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Performance Audit

Acceptance into Service of Navy Capability

Department of Defence

Defence Materiel Organisation

Australian National Audit Office

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Australian National
Audit Office

Canberra ACT
28 June 2011

Dear Mr President
Dear Mr Speaker

The Australian National Audit Office has undertaken an independent performance audit in the Department of Defence and the Defence Materiel Organisation 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 and the accompanying brochure to the Parliament. The report is titled *Acceptance into Service of Navy Capability.*

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

Yours sincerely



Ian McPhee
Auditor-General

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

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Abbreviations

ADF	Australian Defence Force
ADO	Australian Defence Organisation, consisting of the Services – Navy, Army and Air Force, – the Defence Groups and the Defence Materiel Organisation
ADTEO	Australian Defence Test and Evaluation Office
AEO	Authorised Engineering Organisation
AIOS	Acceptance into Operational Service
AMO	Authorised Maintenance Organisation
ANAO	Australian National Audit Office
ANSI/EIA-632	American National Standards Institute, Electronic Industries Association, *Processes for Engineering a System*, January 1999
APS	Australian Public Service
ASDEFCON (SM)	Australian Standard Defence Contracting (Strategic Materiel)
CAID	Clear Accountability in Design
CDD	Capability Definition Document
CDG	Capability Development Group
CEPMAN 1	Capital Equipment Procurement Manual 1
COTS	Commercial off-the-shelf equipment
CNSAC	Chief of Navy Senior Advisory Committee
CS^2	Cost/Schedule Control Systems Criteria, now known as the Earned Value Management System (EVMS)
DAO	Defence Acquisition Organisation, transformed into the DMO in 2000
DAR	Design Acceptance Representative
DGNCS	Director General Navy Certification and Safety
DMO	Defence Materiel Organisation
DSG	Defence Support Group
DSTO	Defence Science and Technology Organisation
EVMS	Earned Value Management System
FIC	Fundamental input to Capability
FMR	Final Materiel Release
FPS	Function and Performance Specification
HMAS	Her Majesty's Australian Ship
IMR	Initial Materiel Release
HNE	Head Navy Engineering

IOR	Initial Operational Release
IPSSR	Improved Project Scheduling and Status Reporting program
JCPA	Joint Committee of Public Accounts, now known as the Joint Committee of Public Accounts and Audit (JCPAA)
LPA	Landing Platform Amphibious
MAA	Materiel Acquisition Agreement
MOTS	Military off-the-shelf equipments
MSA	Materiel Sustainment Agreement
OCD	Operational Concept Document
OR	Operational Release
QEMS	Quality and Environmental Management System
QMS	Quality Management System
RAN	Royal Australian Navy
RAM	Reliability, Availability and Maintainability
RANTEAA	Royal Australian Navy Test, Evaluation and Acceptance Authority
RIMPAC	Rim of the Pacific biennial multi national maritime warfare exercise
SCA	Support Command Australia
SPO	System Program Office
SS/SSSPEC	Subsystem/Support Subsystem Specification
TCD	Test Concept Document
TEMP	Test and Evaluation Master Plan
TI 338	*Report on the Limitations and State of the Mission and Support System.* Formerly known as – *Report of Materiel and Equipment Performance State*
TRIMS	Technical Risk Identification and Mitigation System
VCDF	Vice Chief of the Defence Force
V&V	Verification and Validation
VCRM	Verification Cross Reference Matrix

Summary and Recommendations

Summary

Introduction

1. The Australian Defence Force (ADF) is currently midway through a major Navy capability acquisition program. Each new Navy capability project aims to respond effectively to changing defence strategic circumstances, to exploit technological advances to achieve system performance and quality requirements, while making cost-effective use of defence resources.

2. The Navy capability projects underway today are the forerunners of potentially much larger acquisitions outlined in the Government's 2009 Defence White Paper. The White Paper indicates the Government's intention to further modernise and enhance the Royal Australian Navy (Navy), so that by the mid 2030s the Navy:

> …will have a more potent and heavier maritime force. The Government intends to replace and expand the current fleet of six Collins class with a more capable class of submarine, replace the current Anzac class frigate with a more capable Future Frigate optimised for ASW [*anti submarine warfare*]; and enhance our capability for offshore maritime warfare, border protection and mine countermeasures.[1]

3. The development of Navy capability involves, in the first instance, Defence's Capability Development Group (CDG)[2] defining Navy's capability requirements in accordance with strategic guidance and in consultation with Navy and other stakeholders. These requirements then form the basis for the development of options for consideration by government.

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[1] Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030*, Defence White Paper 2009, May 2009, pp. 13, 53, 60, 63-64, 67, 70-73.

[2] CDG is one of the Groups within the Department of Defence. The Defence portfolio consists of a number of component organisations that together are responsible for supporting the defence of Australia and its national interests. The three most significant bodies are:

- the Department of Defence — a department of state headed by the Secretary of the Department of Defence;
- the ADF — which consists of the three Services (including Reserves) commanded by the Chief of the Defence Force (CDF);
- the Defence Materiel Organisation (DMO) — a prescribed agency within Defence, headed by its Chief Executive Officer (CEO) DMO.

In practice, these bodies work together and are broadly regarded as one organisation known as Defence (or the Australian Defence Organisation).

4. The Defence Materiel Organisation (DMO) is responsible for acquiring and sustaining the Mission System and Support System elements of defence capability approved by government. DMO manages and oversees the processes by which private sector firms design, manufacture and test Mission Systems and their Support Systems in accordance with function and performance requirements defined by CDG, the regulatory requirements defined by Navy, and the 'readiness' and 'sustainability' requirements directed by the Chief of the Defence Force (CDF).[3]

Delivering Navy capability

5. Delivering Navy capability into service is a large-scale, complex and critical undertaking, requiring close management of each capability project's planning, acquisition and acceptance phases. It typically involves the coordinated and integrated effort of several large Defence and private sector organisations, with capability outcomes dependent on management being well positioned to identify whether projects are progressing as planned and to respond to emerging issues. Project risks need to be managed by all parties, with all organisational relationships focused on delivering the specified ADF capability within the approved cost and schedule.

6. The management arrangements for planning, acquiring and accepting Navy capability have been subject to significant changes over several decades. Since 1984, capability definition and systems development and maintenance historically performed by Navy, have been progressively transferred to other Defence Groups, and to the private sector under contract. Navy now relies on CDG and DMO to define, acquire and support its ships and submarines. In turn, DMO contracts the private sector to undertake the design and construction of Navy ships and submarines, and also to provide them with deep-level maintenance.[4] DMO also relies on private sector Classification

[3] Readiness is the ability to prepare a capability for operations within a designated time. Sustainability is the ability to maintain a capability on operations for a specified period.

[4] Deep-level maintenance includes scheduled maintenance, unscheduled maintenance and repairs, which require extensive Repairable Item dismantling in specialised jigs, and the use of specialised support equipment, technical skills or industrialised facilities.

Societies[5] to certify that Navy's ships comply with various International Maritime Organisation design, construction and maintenance regulations.

7. As part of the Defence Reform Program, the Defence Executive in July 1998 announced a fundamental review of Defence's capability management principles and practices across the whole capability continuum to ensure the 'seamless management' of whole-of-life capability.[6] The Defence Executive decided that seamless management would require it to:

> … establish the appropriate underlying processes and systems needed for this, and we will assign capability output managers who are responsible for delivering effective capability. The result will be that our systems meld together all of the elements that go into building an effective defence force - people, equipment, training, acquisition, doctrine, logistics, disposition, facilities and so on.[7]

8. The following years saw continuing changes to Defence's arrangements for achieving Navy capability. With the formation of DMO in July 2000, the acquisition and logistics support of Navy ships and submarines provided by DMO was decentralised from Canberra to DMO Maritime System Program Offices, usually located in dockyards around Australia. In 2002, new capability management processes incorporating two-pass government approvals were introduced by the then Vice Chief of the Defence Force. These processes were expanded by DMO's adoption of more widespread systems engineering management practices, and later by the creation of CDG in 2004.

