risk level of this

65 Department of Defence, *Naval Shipbuilding Plan*, 2017, pp. 105–106.

66 The Hon. M Turnbull MP, Senator the Hon. M Payne and the Hon. C Pyne MP, (Prime Minister of Australia, Minister for Defence and Minister for Defence Industry), 'Prime Minister, Minister for Defence and Minister for Defence Industry - New Approach to Naval Combat Systems', media release, 3 October 2017.

decision has always been medium/high, especially based on the Hobart Class Aegis experience already achieved.

4.25 The United States Navy currently operates the Aegis Ballistic Missile Defense capability in 33 of its ships including five guided missile cruisers, and 28 guided missile destroyers. The United States Navy intends to increase the number of its guided missile destroyers carrying this capability, but has not identified an intention to expand this capability to its frigate fleet.⁶⁷

4.26 The selection of the Aegis combat system for the Future Frigate allows Defence to draw upon its experience with the Hobart Class Destroyer, which also operates the Aegis combat system. The potential addition of the Aegis Ballistic Missile Defense capability into this system—which has not previously been integrated into a frigate—would be a new capability for the designers and shipbuilders to incorporate, while working to meet a compressed schedule.

4.27 The internal review of the Future Frigate program, conducted in August 2016, observed that:

At a technical level, depending on the contender selected, this program may well incorporate too many "new things" for a schedule compressed approach. These would include new/different Vertical Launch System, new Combat System (for the platform) and new radar (both developmental in itself and new to the platforms), all within a compressed schedule. As these three items provide much of the combat capability of the platform, that combination also increases the risk to levels far beyond a build of a 'mature' ship design.

4.28 The ANAO has previously observed that 'in Australian defence projects, large, complex and software-dependent equipment such as a ship or submarine combat system is normally the source of the greatest risk and the majority of problems'.⁶⁸ Bearing in mind the 2016 internal review, the potential inclusion of the Ballistic Missile Defense capability would substantially increase the design and integration risks for the Future Frigate program. Defence advised the ANAO in December 2017:

In the period since April 2015, Defence undertook more than 60 studies with the United States Navy (sub-contracting Lockheed Martin), Saab Australia and CEA Technologies to identify the risks and work associated with developing the combat management system for the Future Frigate. The studies were initially to understand what options were available to meet the capability need and later to inform a comparative assessment of the options. The outcomes of these studies and broader information available to Defence were analysed using a risk-based methodology against five key project criteria aligned with the 2015 Competitive Evaluation Process for the Future Frigate.

The announcement in October 2017 of an Aegis-based combat management system for the Future Frigate, supported by a Saab Australian interface, provides the lowest comparative risk to achieving the high level capability requirements and five key project criteria.

The observations from the Independent Assurance Review (IAR) of the Future Frigate, conducted in August 2016, quoted in [paragraph 4.26] resulted in the project taking actions to reduce the level of risk associated with the areas of change. These actions included:

1. conducting risk reduction studies to confirm the ship designers' abilities to incorporate the areas of change and understanding any impact assessments; and

67 United States Department of Defence Missile Defence Agency, available from <https://goo.gl/vjS32L> [accessed 29 January 2018].

68 ANAO Audit Report No. 22 2013–14 *Air Warfare Destroyer*, p. 235.

2. bringing forward the Future Frigate combat management system decision to September 2017 in order to enable system integration activities to occur earlier and prior to second pass (Gate 2) in 2018. The development of the phased array radar remains on track.

Design selection—Future Submarine Program

4.29 The Future Submarine Program is highly developmental and does not conform to the Government's guiding principles on design maturity. This is in line with the Government's policy for the required capability of the Future Submarine Platform.⁶⁹ The program is currently in its conceptual design phase.

Cost Risk

4.30 Analysis commissioned by Defence identified that building surface combatant naval ships⁷⁰ in Australia carries a 30–40 per cent price premium in comparison to United States shipbuilders. When compared to international best practice the price premium is 131 per cent. The Defence analysis identified that the 30–40 per cent cost premium could be reduced by approximately half over time with:

- a consistent demand for naval vessels;
- reform to Defence's acquisition and contracting processes focussing on cost effectiveness;
- ensuring the construction of new ships is based on a mature design, with minimal changes after production commences, with an integrated design, builder and supplier model of production.⁷¹

4.31 In 2015, the Government advised Defence that a 30–40 per cent premium on surface-ship builds was unacceptable. Defence advised the ANAO in August 2017 that it had not undertaken further analysis to determine the Australian build premium for the Offshore Patrol Vessel and Future Frigate programs.⁷²

4.32 Defence advised the ANAO in December 2017 of pathways through which the programs could address the Australian build premium, including international benchmarking to gauge the effect of the production learning curve over the duration of the build; and implementing the Government's design maturity; and minimal design changes principles.

