

Submission to the Joint Committee of Public Accounts and Audit by Christopher Skinner

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MAJOR POINTS IN THIS SUBMISSION

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The FSP has attracted wide attention from professional industry and community groups, much of the commentary poorly informed. There is room for improvement in several areas, but not by any slackening of the pace of what is underway. On the contrary, the FSP needs to be accelerated to avoid the capability gap but more importantly to build up the submarine force to the twelve boats to which we have committed, as soon as practicable.

Ultimately what energy sources should be used after fossil fuels are no longer acceptable? Of the most widely used non-fossil fuel source – nuclear propulsion – how would Australia adopt nuclear propulsion in the absence of a domestic nuclear power industry?

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Joint Committee of Public Accounts and Audit Terms of Reference

Any matters contained and associated with the following Auditor-General's Reports:

No. 19 (2019-20) 2018–19 Major Projects Report

No. 22 (2019-20) Future Submarine Program - Transition to Design

On 5 February 2020 having considered recently tabled Auditor-General's Reports the Joint Committee of Public Accounts and Audit resolved to conduct an inquiry into the above Auditor-General's Reports.

Under section 8(1) of the legislation establishing the JCPAA, the Public Accounts and Audit Committee Act 1951, one of the duties of the Committee is to 'examine all reports of the Auditor-General (including reports of the results of performance audits) that are tabled in each House of the Parliament' and 'report to both Houses of the Parliament, with any comment it thinks fit, on any items or matters in those reports, or any circumstances connected with them, that the Committee thinks should be drawn to the attention of the Parliament'.

Introduction

I make this submission as a private citizen without any pecuniary attachments to any organisation or other entity. The views expressed are solely mine but are based on a lifetime of engagement in naval defence capability design, implementation, operation and sustainment.

2018-19 Major Projects Report (ANAO Report No. 19 (2019-20))

This Major Projects Report [MPR] covers 26 major projects of the 205 major projects under management by the Defence Capability Acquisition and Sustainment Group [CASG]. Of these I offer comment overall and with specific comment of the two projects involving the COLLINS Class submarines.

Future Submarine Program - Transition to Design (ANAO Report No.22 (2019-20))

The Future Submarine Program [FSP] also known as SEA 1000 and more recently the ATTACK class submarine program has attracted an extraordinary amount of attention and comment, much of which is incompletely informed due to so much of the relevant information being withheld from public access. While this reticence may be necessary for matters of national security or commercial confidentiality, there does not seem to be any policy or intention to make public as much project information as is possible.

I have a number of specific comments on the FSP program and also on the implications for Australian submarine force structure of the relationship between the remaining service life of the COLLINS class boats and the FSP delivery schedule.

ANAO Report No.19 (2019-20) Major Projects

Within the ANAO Report No. 19 on Major Projects are 26 Project Data Summary Sheets (PDSS). Of these I offer comments on only the two sheets relating to the Collins class submarines, as discussed below. Together these are the only visible major projects that contribute to the life cycle sustainability of the six Collins class submarines, yet they only obliquely relate to the class Life-Of-

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Type-Extension [LOTE] that is accepted to be needed to cover the transition from Collins to Attack class in the Australian submarine force structure.

SEA 1439 Phase 3 Collins Class Submarine Reliability and Sustainability

SEA 1439 Phase 3 is a program of upgrades to Collins Class platform systems and shore infrastructure to improve the Class reliability, sustainability, safety and capability for each of the six submarines.

Highlights from this data sheet include the following:

- *'Defence considers, as at the reporting date, there is sufficient budget remaining for the project to complete against the agreed scope.'* Total Approved Budget is \$445.3m
- *'The project consists of 24 separate sub-projects of which the outstanding elements are aligned to the Collins Class Submarine Integrated Master Schedule (MS). The IMS depicts the submarine maintenance periods where project implementation can be performed... each installation is dependent on the Full Cycle Docking (FCD) program and Enterprise priorities, consequently completion dates vary according to the maintenance program and the focus of ensuring submarines availability targets are achieved.'*
- Government 2nd Pass Approval took place in September 2000. Final Operating Capability (FOC) is forecast for June 2023 for the last sub-project. This protracted timescale has been the result of the multiplicity of sub-project characteristics and the timing of FCD availability for each of the submarines.
- Of the 24 sub-projects only two provide new capabilities: Special Forces Upgrade and the Torpedo Decoy. The remaining sub-projects are medium to low complexity engineering enhancements. They include Fire Fighting Upgrade, Sewage System Upgrade and *'Fast-Track modifications to address platform build deficiencies in a holistic get-well program.'*
- The Special Forces upgrade provides three capabilities. All are expected to achieve Operational Release (OR) by July 2020.
- The Torpedo Decoy received OR in 2014.
- Fourteen of the 22 engineering enhancements have been completed, with the remainder to be implemented progressively until 2022 subject to submarine availability and the FCD program.
- *'The scope of this project is limited to the reliability and sustainability issues identified in the 1999 review (by the Head Submarine Capability Team following the McIntosh and Prescott Report)) and not the more contemporary reliability and sustainability issues relating to diesel engines, generators, batteries or the main motor; these issues are being addressed under the submarine sustainment program.'* This immediately raises the question – where is the major project that addresses these matters of sustainability and how are they related to the notional LOTE program?
- In 2017 Government approved transfer of two additional engineering enhancements into this project:
 - Dived Safety Modifications
 - Communications Mast and Antenna Replacement
- A separate but related project SEA 1439 Phase 3.1 covers remediating obsolescence of the Collins Class Integrated Ship Control Management and Monitoring System (ISCMMS).
- SEA 1439 Phases 4A, 4B, 5B and 6 each cover further enhancements and capability assurance projects that all require coordination and planning for installation and testing

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availabilities. Of these SEA 1439 Phase 5B2 Collins Class Communications and Electronic Warfare Program is dealt with in a separate PDSS and is discussed below.

- The performance reports include schedule variances of varying figures up to 122 months for the Full Class Implementation of the Special Forces Upgrade. This was partially due to redesign found to be necessary after sea trials – a perfectly natural and expected occurrence with enhancements designed in during the service life.
- The Torpedo Decoy has also experienced delay in Final Operating Capability due to *'a combination of delays in acceptance of the safety case and a delay in approval of the OR due to the appointment of a new Chief of Navy.'*
- *Lessons learned included:*
 - *'Ensure that all capability requirements are clearly defined, approved and appropriately funded before detailed acquisition planning commences.'*
 - *'Consider the impact associated with long term sole source cost plus contracts.'*
 - *'Responsibilities need to be clearly defined between project stakeholders...'*

SEA 1439 Phase 5B2 Communications and Electronic Warfare Improvement Program

SEA 1439 Phase 5B2 is a multiple (project) that seeks to deliver a modernised submarine communications system and upgrade Electronic Support measures (ESM) in the Collins Class submarines based on modernised systems architectures and standardised systems.

Modern Submarine Communications System (MSMCS) Stage 1 replaces obsolete Communications Centre (COMCEN) equipment and will provide Collins Class submarines with improved performance, reliability and interoperability with other elements of the Australian Defence Force (ADF) and allied nations.

MSMCS Stage 2 will deliver urgent communications systems upgrade including satellite communications that will deliver a submarine internet protocol capability with supporting applications that will significantly reduce operator workloads and improve system management. Raytheon Australia has been engaged as Prime System Integrator to implement Stage 2.

Also funded within Stage 1 as a standalone capability is Microwave Electronic Support (MWES) to improve submarines' capability to detect, identify and localise intercepted electromagnetic signals. MWES will be installed independently of other work in this project.

This PDSS relating to the Collins Class submarines is referenced in the preceding PDSS but has its own report sheet from which the following comments are drawn.

- Stage 1 installation has been brought forward on the second platform from FCD to an earlier Mid Cycle Docking (MCD) maintenance period. This followed delays in obtaining objective quality evidence to support Initial Materiel Release (IMR).
- MSMCS Stage 2 has deficiencies in elements of the Wide Band Satellite (WBS) caused by late delivery and in the Submarine Local Area Network, which has been affected by stakeholder engagement and the complexity of the required capability and challenges in achieving software security accreditation.
- MWES system experienced significant schedule slippage due to difficulties in engaging subcontractors in the early phases of the project.
- MWES will be installed independently and in parallel with Stages 1 and 2, *'in a flexible manner so as to achieve the best suited boat at the time of the materiel availability.'*
- Total approved budget for the project is \$607.8m of which \$250.6m had been expended, more than half of it with Raytheon Australia,

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- Of the approved budget \$36.7m was allocated for risk reduction for the development of the design for the Stage 1, and \$203dm for development of a solution to address COMCEN obsolescence issues.
- Schedule performance has experienced delays of up to 42 months but progress has otherwise been steady, and even achieved acceleration when an installation occurred at MCD rather than waiting until the planned following FCD.
- Final Operational Capability is expected to be achieved in December 2027 (a year after the start of the first LOTE FCD).
- Lessons learned have included:
 - Early engagement with stakeholders to finalise Configuration Change Proposals (CCP) is critical to ensure deliverables are sufficient.
 - Tender documents and contracts must identify contractor's key personnel for specialised tasks.
 - Key stakeholders must include freight organisations for classified items needed for installations or testing.