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5 Over the last 10-15 years, Defence has become increasingly reliant on shipping industry Classification Societies to provide independent verification that each naval vessel complies with design, construction and operation requirements relevant to the vessel's particular class. This aligns with commercial shipbuilding practice whereby, for finance and insurance purposes, shipbuilders contract Classification Societies to independently verify, and then certify, that ship designs and construction comply with engineering standards, international conventions, rules and regulations.
See http://www.iacs.org.uk/document/public/explained/Class_WhatWhy&How.PDF

6 ANAO Audit Report No.13, 1999–2000, *Management of Major Equipment Acquisition Projects*, Department of Defence, October 1999, pp. 18, 19, 44, 58-65. When the Defence Executive was formed in 1998 it was to be Defence's highest decision-making body and was comprised of all ten of the Organisation's senior managers along with COMSPTAS [Commander Support Australia]. Two external members were to be invited to join the Executive to provide a wider perspective. It established a Capability Management Improvement Team to explore options and make recommendations for improving Defence's capability management. Defence Executive: *A Message to all Defence Personnel from the Executive* (internal memorandum), Canberra 6 July 1998. Department of Defence, *DEFGRAM NO 187/98, Formation of Capability Management Improvement Team,* 6 August 1998, Annex A: Capability Management Improvement Terms of Reference.

7 Defence Executive: *A Message to all Defence Personnel from the Executive* (internal memorandum), Canberra 6 July 1998.

9. Over this period, Navy retained its historical responsibility for the safety and seaworthiness of its ships, and consequently for implementing technical and safety regulations. A new regulatory system was introduced by Navy in 2003.

10. Successful project management requires well-qualified and highly skilled project managers, backed by project and financial systems that provide immediate access to reliable and accurate information on project costs, schedule and performance.[8] While organisational responsibilities for delivering Navy capability have changed across the years, there has been wide acceptance of the need to complement effective project management with systems engineering principles.[9] Systems engineering involves the orderly process of bringing complicated systems into being through an integrated set of phased processes covering user requirements definition, system design, development and production, and operational system support.[10] Successful systems engineering is dependent on both *technological* expertise and *management* expertise:

> The best tools/models may be available to implement [*the systems engineering*] process… however, there is no guarantee for success unless the proper organizational environment has been created and an effective management structure is in place. Top management must first believe in and then provide the necessary support to enable the application of system engineering methods… Specific objectives must be defined, policies and procedures must be developed, and an effective reward structure must be supportive.[11]

11. The criterion of success in Navy capability development is usually expressed as the acceptance into service of a Mission System (such as ship or

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[8] Department of Defence, *Defence Procurement Review 2003*, August 2003, pp. vii, viii, 16, 17, 39, 40, 41.

[9] In 2003, DMO recognised the need to establish a project management certification framework that identified mandated levels of education, training and experience in project management for the management of projects with different levels of complexity. This framework was to contain the various levels of software and systems engineering education, training and experience that were applicable to people managing complex safety and mission critical software intensive projects. Keynote address by the Head Electronic Systems Division, Defence Materiel Organisation, to the Systems Engineering, Test and Evaluation Conference 2003, *DMO Reform - Implementing a Systems Philosophy in the Defence Materiel Organisation*, 29 October 2003 Canberra, p. 12. In 2010, DMO reported that its workforce development program continued to expand the range of development activities, especially competency based skilling and a strong professionalisation program aligned to DMO's business needs. Department of Defence, *Defence Annual Report 2009-10*, Vol. 1, p. 149.

[10] Blanchard, Bengamin. S., *System Engineering Management*, John Wiley & Sons, Second Edition, 1998, pp. 1, 10-12, 35–48.

[11] ibid., pp. 25–26.

submarine) as specified, on time and within budget. However, Navy capability comprises not only Mission Systems, but also other capability elements, collectively known as Logistics (or Support) Systems. These comprise maintenance planning, trained personnel, support equipment and maintenance spares, technical data and computer resources, facilities, transport and storage, and various other investments that contribute to the success of naval operations. Known in Defence as the Fundamental Inputs to Capability (FIC), DMO, CDG and other organisations in Defence play major roles in developing each capability input. All the inputs are not productive if Mission Systems are not available when required, are unfit for service, or pose unacceptable risks to personnel, public safety, and the environment.

12. Consequently, Navy capability development requires the delivery of both the Mission Systems and the other seven inputs that culminate in capability. The successful delivery of these inputs is dependent upon effective organisational structures, high standards of management cooperation and coordinated effort, supported by adherence to the best systems engineering practices available.

Audit objectives and scope

13. The objective of the audit was to report on the effectiveness of Defence's approach to the acceptance into service of Navy capability, and to identify where better practice may be used by CDG, DMO and Navy. The audit included examination of:

- CDG's definition of Navy capability requirements;
- DMO's verification and validation that systems accepted from contractors comply with government approved requirements, and DMO's compliance with Navy's technical and safety regulations;
- Navy's certification that systems offered for release into operational service are fit for service, and only pose acceptable risks to personnel, public safety, and the environment, and Navy's reliance on Classification Societies; and
- Navy capability management and regulation.

14. This audit is intended to reinforce and inform the ongoing development of Navy capability acquisition and acceptance processes.

15. Table S.1 lists the projects considered by the ANAO during the course of this audit.

Table S 1

Projects and Approved Budgets and Expenditure as at January 2011

Project Number and Phase	Project Name	Defence (including DMO) Allocation at Year of Approval $millions[12]	Allocated DMO Budget as at Jan 2011 Prices $millions[13]	DMO Expenditure as at Jan 2011 $millions
SEA 1102 Phase 3A	Laser Airborne Depth Sounder	14	16	14
SEA 1348 Phase 3	ANZAC Harpoon Missile Capability	143	161	142
SEA 1390 Phase 2.1	FFG Upgrade	1266	1531	1348
SEA 1390 Phase 4B	SM1 Missile Replacement	553	623	283
SEA 1401 Phase 2	Hydrographic Ship Construction	206	225	217
SEA 1405 Phase 1&2	Seahawk ESM and FLIR*	122	177	176
SEA 1429 Phase 2	Replacement Heavyweight Torpedo	238	430	280
SEA 1439 Phase 4A	Collins Replacement Combat System	455	450	425
SEA 1442 Phase 3	Maritime Tactical Wide Area Network	43	52	31
SEA 1444 Phase 1	Armidale Class Patrol Boat	437	537	482
SEA 1448 Phase 2A	ANZAC Anti-Ship Missile Defence	449	389	223
SEA 1654 Phase 2A	HMAS *Sirius* Acquisition	136	139	138
SEA 4000 Phase 3	Air Warfare Destroyer (AWD) Build	7073	7996	2634
JP 2008 Phase 3E	Satellite Terrestrial Infrastructure	115	210	206
JP 2027 Phase 1&2	Landing Platform Amphibious (LPA) ^	125	156	155
JP 2043 Phase 3A	High Frequency Modernisation	505	672	426
JP 2048 Phase 4A/B	Amphibious Deployment Sustainment	2980	3131	1285
JP 2070 Phase 2&3	Lightweight Torpedo Replacement	534	646	452
AIR 87 Phase 2[14]	Armed Reconnaissance Helicopter	1584	2062	1684
AIR 9000 Phase 2	Multi-Role Helicopter-90	3523	3758	1739
	Total $millions	**20,501#**	**23,361**	**12,340**

Source: Compiled from Department of Defence and Defence Materiel Organisation advice, June 2011.