Integrating the Future Submarine Australian build into the Naval Shipbuilding Plan

4.33 The 2015 analysis commissioned by Defence into the Australian shipbuilding industry was based on an Australian build for the Offshore Patrol Vessel and Future Frigate. The analysis did not take into account an Australian build for the Future Submarine program, which will now involve the

69 In its recent audit of the Future Submarine competitive evaluation process, the ANAO found that the Future Submarine will not be subject to military-off-the-shelf design constraints. This is in line with the Government's policy that the Future Submarine will be a developmental acquisition, as opposed to a military-off-the-shelf acquisition. See ANAO Audit Report No. 48 2016–17 *Future Submarine Competitive Evaluation Process*, p. 20.

70 Surface combatant naval ships, in the Australian context, refer to frigates and destroyers.

71 *Australia's Naval Shipbuilding Enterprise Preparing for the 21st Century*, RAND Corporation, Santa Monica, California, 2015, p. xxxvii.

72 Defence had undertaken a rough-order-of-magnitude analysis of the potential build premium for the Future Submarine program, estimating a build premium of 15 per cent (See ANAO Audit Report No. 48 2016–17 *Future Submarine—Competitive Evaluation Process*, p. 25). However, this figure was based on different assumptions to the present program requirements for Australian industry involvement.

production of 12 submarines at the Osborne (north) shipyard in South Australia as part of the *Naval Shipbuilding Plan*. At the time of the analysis, the detail of the Future Submarine build had not been determined by the Government—the *2016 Defence White Paper* identified a: ‘commitment to maximising Australian industry without compromising cost, capability, schedule or risk’.⁷³

4.34 On 26 April 2016, the Prime Minister announced an Australian build for the Future Submarine program:

The next generation of submarines for Australia will be constructed at the Adelaide shipyard, securing thousands of jobs and ensuring the project will play a key part in the transition of our economy.⁷⁴

4.35 As discussed, the Future Submarine will not be subject to military-off-the-shelf design constraints, reflecting the Government’s policy it will be a developmental acquisition.⁷⁵ With an estimated cost of \$50 billion, the design phase of the Future Submarine commenced prior to the release of the *Naval Shipbuilding Plan* in May 2017. Defence has identified that a program of this magnitude and developmental nature has the potential to significantly affect the surface shipbuilding programs and existing Collins Class sustainment program at the Osborne shipyard. Defence advised the Government in 2015 of:

- the significant challenge in undertaking three concurrent naval build programs;
- the effect on the affordability of the *2016 Defence White Paper* due to the ‘very high’ premium that would be incurred by an Australian submarine build; and
- the potential increase in the cost of labour as shipbuilders, suppliers, sustainment providers, and the Commonwealth compete for a limited pool of labour.

4.36 The integration of the Future Submarine build—a developmental program which operates outside of the Government’s guiding principles⁷⁶—into the overall naval shipbuilding enterprise, presents Defence with an ongoing risks in containing costs and managing the demand for labour resources.

Affordability

4.37 Defence analysed the cost of implementing its program of naval construction for the *2016 Defence White Paper*. Defence advised the Government in July 2015 that accelerating the Offshore Patrol Vessel and Future Frigate program added approximately \$5–6 billion (13–16 per cent of total cost for the two projects) to the forward capital and operating program from the commencement of the shipbuilding programs to the period ending 2024–25. Defence further advised that to offset the additional \$5–6 billion required, 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.

73 Department of Defence, *2016 Defence White Paper*, p. 92.

74 The Hon. M Turnbull MP and Senator the Hon. M Payne, (Prime Minister and Minister for Defence), ‘Future Submarine Program’, media release, 26 April 2016.

75 ANAO Audit Report No. 48 2016–17 *Future Submarine—Competitive Evaluation Process*, p. 20.

76 Such as selecting a mature design; limiting the amount of design changes during production; and limiting the amount of unique Australian design changes.