ANAO Report No.22 (2019-20) Future Submarine Program - Transition to Design

The Future Submarine fleet is to replace the fleet of six Collins class submarines currently operated by the Royal Australian Navy, which without an extension to their service life, are due to be withdrawn from service by 2036.

This report follows two previous Auditor-General reports on the Future Submarine Program:

- Auditor-General Report No. 48 2016-17 Future Submarine – Competitive Evaluation
- Auditor-General Report No. 30 2017-18 Naval Construction Programs – Mobilisation

This report covers the following major activities:

- Implementation of the Design and Mobilisation Contract with DCNS (now Naval Group) signed on 30 September 2016. Completed within this contract was the Concept Studies Review, which supported the need to allow additional time for Naval Group to meet Defence's requirements for a high level of design maturity before progressing to subsequent phases of the design, thereby reducing costly uncertainties during the build phase and the need for larger construction contingencies.
- Defence, Naval Group as Submarine Designer and Lockheed Martin Australia as Combat Systems Integrator signed a Tripartite Co-operative Agreement on 3 May 2017.
- Scope of the Strategic Partnering Agreement (SPA) with Naval Group (formerly DCNS) signed in February 2019 covering governance, cost control and industry objectives, establishes mandated system reviews based on defined exit and entry criteria and contractual off-ramps and exit payments. The SPA provides a basis for establishing a successful strategic partnership and delivering shared program objectives. The SPA contains the process for the Parties to enter into Program Contracts, and the terms and conditions applicable to those Program contracts.
- Performance of the early stages of the design activities, starting with the Submarine Design Contract signed on 1 March 2019 under the SPA, which supersedes the Design and Mobilisation Contract of 2016.

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Notable statements from the report include the following, with some comments from the author of this submission:

- Defence's overall assessment of risk for the Future Submarine Program (FSP) is 'high' and has adopted relevant risk mitigation strategies, including the early establishment of a long-term partnership with Naval Group. Differences in commercial, engineering and manufacturing approaches have been identified and are being addressed.
- Two key mandated design milestones have been extended:
 - System Requirements Review, renamed as the Functional Ship Systems Requirements Review (Definition Phase) to accord with international (IEEE) systems engineering standardised practice, from March 2019 to October 2019; and
 - Preliminary Design Review, renamed to Systems Functional Review, from March 2020 to January 2021.
- *'Defence has identified that a delay in the FSP of more than three years will create a gap in Navy's submarine capability. Defence's planning for a life-of-type-extension (LOTE) for its Collins class submarines, to manage the risk of a Capability gap, remains at an early stage.'*
- *'There has been ongoing parliamentary and community interest in Defence's management of the FSP, particularly relating to cost and capability; negotiation of the SPA with Naval Group and the French Government; the possible emergence of a capability gap ; and the planned life-of-type-extension of the Collins class to address any capability gap; and the Naval Shipbuilding Plan.'*
- The Government's objectives for the FSP include:
 - To deliver a regionally superior submarine capability that provides the Commonwealth with sovereign control over the operation and sustainment of the fleet;
 - To address Australian regulatory safety and environmental obligations;
 - Knowledge and skills to understand and control sustainment cost drivers; and
 - To maximise Australian industry involvement through all phases of the FSP without unduly compromising capability, cost and schedule.'
- The SPA does not explicitly address the maximization of Australian industry involvement
- There is no apparent agreed definition of what 'regionally superior' connotes nor how this should be translated into design and acceptance into naval service.
- Defence currently employs 130 contractors in mainly technical, engineering, and program management roles within the FSP.
- Defence has stated that the first Collins class LOTE would occur in the FCD starting in 2026 and the intervening period will permit successful planning for that activity.
- Defence is also considering installing sub-systems and components in the upgraded Collins class that will be common to the Attack class.
- Defence has stated that one of the steps taken to mitigate program risks is to require the detailed design process take place in Australia. This was communicated to Naval Group on 18 December 2018 and was included in the Submarine Design Contract, requiring Naval Group to provide a 'Transfer of Technology Forward Options Report' by 12 July 2019 however this has been delayed.