Notes: * Due to the project's closure, the DMO figures are in January 2010 dollars.
^ Due to the project's closure, the DMO figures are in September 2004 dollars.
Aggregated total of the projects' approved budgets, with their price basis based on individual project approval dates.

[12] Price basis is at the year in which the project was approved by government and does not include price indexation, scope changes, or any exchange rate variations since approval of the project. Source: Department of Defence, June 2010. Rounded to the nearest $million.

[13] DMO Project budgets against which cost performance is measured are subject to variations arising from price indexation (inflationary) effects, exchange rate variations, changes in scope, transfers to Defence Groups and DMO cost performance. Source: Defence Materiel Organisation, January 2011. Rounded to the nearest $million.

[14] The Army AIR 87 ARH and AIR 9000 MRH helicopter projects were included in the audit as their specifications include operations from Navy platforms.

16. Of the 20 projects considered in this audit, 11 are also included in the DMO 2009–10 Major Projects Report;[15] these are shaded in light blue in Table S.1. Seven of the projects have previously been the subject of ANAO performance audits, which are listed in Appendix 2.

17. Eight of the projects have Mission Systems and Support Systems undergoing naval operational test and evaluation, as part of the Initial Operational Release phase.[16] A further seven projects have successfully completed Navy's operational test and evaluation and have been accepted into naval service, a state now known as Operational Release.[17] Of the remaining five projects, four are progressing through their development and contractual acceptance test and evaluation phase managed by the DMO. In May 2011, the remaining project, the JP 2027 Landing Platform Amphibious (LPA) project, was in a seaworthiness remediation phase for one ship (HMAS *Kanimbla*) and a decommissioning phase for the other ship (HMAS *Manoora*).[18] In 2003, the LPA project entered its sustainment phase, on the closure of its acquisition phase.

18. Fieldwork for the audit was conducted from January 2010 to March 2011, at the Canberra central offices of CDG, DMO, and Navy. Interstate fieldwork was also conducted at the Navy's Test, Evaluation and Acceptance Authority (RANTEAA) at Garden Island, Sydney; and at relevant DMO Project Offices. The audit team held meetings with United States of America (USA), United Kingdom (UK) and Canadian Defence authorities involved in Navy capability acquisition, test and evaluation and capability management. This enabled international comparisons of initiatives used to address particularly challenging management issues revealed by the audit.

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[15] This DMO Major Projects Report was published in ANAO Report No.17, 2010–11, *2009–10 Major Projects Report Defence Materiel Organisation*, November 2010, pp. 67–128, 135–406.

[16] The Initial Operational Release milestone marks the point in time at which the control and responsibility of new or upgraded Mission and Support Systems transfers from the DMO to Navy, and the Chief of Navy, in his Capability Manager role, accepts all Mission and Support System technical and operational risks from the DMO.

[17] The Operational Release milestone marks the point in time at which the Capability Manager is satisfied that a Capability System, or subset, has proven effective and suitable for the intended role and, that in all respects, it is ready for operational service.

[18] On 6 April 2011 the Minister for Defence and the Minister of Defence Materiel confirmed that Australia had been successful in its bid to acquire a Bay Class ship, Largs Bay, for £65 million (approximately $100 million). Largs Bay is a Landing Ship Dock (LSD) which was commissioned into service in 2006. It became surplus to UK requirements as a result of the UK Government's 2010 Defence Strategic Review. Minister for Defence, MIN80/11, *Largs Bay acquisition*, 6 April 2011, p. 1.

Overall conclusion

19. Particularly since 1998, Defence has sought to put in place the seamless management of ADF capability from requirements definition through to withdrawal from service. After a series of changes to Defence's organisational structures and processes, there is still some way to go before Defence achieves the objective of seamless, well-developed processes and systems underlying the effective and efficient delivery of Navy capability.

20. DMO, CDG and Navy have sought to design management practices based on better practice in the commercial and naval sectors. These include formally setting out their respective roles and management responsibilities, and adopting systems engineering as the basis for acquiring and supporting ADF capability.

21. However, the overall picture is of a capability development system that has not consistently identified and responded, in a timely and comprehensive way, to conditions that adversely affected Navy capability acquisition and support. Opportunities to identify and mitigate cost, schedule and technical risks have been missed, resulting in chronic delays in Navy Mission Systems achieving Final Operational Capability.[19]

22. At the highest level, the Acquisition Business Cases, project plans and inter-group agreements for some of the projects examined have not set out clearly the government-authorised parameters for each project in terms of scope, cost and schedule at the time of each project's approval. Consequently, compliance with government requirements, which is a fundamental responsibility of Defence, could not be confirmed by Defence.[20] In addition,

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[19] Final Operational Capability is the point in time at which the final subset of a Capability System that can be operationally employed is realised. Final Operational Capability is a capability state endorsed at project approval at Second Pass, and reported as having been reached by the Capability Manager. Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. A1.

[20] At the time of the audit, DMO was not able to provide the relevant government approval for the projects in the audit sample. In May 2011, Defence advised the ANAO that:

Footnote continued on the next page…

other significant deficiencies which adversely affect the projects subject to this audit included:

- Navy as Capability Manager, and DMO as acquirer, not fully and formally setting out their respective roles and responsibilities in the form of comprehensive CDG-DMO-Navy Materiel Acquisition Agreements for all acquisition projects. This requirement was agreed to in 2009,[21] and developing these agreements for Navy projects has been a slow process, with completion now expected by December 2011;
- the process of gaining agreement on requirements and on the procedures for verifying and validating that equipment fully meets contractual requirements was not adopted as standard practice by DMO and Navy. The aggregation of the requirements specified in the three key Capability Development Documents (the Operational Concept Document, the Function and Performance Specifications and the Test Concept Document)[22] should align with Navy's criteria for

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In early 2011, the DMO started a Project Baseline Review (otherwise known as a project 'due diligence') to ensure alignment between current project objectives and each corresponding Government project approval. Noting the extended duration of many major capital acquisition projects, the DMO is conducting this review to ensure the current key project elements of scope, budget and schedule match each related Government project approval (tracing from the original approval through to any subsequent Government-authorised changes). This work requires reference to Cabinet and other Government documents from across each project's life; as the majority of these documents are not held in the DMO (or Defence), external liaison is required to establish an authoritative record. Once this research is completed, the DMO will then assess the degree of alignment between the current project objectives and Government approval. Any significant deviation is then expected to be addressed with Government. The DMO plans to finalise this work by December 2011. Defence advice to the ANAO 29 May 2011.

[21] Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review*, May 2009, pp. 9, 26. At the time of the audit, all but one of the projects considered by the ANAO during the course of this audit continued to have Materiel Acquisition Agreements in place that were solely between CDG and DMO, thus excluding the Capability Manager.

[22] Operational Concept Documents (OCDs) are intended to inform system acquirers and developers of the ADF's operational requirements. Without specifying particular solutions, OCDs: describe the characteristics of the required capability from an operational perspective; facilitate an understanding of the overall system goals from both the Mission System and Support System perspectives; detail missions and scenarios associated with operations and support from both the Mission System and Support System perspectives; provide a reference for determining 'fitness for service'; and provide a justifiable basis for the formal requirements for both the Mission System and Support System.

Function and Performance Specifications (FPSs) define what the ADF requires. They specify the system's functional requirements from the perspective of the needs of final users; specify, in quantifiable terms, the system's critical performance requirements that are the basis for design acceptance and qualification testing of the system; and provide the basis for the contracted Mission System and Support Systems' design specifications.