4.38 At the time, the Minister for Defence undertook to provide the Government with a revised force structure⁷⁷ for agreement. The Minister also undertook to provide independently-verified revised funding requirements for the two surface ship programs. The ANAO found no evidence that the revised force structure or independently-verified funding requirements were developed and provided to the Government by Defence.

4.39 In April 2018, Defence advised the ANAO that:

In August 2017, 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. Defence is continuing to monitor the Future Submarine program closely and provides regular advice to Government on the program's funding profile requirements.

4.40 Defence has not revisited the 2016 White Paper cost assumptions. There would be benefit in doing so, in light of the Government's decision to construct all ships and submarines in Australia and the bringing forward of expenditure for those programs to meet the compressed build schedule for surface ships. The potential addition of the Aegis Ballistic Missile Defense capability is a further relevant consideration.

Recommendation no.1

4.41 That Defence, in line with a 2015 undertaking to the Government, determine the affordability of its 2017 *Naval Shipbuilding Plan* and related programs and advise the Government of the additional funding required to deliver these programs, or the Australian Defence Force capability trade-offs that may need to be considered.

Defence response: *Disagreed.*

4.42 *Defence takes an enterprise approach for Naval Construction Programs. The shipbuilding provisions identified in the Integrated Investment Program are consolidated for Government to consider the Naval Construction Program affordability as each project is presented to Government.*

4.43 *Offsets are recommended to Government if there is a shortfall between the funding requirement and existing provision.*

Realising economic benefits

4.44 The *Naval Shipbuilding Plan* states that the development of the continuous shipbuilding industry will: 'generate significant economic growth across Australia, revitalise Australia's heavy engineering and advanced manufacturing industrial capability and capacity, and grow and sustain thousands of Australian jobs'.⁷⁸

⁷⁷ Force structure refers to how the Australian Defence Force is structured in terms of personnel; major assets and weapons in order to achieve the Government's required outcomes.

⁷⁸ Department of Defence, *Naval Shipbuilding Plan*, 2017, p. 13.

4.45 The 2015 shipbuilding analysis identified that government spending on naval shipbuilding can have favourable economic impacts, but those effects are localised to a large degree. Regarding economic benefits, the analysis stated:

The literature search uncovered no consensus on the effect of military spending on local and regional economies ... naval shipbuilding can have favourable local effects, especially during times of overall economic distress. But those effects are localised to a large degree, and it is unrealistic to expect that shipbuilders will produce significant favourable spin-offs and spill-overs.⁷⁹

4.46 Separate analysis was commissioned by Defence and conducted by Deloitte Access Economics in 2014, to examine the potential economic benefits of major Defence projects. That study:

[Did] not support the notion that major defence projects generate a sufficient amount of additional benefits to the economy that would offset any significant domestic price premium. The pure stimulatory effects often discussed in debates on defence procurement are unlikely to adequately account for the costs of funding the outlays and the displacement of resources from their most efficient uses when a new large defence capability is developed locally.

4.47 Prior to the development of the *Naval Shipbuilding plan*, the Productivity Commission conducted a Trade Assistance Review of naval shipbuilding in Australia in 2015, which observed that:

The cost premium provides a hurdle that self-reliance benefits must exceed before a decision to build locally should be made. The benefits are difficult to enumerate. There does not appear to be a public evaluation of whether, in the past, the 'insurance policy' of local manufacture was either necessary or useful in maintaining ADF operational capability.

Paying more for local builds—without sufficient strategic defence and spill-over benefits to offset the additional cost—diverts productive resources (labour, capital and land) away from relatively more efficient (less assisted) uses.⁸⁰

4.48 Between May 2017 and August 2017, the ANAO made several requests to Defence to provide the economic modelling data that informed the *Naval Shipbuilding Plan's* forecast of the 'significant economic growth' to be created by the continuous shipbuilding industry. Defence did not provide any data to substantiate the *Naval Shipbuilding Plan's* forecast.⁸¹ Defence advised the ANAO in December 2017 that:

As the Naval Shipbuilding Plan states, economic growth will be achieved through maximising Australian industry participation and securing Australian jobs that will endure for decades to come.

Economic growth will also be assessed by private sector investment to create the industrial hub around supply chains around the primary construction shipyards at Osborne, South Australia and Henderson, Western Australia.

79 *Australia's Naval Shipbuilding Enterprise Preparing for the 21st Century*, RAND Corporation, Santa Monica, California, 2015, p. xxxviii.