The report mentions ancillary advisory bodies that have been active since the inception of the FSP:

- Naval Shipbuilding Advisory Board established in December 2016, chaired by Professor Donald Winter and has met 11 times from June 2017 until February 2019. The Board recommended that Defence consider alternatives to the current plan, and that even if the

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SPA negotiations were successful Defence consider if proceeding is in the national interest. In response to this Defence examined the additional service life of the Collins class that would be delivered under life-of-type-extension activities, and the time this would allow to develop a new acquisition strategy for the Future Submarine. This examination has not been made public.

- Submarine Advisory Committee consisting of three former senior officers of the United States Navy and Royal Australian Navy, to which Defence provides submissions if and when needed. There was no report of such activity.

Concluding Remarks regarding the Two ANAO Reports

Collins Class Projects

The Major Projects Report includes two projects involving the Collins class submarines that illustrate the piecemeal nature of submarine configuration changes for either capability improvements or to overcome obsolescence and enhance safety, reliability and environmental sustainability. The nature of each of the sub-projects involves a variety of components and materials, all requiring to be fitted into and functionally integrated in a confined and safety critical enclosed space. Finally, the availability of each submarine to execute the change is closely constrained by their operational cycle and maintenance availabilities. Clearly a great deal of coordination is needed

And the outcome is never 100% guaranteed, especially for the first-of-class fitment which sometimes needs to be reworked after test and evaluation has been conducted, often requiring operation underway in sea time outside of maintenance availability periods.,

For this reason, the sanguine assertion by Defence that the period until 2026 is ample time to plan and prepare for the Collins class LOTE is regarded as naively optimistic. A major project should be established right away for this work to systematically compile the components of the LOTE, beginning with condition monitoring and detailed surveys of hull, mechanical, electrical and safety equipments in all six boats., individually. The conditions may well vary considerably between boats and each must be addressed on its own merits.

An important function of the LOTE will be the design processes, especially naval architecture, electrical and mechanical design, and fabrication of new hull and platform structures, and development of the safety cases. ASC should be tasked to assemble a team for this with access to all the necessary design intellectual property rights, and that may well require a contract with Saab/Kockums to supplement what ASC already has.

Future Submarine Program

The FSP has attracted wide attention from professional industry and community groups, much of the commentary poorly informed. There is room for improvement in several areas, but not by any slackening of the pace of what is underway. On the contrary, the FSP needs to be accelerated to avoid the capability gap but more importantly to build up the submarine force to the twelve boats to which we have committed, as soon as practicable.

What is needed as a matter of urgency is to conduct the Preliminary Design Review and publish the major outcomes and issues as widely as possible, with a view to engagement with Australian academic, industrial and community groups in every way possible in the detailed design processes, with special attention on how the sustainment will be performed.

For example, when will an east coast submarine sustainment base be established and how will it interface with the design authority?

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In the shorter term when will the land-based test centres be commissioned so that the working combat systems and platform systems can be proven and evaluated on land before final installations in the first of class submarine.

Wider Issues to Be Considered beyond the Scope of the ANAO Reports

In addition to the matters reflected in the Auditor-General Reports there are other matters that need to be addressed sooner than the next federal election. These include:

- The rapidly evolving role for autonomous vehicles in both defence and attack. How should they be orchestrated with the evolving undersea warfare capability embodied in the Attack class FSP?
- How would an advanced submarine provide targeting information to an advanced long-range intelligent weapon such as the AGM-158C under procurement for RAAF maritime strike operations?
- The evolving means for swarming of autonomous vehicles and how should this be controlled by a parent platform such as the Attack class submarine?
- Ultimately what energy sources should be used after fossil fuels are no longer acceptable?
- Of the most widely used non-fossil fuel source – nuclear propulsion – how would Australia adopt nuclear propulsion in the absence of a domestic nuclear power industry?

Author Biographical Note

Christopher Skinner is a chartered professional engineer in the fields of electrical and software engineering. He served 30 years in the Australian Navy in six ships including all three Charles F. Adams class DDGs. His shore appointments included secondment to the Defence Science and Technology Organisation, Salisbury in the Communications and Electronics Engineering Division, Test and Evaluation Manager for the First of Class Oliver Hazard Perry FFG-7 frigate program in the U.S. Naval Sea Systems Command, Washington DC and Superintendent Missile and Torpedo Maintenance at the time of introduction of the Mk 48 wire-guided torpedo and UGM-84 Submarine Harpoon missile for the Oberon class Submarine Weapons Update Project [SWUP]. Skinner retired as a Captain from the RAN Trials and Assessing Unit following posting as the first project director of the New Surface Combatant Project that became the ANZAC frigate program. He continued in defence and transportation industry and academia and is currently the Editor of the Australian Journal of Multidisciplinary Engineering