Footnote continued on the next page…

determining that materiel offered by DMO at the end of the acquisition phase matches the Government approval and is 'fit for service' — where fitness for service relates to the materiel's ability to satisfy operational requirements.[23] The adoption of the essential systems engineering process of ensuring that agreement is reached on these matters at the outset of, and throughout, projects, is critical to facilitating the transition from acquisition to operational acceptance and is now being considered by DMO's Standardisation Office;

- records of testing and evaluation, contractual acceptance, and configuration management were not maintained in a systematic and complete fashion by DMO. This practice is essential for capability acceptance, and for the provision of ongoing assurance that materiel remains fit for service and poses only acceptable risk to personnel, public safety, and the environment. This is a significant systems engineering deficiency and a regulatory non-compliance issue; and
- Navy's administration of its technical and regulatory responsibilities, including verifying regulatory compliance, was not as complete and thorough as necessary in the circumstances. In some essential systems engineering, technical regulatory elements and capability integration management areas, there are insufficient numbers of qualified staff, and this needs to be addressed as a priority.

23. In such cases, Navy capability acquisition schedules have suffered, and continue to do so, with some materiel delivered to Navy having incomplete requirements verification and configurations records, resulting in difficulties in determining safety and fitness for service. It is evident that such problems have proliferated because of the lack of effective mitigation through the definition,

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Test Concept Document (TCD) outlines the test approach and strategy to be used to verify and validate that the design and operational requirements of the new or upgraded capability have been met. It defines the ADF's intended test and evaluation approach and strategy for accepting the system, agreed between the DMO and Defence; it forms the basis for the project's Test and Evaluation Master Plan and identifies the funding and resources required for the project's test and evaluation program that culminates with System Acceptance and Operational Release; it defines the Critical Operational Issues (identified in the Operational Concept Document) that are to be tested and evaluated to assess the system's ability to perform its mission; it defines the Critical Technical Parameters derived from the critical requirements identified in the Function and Performance Specification; and finally it defines the agreed operational scenarios that need to be successfully trialled in order for the delivered capability to receive Operational Release.

[23] Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 2 and Definition of Terms.

acquisition and acceptance phases. The pathway to better capability outcomes here is reliant on clear up-front agreements on capability requirements definition, verification and validation procedures, and configuration management. These agreements, which would supplement the higher-level Materiel Acquisition Agreements, are necessary to minimise the likelihood of disagreement about the capability requirements expected to be delivered, and the adequacy of the validation and verification procedures applied to confirm delivery of these requirements, arising when a project is transitioning from acquisition to acceptance into service. Such agreements should allow the focus to be kept on resolving any capability deficiency that remains.

24. Analysis of project documentation by the ANAO shows overall project management improvements have occurred since around 2003, when Defence increased the application of systems engineering concepts to the requirements definition phase of its projects, resulting in better developed operational concepts, function and performance specifications and test concepts. Those improvements are reflected in Defence's contracting template, which clarifies the accountability for design, and underscores the vital importance of progressive verification and validation that ADF capability requirements have been met. Of the 20 projects considered in the course of this audit, these improvements apply to the five post-2003 projects,[24] and to a lesser extent to the remaining 15 pre-2003 projects, as most often the improvements could not be fully retrospectively applied to these older projects.

25. Nevertheless, despite the improvements in requirements definition and verification and validation processes, there remains scope for improvements in process implementation that should further assist in achieving better capability outcomes. While some factors, such as those relating to industry capability, may be outside of Defence's direct control, Defence's Navy capability development management arrangements can be further improved. Customer-supplier agreements in the form of Materiel Acquisition Agreements that include the Navy Capability Manager as a co-signatory as well as CDG and DMO, were being developed during the course of this audit. Although long overdue,[25] these three-way agreements are expected to clarify the customer-

[24] SEA 1390 Phase 4B, SEA 1448 Phase 2A, SEA 4000 Phase 3, JP 2048 Phase 4A/B and AIR 9000 Phase 2.

[25] The need for Capability Managers to sign the Materiel Acquisition Agreements was established in May 2009. See Recommendation 3.1 of Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review,* May 2009, p. 26.

supplier arrangements and create the conditions for projects to more smoothly transition from acquisition to acceptance into service.[26]

26. In an environment where project durations can extend over many years, it is not uncommon for technological advances to occur and/or operational requirements to change during a project's course. It is to be expected that reasonable efforts are made to keep pace with those changes, including seeking prior necessary government approvals. It is also reasonable to expect that, from the systems engineering perspective, adherence to properly conducted configuration management processes will enable agreed changes to occur in a controlled manner.

27. Uncertainty regarding acquisition requirements and the adequacy of verification records needs to be avoided as far as is possible - especially for fixed-price contracts, where contractors are sensitive to changes, or perceived changes, in the contracted scope of work. This underscores the importance of Defence's post-2003 policy of having in place, prior to contract signature, agreed Capability Definition Documents to serve as the basis for acquisition contract Statements of Work. It also underscores the key role of System Definition Reviews that enable timely agreement between DMO, Navy and contractors on acquisition requirements, and their verification and validation procedures.

28. When Defence contracts involve system design and development, the implementation of effective project management and systems engineering processes are central to achieving better outcomes. When the acquisition involves military off-the-shelf (MOTS) or commercial off-the-shelf (COTS) equipment that needs no further development or integration into other systems, Defence may choose to rely on the vendor's systems engineering processes. However, it remains fundamental that senior responsible officials managing the definition, acquisition and acceptance phases of such equipment must have clear visibility of the key decisions, assumptions, and test and evaluation data that led the vendor to offer the equipment as off-the-shelf. In all cases, CDG, DMO and Navy would benefit from working more closely during important phases of the development of major systems; notably when systems are first specified, during the day-to-day management of construction

[26] Defence advised that the planned completion date for the revised tripartite Materiel Acquisition Agreements that include the Navy Capability Manager introduction is December 2011.

of major systems, during acceptance and operational testing, and while verifying compliance with technical and operational regulations.

29. At key stages of each project, all parties would benefit from a definite agreed view of the risks that must be managed in order to achieve a successful outcome. Experience in the USA and the UK underscores the importance of the acquisition organisation and Navy working together to ensure that handoffs to Navy do not become 'voyages of discovery' in the final stages of the project.[27] Knowledgeable people need to be in position at the right time, to give proper consideration to each system-under-development's functional, physical and regulatory requirements, as well as to the procedures used to verify and validate the achievement of those requirements. The overall aim is to ensure that projects move smoothly forward in the clear knowledge of the risks and issues that need to be managed at each point in time.

30. Ideally, cooperation between the parties would be underpinned by improved horizontal responsibility and accountability arrangements. For Defence's current organisational and management models to work more effectively to deliver the anticipated efficiencies, there is a need for clearer, more specific agreements and accountabilities between the various organisations that assist the Chief of Navy to acquit his overall responsibility for delivering the Navy capability outcomes agreed to by government.[28] This is because the current customer-supplier model adopted by Defence results in the Chief of Navy having no direct authority over key Defence Groups (including DMO) that develop capability elements needed to achieve these outcomes.[29] This is a significant issue in any matrix management model such as that employed by Defence. At the time of the audit, CDF and the Secretary

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[27] In December 2008, the US Department of Defense issued revised defense system acquisition instructions concerning collaboration between developmental and operational testers to build a robust integrated test program, and to increase the amount of operationally relevant data that can be used by both communities. Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, *Report of the Defense Science Board Task Force on Developmental Test & Evaluation,* May 2008, p. 8. Department of Defense Instruction 5000.002, *Operation of the Defense Acquisition System*, December 2008, Enclosure 6, Integrated T&E.