80 Productivity Commission, *Trade Assistance Review 2014–15*, p. 37.

81 An economic study of South Australia, *What we know about the economic benefits of naval shipbuilding for South Australia*, was released by PwC in October 2017. The study did not comment on the impacts that the *Naval Shipbuilding Plan* would have at a national level, but estimated that over the life of the naval construction programs, \$134.4 billion would be added to South Australia's Gross State Product (GSP), p. 6.

Managing risk

4.49 The *Naval Shipbuilding Plan* did not identify how Defence will address the high to extreme level of risk associated with its naval construction programs, as advised to the Government in 2015 and 2017. Defence advised the ANAO that its main risk mitigation strategy is implementation of the Government's guiding principles. Successful implementation of the *Naval Shipbuilding Plan* will also require:

- the timely and effective mobilisation of key enablers;
- the timely and effective implementation of each construction project; and
- the seamless management of the naval construction program as a whole, to avoid flow-on effects and maintain a continuous build process which delivers the specified capability on time and within budget.

4.50 The history of naval construction programs in Australia suggests that these are very high expectations indeed.⁸² Shortcomings in the management of program risk will result in the extension of service of the Armidale and ANZAC class ships, and the Collins Class submarines, and the associated costs and effects on naval capability.



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14 May 2018

82 For example see ANAO Audit Reports: No. 34 1997–98 *New Submarine Project*; No. 22 2013–14 *Air Warfare Destroyer Program*; No. 9 2015–16 *Test and Evaluation of Major Defence Equipment Acquisitions* (specifically Landing Helicopter Dock). Also see RAND Corporation, *Learning from Experience Volume IV Lessons from Australia's Collins Class Submarine*, 2011.

Appendices

Appendix 1 Osborne shipyard infrastructure contract work elements and target dates

Table A.1: Osborne shipyard infrastructure contract work elements and target dates

Work Element	Target Date
Mobilisation works	18 October 2018
Early works	18 October 2018
Main Works	
Site Horizontal works	15 May 2018
Site-wide plant and equipment	22 November 2019
Site-wide services and engineering	28 September 2019
Steel fabrication unit and assembly hall	27 March 2019
Block assembly hall	30 July 2019
Blast and paint hall	5 December 2018
Block outfitting and erection hall	22 November 2019
Apron/transition area	3 December 2018
Modernised pipe spool workshop	16 August 2018
Modernised electrical workshop	16 February 2019
Modernised outfitting component and sheet metal workshop	3 August 2018
Modernised test and qualification centre	8 August 2018
Modernised equipment maintenance workshop	8 August 2018
Modernised machinery engine reduction gear (MERG) workshop	13 February 2019
Conversion of existing blast and paint facility to warehouse	16 May 2019
Modernised warehouse and inventory	13 February 2019
Wharf upgrade	7 August 2019
New offices and amenities	29 November 2019
Carpark	29 June 2018

Source: Managing Contractor Contract—Osborne Naval Shipbuilding Precinct (Surface Ships) Infrastructure (Schedule 3).

Appendix 2 Senate Order: Future Submarine Design and Mobilisation Contract

On 25 May 2017, the Auditor-General received a request from Senator Nick Xenophon to examine the *Future Submarine Program Design and Mobilisation Contract* in regard to the Senate Order for Departmental and Agency Contracts. The Order relates to the use of confidentiality provisions in Commonwealth contracts. The request to the Auditor-General followed the tabling of a redacted version of the contract by the Minister for Defence in the Parliament on 1 December 2016, in response to an order of the Senate on 9 November 2016.

The ANAO's review indicated that contract details recorded on Austender were consistent with the signed contract, with the exception of the Commencement date. Austender records the commencement date as 2 November 2016. Defence documents record the commencement date as 19 October 2016.

The ANAO's review⁸³ of the redacted contract against the un-redacted version indicated that, with the exception of the sections discussed in the following paragraph, the redacted sections:

- contained information that could cause unreasonable detriment to the owner of the information; and/or
- contained information that, if released, could be against the national interest.

Section 3.7 and Attachment I of the contract identify key persons within Defence and DCNS (now Naval Group) involved in the program. It is not clear why these section were redacted.

83 The purpose of the ANAO review was to determine whether the contract meets the reporting guidelines for confidentiality of contract inputs (material within the contract documentation). This review did not determine whether the specific redactions made by the Defence Minister when tabling a copy of the contract in the Senate were appropriate. Further, the review did not determine whether the reported confidential contract outputs (material generated in the performance of the contract) were appropriate.