[28] The Chief of Navy is responsible for exercising oversight and coordination of all elements necessary to introduce the full level of operational capability into service within scope, cost, workforce, schedule and risk parameters agreed to by government. Department of Defence, *Joint Directive by Chief of the Defence Force and Secretary, Department of Defence for Project XXX Phase NN, Post Second Pass Implementation Stage,* Draft declassified template, March 2011.

[29] This includes DMO for Mission System and Support Systems, Defence Support Group for Defence Facilities, and the Chief Information Officer Group for information and communications technology.

were considering proposed changes to Defence's accountability and authority structure.[30]

31. As previously mentioned, the audit has highlighted that Defence's objective of developing the 'seamless management' of whole-of-life capability still has some way to go. The approach currently employed has a number of gaps and accordingly there is a need for Defence to:

- improve the overall transition of Navy capability agreed to by government, from its capability definition phase, through its acquisition phase and into acceptance into operational service, by improving managerial control by Defence over the setting of the detailed Navy capability requirements flowing from government's overall project approvals. This includes the formal endorsement of these requirements by CDG, DMO and Navy based on government approval at Second Pass, and the application of an authorised change management process (which includes obtaining government approval where required) for any changes to the project's requirements and/or its test and evaluation program throughout the project's life;
- improve its systems engineering processes and their efficiency through compiling, from existing documents, authoritative systems engineering guidance for use by all materiel projects. This would clarify and streamline what is expected of Defence personnel employed in systems engineering roles, and remove processes that are no longer cost effective in the delivery of capability;
- support the maintenance of adequate standards of requirements management and verification and validation, throughout each phase of Navy capability definition, acquisition and acceptance into service, by

[30] Department of Defence, *The Defence Accountability Framework, Review of accountability and governance in the Department of Defence*, January 2011.

For newly approved projects from February 2011, Project Directives will hold the Chief of Navy responsible for exercising oversight and coordination of all the elements necessary to introduce the full level of operational capability into service within scope, cost, workforce, schedule and risk parameters agreed to by government. This includes applying a regulatory system to assure that Navy capability is fit for service and only poses acceptable risks to personnel, public safety, and the environment. Department of Defence, *Joint Directive by Chief of the Defence Force and Secretary, Department of Defence for Project XXX Phase NN, Post Second Pass Implementation Stage*, Draft declassified template, March 2011. Department of Defence, *Defence Capability Development Handbook (Interim),* April 2010, paragraph 4.58. Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008. Defence Instructions (General) Log 4-5-012, Regulation of technical integrity of Australian Defence Force materiel, September 2010.

increasing the sharing of information on project requirements, and on the test and evaluation program used to verify and validate that project requirements have been fulfilled;

- effectively address significant systems engineering and technical regulation issues concerning Configuration Management, which have remained unresolved for over a decade; and
- strengthen the critical System Acceptance process by ensuring that the DMO delegate authorised to approve Systems Acceptance is an executive with seniority commensurate with the importance of the project, who is external to the Systems Program Office and who is designated in the Project Certification Plan.

32. The scale and complexity of projects to deliver Navy capability are key reasons why it is unsurprising that not all projects progress as planned, but these inherent characteristics of many Navy capability projects are also important reasons why Defence needs to improve its implementation approach, and related accountabilities, leading to acceptance into service of new or upgraded capability. The notion of seamless management of ADF capability initiated by Defence more than a decade ago is a sound concept, but more needs to be done to operationalise it and streamline existing approaches for accepting Navy capability into service.

33. In addition, it is evident from the audit that greater emphasis needs to be applied by Navy, CDG and DMO, in maintaining a shared understanding of the risks to the delivery of the Navy capability agreed to by government. Importantly, there also needs to be sharing of the responsibly for mitigating those risks, including in relation to implementing effective recovery actions, when issues arise that threaten the acquisition of that capability. Without the application of greater discipline by Defence in the implementation of its own policies and procedures (including by having the required technical personnel in place to execute these), improved communication and collaboration across the relevant parts of Defence during a project's lifecycle, and the maintenance of adequate records to support appropriate monitoring of capability development performance, the necessary improvements in acquisition outcomes will not be achieved.

34. The ANAO has made eight recommendations designed to improve Defence's management of the acquisition and transition into service of Navy capability, including reducing delays in achieving operational release of such capability.

Key findings by chapter

Chapter 2 – Capability management process development

35. The Defence Procurement Review 2003 (also known as the Kinnaird review) sought to strengthen Defence's two-pass project approval process for acquisitions. It also led to the formation of the CDG in February 2004,[31] and to the DMO becoming a financially autonomous project management and service delivery organisation within the Defence portfolio in July 2005.[32] Under these arrangements the Service Chiefs relied on CDG, through the CDG-DMO Materiel Acquisition Agreement Process, to oversee, co-ordinate, and report on all elements necessary for the acquisition of ADF Mission and Support Systems.

36. The 2008 Defence Procurement and Sustainment Review (known as the Mortimer Review),[33] sought to improve the capability development process by, amongst other things, increasing the role of the Service Chiefs in the capability development and reporting process. However, the Chief of Navy presently has no direct authority over key Defence Groups (such as DMO) that develop capability inputs needed to achieve the capability outcomes agreed to by government for which he has overall responsibility. This is a significant issue in any matrix management model such as that employed by Defence.[34] CDF and the Secretary were considering proposed changes to Defence's accountability and authority structure during this audit.[35]

37. As of February 2011, the Capability Managers' role of bringing together all the fundamental inputs required to achieve the capability outcomes agreed

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31 Department of Defence, *Defence Procurement Review 2003*, August 2003, pp. iv, v, 11.

32 ibid., pp. iv, 33-37.

33 In May 2008, the Government commissioned the Defence Procurement and Sustainment Review. The Review report provided to the Government in September 2008 made 46 recommendations aimed at addressing the five principal areas of concern identified by the Review: inadequate project management resources in the Capability Development Group; the inefficiency of the process leading to Government approvals for new projects; shortages in DMO personnel; delays due to inadequate industry capacity; and difficulties in the introduction of equipment into full service.

34 The matrix management model reflects organisational arrangements where the traditional hierarchical functional group structures, that have vertical authority and accountability for function (process) execution and skills development, are supplemented by project management structures that have horizontal authority and accountability for product development coordination and delivery, across multiple functional groups.

35 Department of Defence, *The Defence Accountability Framework, Review of accountability and governance in the Department of Defence,* January 2011.

to by government, had yet to be drafted into Project Directives for any of the 20 projects included in this audit.[36] Defence was producing Project Directives only for new projects currently being approved by government. With respect to the 20 projects included in this audit, Materiel Acquisition Agreements that include the Capability Manager had only been signed for the JP 2070 Lightweight Torpedo Replacement project. Consequently, the effectiveness of these new arrangements could not be examined during this audit.

Chapter 3 - Defining Navy capability requirements

38. Since 2003, Defence has made improvements to project management and the application of systems engineering concepts when defining the requirements for projects, resulting in better developed operational concepts, function and performance specifications and test concepts. Defence's CDG is, among other things, responsible for defining Navy capability requirements in systems engineering terms. Since its formation in 2004, CDG has defined new or upgraded Navy capability through three key capability definition documents:

- the Function and Performance Specification, which specifies the functional characteristics of systems to be acquired, and the level of intended performance;
- the Operational Concept Document that sets out how the systems will be operated in their intended operational environment; and
- the Test Concept Document that sets out the tests that need to be conducted to demonstrate that the systems will comply with their specified requirements, and thus are fit for service and only pose acceptable risks to personnel, public safety, and the environment.

39. The ANAO found five of the 20 projects included in the audit were established after 2004, and each of these has approved versions of all three capability definition documents, as required by Defence policy following the 2003 Defence Procurement Review. The documents for the remaining 15

[36] The Project Directives will hold the Capability Managers responsible for exercising oversight and coordination of all elements necessary to introduce the full level of operational capability into service within scope, cost, workforce, schedule and risk parameters agreed to by government. Department of Defence, *Joint Directive by Chief of the Defence Force and Secretary, Department of Defence for Project XXX Phase NN, Post Second Pass Implementation Stage,* Draft declassified template, March 2011. Department of Defence, *Defence Capability Development Handbook (Interim),* April 2010, paragraph 4.58.

projects established prior to 2004 were to varying degrees less defined. For these projects, Defence was exposed to risks in gaining agreement with contractors (often a year or more into a fixed-price contract[37]) regarding Defence's requirements for system function and performance, and on the test and evaluation procedures to be used to verify compliance with contractual requirements.

40. There remain opportunities for Defence to further improve its project definition process by including better coverage of Navy's regulatory requirements, and more generally by improving the overall flow of the acquisition management process. To this end, DMO's Standardisation Office has commenced developing a DMO Systems Engineering Manual which, although long overdue, should lead to improved systems engineering in DMO, from which it may be expected there would be better process interfaces with CDG and Navy.[38] It should also provide a basis for the application of standardised processes, which would assist Defence personnel to continuously improve their systems engineering skills and the delivery of defence capability.

41. Post-2004 projects such as SEA 4000 Phase 3 Air Warfare Destroyer project and JP 2048 Phase 4A Amphibious Deployment and Sustainment projects also show significant improvements in certification planning. Certification provides assurance that a product, service or organisation complies with a stated specification standard or other requirements.[39] The ADF's philosophy is that the organisations responsible for delivering supplies or services will certify that the materiel for which they are responsible complies with specified standards and is technically fit for service in the intended role. However, for most of the projects in the ANAO's audit sample,

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[37] This situation presented particular difficulties for DMO Project Directors. ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, pp. 14, 15, 66-67. Fixed-price contracts are generally considered to be the lowest risk to the government, because the onus is on the contractor to provide the deliverable at the time, place, and price specified in the contract. In addition, the contractor is responsible for bearing any costs associated with a delay or inadequate performance, assuming that the government has not contributed to contractor performance issues through issues such as late delivery of government-furnished equipment or changed requirements.

[38] DMO recognised the need to develop a DMO Systems Engineering Manual in 2002, when it commenced a Systems Engineering Improvement Program. Department of Defence, Defence Materiel Organisation, *Systems Engineering Improvement Program (SEIP) Phase One Overview Improving Capability Through the Application of Systems Engineering*, Edition 1, September 2003, p. 3

[39] Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, Definition of Terms. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 2 and Definition of Terms.

Certification Plans were not authorised until some years after the project's approval by government and the signing of prime contracts.[40]

42. Changes brought about by the 2008 Defence Procurement and Sustainment Review include the progressive redrafting of the Materiel Acquisition Agreements between CDG and DMO to include the Capability Managers and their recently defined role of capability development coordination and reporting.[41] The new Materiel Acquisition Agreement provisions more clearly set out responsibility for defining requirements and agreeing procedures for determining compliance with the requirements.

43. There is little doubt that, besides needing effective management structures, Navy capability development requires standardised management processes that enable the smooth handoff of systems engineering work across organisational boundaries. CDG and DMO have achieved progress in this area. However, improving the handoff of work between DMO and Navy is a more challenging task, as it requires sound systems engineering to detect risks and issues that may develop and compound during each project's system definition and acquisition phases. Risks and issues need to be recognised and reduced to manageable levels more effectively than has been demonstrated to date in many projects.

44. The ANAO has recommended (Recommendation 1) that to achieve the 'seamless management' of whole-of-life capability envisaged in 1998, CDG, DMO and Capability Manager organisations further rationalise and streamline all key capability definition, acquisition and materiel support processes, and ensure that these processes are integrated, practical and focused on the efficient and reliable delivery of ADF capability. The ANAO considers that this task would generally not involve developing new processes, but rather ensuring more efficient, effective and streamlined use of existing processes, and the removal of processes that have proven to be not cost effective. In progressing this work, Defence could leverage off DMO's engineering policies, procedures and guidance standardisation program, to achieve important elements of its seamless management concept.

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[40] SEA 1102 Ph 3A, SEA 1348, SEA 1390 Ph 2.1, SEA 1390 Ph 4B, SEA 1401 Ph 2 – Survey Motor Boats, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1654 Ph 2A, JP 2008 Ph 3E, and JP 2043 Ph 3A.

[41] Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review*, May 2009, pp. 9, 26, 27.

Chapter 4 – Requirements management and regulatory compliance

45. DMO project offices are required to monitor and report the cost and schedule performance of the projects they are responsible for, and to verify and validate that materiel delivered by contractors complies with the function and performance requirements specified in the acquisition contracts. It may be extremely costly to fix requirements or design defects found late in a project's design and test phase. This underscores the critical importance of systems engineering processes that incorporate system definition and design reviews, and progressive verification and validation of a system's compliance with specified requirements. The intent should be to detect and correct requirements and design defects as early as possible, while there are still sufficient resources within the project's budget to correct any defects and to limit any impact on schedule.

46. It would be desirable for Defence to reinstate the mandatory application of a Technical Risk Identification and Mitigation System, so that risks associated with each project's engineering management can be identified and mitigated in a timely way. It would also be desirable for DMO to further develop its progress measurement techniques and its Improved Project Scheduling and Status Reporting (IPSSR) program to better monitor and report project status.

47. Of the 20 projects considered during the course of this audit, the ANAO found only nine had current statistics to evidence that the verification and validation acceptance process was in operation. Defence regulations require that data applied to, and derived from, technical activities (including verification and validation statistics) must be authoritative, accurate, appropriate and complete.[42] To that end, Defence's strategic materiel contracting template has, since 2002, mandated the use of the DOORS® requirements management system for Defence's strategically important complex projects. However, the ANAO found some projects were using ad-hoc requirements management systems based on spreadsheets and databases

[42] Such data must always be accessible, but need not be retained in-house. Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, p. 4. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 3.

developed by project personnel.[43] The projects using the mandated DOORS® system were in need of more personnel trained and experienced in its use.

48. The ANAO has recommended (Recommendation 2) that DMO takes steps to ensure that project offices use only approved requirements management systems and that its personnel are adequately trained in their use. Improvements in requirements management would benefit DMO in its contract management role, and would also assist Navy's technical and safety regulators to gain sufficient, appropriate evidence to assess and manage the residual risk that the Chief of Navy accepts when releasing new or upgraded capability into service.

49. The ANAO also observed that DMO and Navy would benefit from working more closely during acceptance test and evaluation. A close working relationship is specified in DMO's System Acceptance criteria, but in practice this does not always eventuate. For example, in December 2009, DMO completed contractual acceptance of all four upgraded RAN FFG Guided Missile Frigates with limited engagement of Navy in the verification and validation process leading to contractual acceptance. To date there are significant elements of the upgraded FFG Combat System that are yet to demonstrate the performance, reliability, availability and maintainability expected by Navy, but recourse to contractual remedies is now significantly reduced.

50. The Lightweight Torpedo Replacement project is in a similar situation. DMO provided the contractors with Supplies Acceptance Certificates for torpedos delivered by November 2010, albeit in the absence of completed verification and validation of the torpedos' performance against their specifications. Also absent were a Navy approved Test and Evaluation Master Plan, and a regulatory Certification Plan endorsed and authorised by Navy.[44]

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[43] This practice is not encouraged by DMO's senior management, since it does not enforce the rigour necessary for requirements management, nor do they make it easy to establish and maintain traceability between the requirements specified in the function and performance specification, and their derived requirements allocated to systems specifications and Support Systems specifications. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008. p. 27.

[44] Defence advised the ANAO in June 2011 that: 'the [JP 2070 acquisition] contract provides robust protection to the Commonwealth should the torpedoes subsequently prove to be deficient against the specifications.' Defence advice to the ANAO *DMO Additional Information and Proposed Amendments – Revised S.19 Summary*, 8 June 2011.

51. In the light of these findings, a more integrated approach to test and evaluation would:

- enable Navy's operational test and evaluation personnel to assist DMO to identify the early emergence of issues that may adversely impact on operational release of new or upgraded capability;
- avert the repetition of operational tests that could more efficiently and effectively be conducted as part of verification and validation acceptance testing; and
- avoid contractual difficulties resulting from supplies acceptance by DMO prior to Navy completing technical and safety regulatory reviews.

52. The ANAO has recommended (Recommendation 3) that Navy and DMO take steps to streamline and integrate verification and validation and acceptance testing, and overall regulatory review processes.

53. The strategy adopted by DMO increasingly over the last decade is to no longer implement the earned value progress payment strategy recommended by the Joint Committee of Public Accounts in 1986.[45] Rather DMO provides progress measurements and payments based on a mix of engineering and production metrics, software metrics, cardinal milestones, and a suite of project performance metrics based on Earned Value Management-like principles. However, there remains a risk that contractors may focus more on delivering equipment and less on maintaining a holistic perspective on contractual progress management, which includes other deliveries such as logistics items relating to equipment reliability and maintainability, and configuration management.[46] The result is the loss of a comprehensive progress measurement and payment incentive system, based on work package milestones and other objective measures of achievement, which is an important feature of an earned value system. It may also result in greater costs during the in-service phase, when logistics shortfalls and other deficiencies need to be addressed.

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[45] Joint Committee of Public Accounts, Report 243, *Review of Defence Project Management*, Vol. 1 Report, 1986, pp. 73-76, 115,116. Department of Defence, *Defence Annual Report 1989-90*, pp. 51, 52.

[46] A key lesson learned by DMO on the SEA 1390 Ph 2.1 FFG Upgrade project, was that milestones which enable use of the equipment and supplies (such as integrated logistics support and training) should be given similar weight as delivery of the equipment itself. ANAO Report No.17, 2010-11, *2009-10 Major Projects Report Defence Materiel Organisation*, November 2010, pp. 263, 264.

54. The ANAO observed that about a third of the DMO projects considered in this audit achieved Initial Operational Release and Operational Release without having complete configuration audit records relating to both system functional and system physical characteristics. DMO project teams are responsible for maintaining accurate configuration records in order to ensure that the risks to technical integrity and safety are adequately identified and managed. Reviews of Configuration Management in DMO and Navy conducted in 1999 and 2010, revealed significant non-compliance with adequate levels of configuration management. This is a significant systems engineering and technical regulation issue and the ANAO has recommended (Recommendation 4) that DMO improves the configuration management of naval materiel, and that Navy rejects materiel that is offered for acceptance into service without sufficient Configuration Management.

55. When Defence contracts involve system design and development, the implementation of effective project management and systems engineering processes are central to achieving improved outcomes. On the other hand, when capability acquisitions involve military off-the-shelf (MOTS) or commercial off-the-shelf (COTS) equipment that needs no further development or integration into other systems, Defence may choose to rely on the vendor's systems engineering processes. However, even though technical risks are seen to decrease as projects move from developmental systems toward off-the-shelf solutions, in practice this has not entirely been the case.[47] The acquisition of off-the-shelf equipment still needs to be accompanied by sufficient and appropriate test and evaluation data suitable for the Services to assess the equipment's fitness for service, and its risk to personnel, public safety, and the environment. In all cases, it is fundamental that senior responsible officials managing the definition, acquisition and acceptance phases have clear visibility of the key decisions, assumptions and test and evaluation data that led the vendor to offer the equipment as off-the-shelf.

56. The ANAO has recommended (Recommendation 5) that Defence strengthen the critical System Acceptance process by requiring Navy capability

[47] ANAO Audit Report No.37, 2009-10, *Lightweight Torpedo Replacement Project*, Department of Defence, May 2010, pp. 18, 19, 65-67, 189. ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, p. 17. ANAO Audit Report No.36 2005-2006, *Management of the Tiger Armed Reconnaissance Helicopter Project – Air 87*, Department of Defence, Defence Materiel Organisation, May 2006, pp. 11, 18, 38. ANAO Report No.13, 2009-10, *2008-09 Major Projects Report Defence Materiel Organisation*, November 2009, pp. 177-178, 212, 218.

Project Certification Plans to designate a responsible officer for System Acceptance, who has seniority commensurate with the importance of the project, and who is external to the Systems Program Office.

Chapter 5 - Navy Materiel Certification

57. When Navy Mission Systems reach a point near System Acceptance from contractors, DMO and Navy engage in certifying that these systems are sufficiently safe for Navy to commence operational test and evaluation at sea. The release of new Navy capability into operations is likely to present Navy with new risks to operational capability and reliability, personnel safety and environmental protection. Accordingly, the Chief of Navy requires assurance that, when new or upgraded systems are offered for Initial Operational Release or Operational Release into Navy service, the systems' mission and support risks are identified, assessed, eliminated or controlled, and subsequently accepted by Navy at an appropriate level.[48] The intention is that this assurance is provided by the Navy Regulatory System, which sets out the requirement for DMO to develop Safety Cases and Reports on Materiel and Performance State (known as TI 338s).[49]

58. The ANAO found that the TI 338s for all 13 Navy projects considered in the course of this audit that had received Initial Operational Release, and Operational Release had been reviewed and endorsed by the regulators prior to the respective Initial Operational Release and Operational Release authorisation by the Chief of Navy. All but one of these projects also had approved Safety Cases. The safety of the remaining project had been assured by safety assessments provided by the Classification Society and other firms engaged by DMO.

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[48] Department of Defence, Defence Instructions (Navy) ADMIN 37-15, *Assuring the safety, fitness for service and environmental compliance of naval capability*, April 2007, p. 3.

[49] Safety Cases are developed by DMO System Program Offices and describe how safety has been considered with regard to the workplace, Mission and Support System hardware and software, personnel and management systems. They are to formally demonstrate that due diligence has been given to the occupational health and safety implications of the introduction into service of new capability, and they facilitate the management of hazards throughout the life of the capability through to disposal. Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual,* Edition 4, 2011, Annex F to Chapter 5.

The TI 338 reports are developed by DMO System Program Offices and provide key risk information to Navy's Commanding Officers and Force Commanders. They provide an account of the materiel state of the Mission and Support Systems, in terms of operational limitations within the parameters approved by government at Second Pass, and hazard risk assessments of the remaining risks at the time of materiel release by DMO to Navy. Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual (NOTEMAN),* Edition 4, 2011, Annex A to Chapter 5.

59. Leading up to this stage, the ANAO's analysis showed that projects that delivered the specified capability and adhered best to approved management processes and record-keeping were less likely to experience delays in achieving Initial Operational Release and Operational Release. Those qualities point to sound processes within DMO, and provide Navy's technical and safety regulators and its test and evaluation personnel with better information on which to gauge how the risks to safety and fitness for service are being managed.

60. ANAO examined evidence of the timeliness and quality of documents provided by DMO for Navy regulatory review. In some instances, there were issues with the adequacy and completeness of the information provided by DMO in support of Safety Cases and TI 338s. In other cases, DMO provided the information but at very late notice, in one instance leaving very little time for Navy to assess the safety of live missile firings. The ANAO has recommended (Recommendation 6) that Navy adopts streamlined regulatory review processes through improved verification cross referencing and that DMO mandates the adherence to the Navy's regulatory review schedule requirements.

61. Over the last decade, Defence has become increasingly reliant on shipping industry Classification Societies to provide independent verification that each naval vessel complies with design, construction and operation requirements that govern the vessel's particular class.

62. Since 2005, Navy has been formulating a Navy Flag Authority arrangement that will, for RAN vessels, establish contractual and formal relationships with the Classification Societies that, with respect to Navy vessels, will facilitate improved requirements-setting and design and construction rule interpretations.

63. As at February 2011, the respective Defence Instructions for the Navy Flag Authority arrangement and the Certification Society engagement arrangements remained under development. The ANAO has recommended (Recommendation 7) that Navy and the DMO seek an early agreement on the arrangements for the Navy Flag Authority arrangements.

Chapter 6 - Navy Operational Release

64. Operational release milestones are a measure of the development and integration of all eight Fundamental Inputs to Capability and the degree of maturity of a new or upgraded capability. Navy accepts that Final Operational

Capability may not be available at System Acceptance by the DMO.[50] It may take some time for all Fundamental Inputs to Capability to be fully realised, and the two steps of Initial Operational Release and Operational Release reflect Navy's progressive acceptance of capability, typically through a series of operational tests and evaluations.

65. Both DMO's System Acceptance process and the progressive realisation of the Fundamental Inputs to Capability, raise the need for acquisition contract provisions that allow operational test and evaluation involvement by Navy, and for DMO's test and evaluation schedule and resources to have the flexibility to facilitate Navy's involvement in system validation leading to System Acceptance. This flexibility also requires DMO to remain engaged following Initial Operational Release and during operational test and evaluation conducted by Navy, to provide resources and to remediate capability deficiencies identified against the approved project requirements.

66. The recent experience of the SEA 1448 Anzac Class Anti-Ship Missile Defence project indicates that this approach is feasible: the integration of system verification and system validation through operational test and evaluation led to successful results for Navy, DMO and its contractors.

67. An integrated and consistent approach would also provide greater assurance to key decision-makers. To date, the overall scope and content of Initial Operational Release Submissions and Operational Release Submissions to the Chief of Navy have varied considerably. At the time of the audit, RANTEAA was seeking to reduce this variability by implementing a more consistent and systematic approach to developing Initial Operational Release and Operational Release Reports and Operational Capability Statements. RANTEAA has now implemented a standard format for these reports, which is now managed under RANTEAA's accredited Quality Management System.

68. Once systems are delivered by DMO to Navy, they are included in the Materiel Condition Assessments carried out by ships crews. These assessments occur during the force preparation phase of a ship's activity program, and as a

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[50] Ideally, Initial Operational Release would occur soon after Mission and Support Systems have undergone System Acceptance by the DMO. Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. A-2

minimum, they are to be conducted within 12 months of delivery.[51] Materiel Condition Assessments would provide important information on Navy equipment reliability, availability and maintainability as demonstrated in its operating environment. However, their timely completion is presently hampered by deficiencies in configuration management conducted by DMO, and deficiencies in the state of the various Configuration Management Information Systems used by DMO and Navy, as reported by various internal reviews.[52]

69. The Materiel Condition Assessments include Combat System Qualification Trials, which validate that an individual ship's combat system has been installed correctly (including software upgrades) and can be operated and maintained in a safe and effective manner. These trials were once conducted by the former Fleet In Service Trials (FIST) section of the former Maritime Command Australia, but are now conducted by each ship's officers and crew. This practice may not be ideal, as the ship may not have available suitably skilled and resourced trials personnel and facilities, or may be subject to scheduling pressures due to other commitments. For preparedness and cost reasons, in-service guided weapon live firings are generally restricted to systems qualification and testing activities. Wherever possible, these firings are also optimised for operator proficiency training and tactical development. Navy advised the ANAO that it has reviewed the allowances for guided weapon live firings and has developed a pragmatic firing policy that balances the cost of conducting live firings against the need for system testing and operator training.

Chapter 7 - Capability Management in Navy Headquarters

70. Since 1984, Navy has undergone a range of significant organisational changes mainly brought about by the establishment of the Capital Procurement Organisation in 1984, the commencement of the Defence Commercial Support Program in 1991,[53] and the Defence Reform Program in

[51] At the time of the audit, the Defence Instructions (General) Ops 45-2, *Capability acceptance into operational service*, February 2008, was being revised to include an Initial Materiel Release milestone, at which time materiel is delivered by DMO to the Chief of Navy for acceptance.

[52] Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report*, September 2010, Executive Summary. *Review of Configuration Management in the RAN*, August 1999.

[53] ANAO Audit Report No.2, 1998-99, *Commercial Support Program*, July 1998.

1998. These changes included the transfer of all Navy design, construction, and deep-level maintenance to the private sector,[54] and the transfer of the functional responsibility for Navy's materiel requirements definition, materiel acquisition and logistics support functions to other Defence Groups, principally to CDG and DMO.

71. The changes have had a significant impact on Defence's ability to attract and retain qualified engineering staff. Currently, Navy has filled only two-thirds of its own engineering positions, 72 per cent of the Navy engineer positions in DMO, and only about one-third of the Navy engineer positions in CDG. This limits the availability of Navy engineers to perform the vitally important role of bringing their knowledge of the operating environment into the capability definition and acquisition stages of the capability life-cycle.

72. The effects of ongoing skills shortages are evident in the application of the Navy Technical Regulatory System, which is dependent on qualified and experienced engineering staff. The 2006 and 2009 internal reviews of Navy's Regulatory system found that the integrity of the Navy Technical Regulatory System was vulnerable to staffing deficiencies, that this presented a significant risk to regulatory framework assurance, and had led to significant deficiencies in the implementation of Navy's Technical Regulations.[55] While obviously a challenge, this needs to be reviewed as a priority.

73. The findings of these internal reviews are corroborated by the significant variations in the quality and completeness of the evidence supporting critical stages of the systems engineering cycle set out in Chapter 4 of this report. This is especially so with respect to information concerning system verification and validation, configuration management, and System Acceptance.

74. The Acceptance into Service process has been adversely affected by mis-matched expectations between DMO and Navy with regard to requirements verification and validation prior to System Acceptance by

[54] Deep-level maintenance includes scheduled maintenance, unscheduled maintenance and repairs (which require extensive Repairable Item dismantling in specialised jigs) and the use of specialised support equipment, technical skills or industrialised facilities.

[55] Royal Australian Navy, *Report on the Strategic Review of Naval Engineering*, November 2009.

DMO.[56] Under these circumstances, it is likely that risks and issues propagating through the system definition, verification and validation and configuration management processes may not be adequately addressed, resulting in some materiel delivered to Navy not being fully fit for service. Clear up-front agreement, including contractual agreements, on requirements and their verification and validation procedures, may minimise the likelihood of disagreement about requirements and the adequacy of verification and validation, thus ensuring that the focus remains on delivering government agreed capability.

Summary of agency response

Defence welcomes the ANAO audit report on Acceptance into Service of Navy Capability and notes that the recommendations provide opportunities to build upon the progress made by Defence in recent years in delivering improved acquisition outcomes. This report demonstrates the complexity of the acquisition and subsequent transition into service of naval platforms, and emphasises the close collaboration that must exist between the Capability Manager, the Defence Materiel Organisation and Capability Development Group, for success. The Government's Force 2030 white paper has a significant maritime component and this audit report is timely, noting the planned introduction of a number of major capabilities in the near future. Defence accepts the eight recommendations of the ANAO report.

Since early 2000, Defence has implemented a suite of acquisition and systems engineering initiatives. These improvements, together with those introduced following the Defence Procurement (Kinnaird) Review 2003 and the Mortimer Review (2008), have further strengthened the acquisition practices of Defence. These improvements address many of the risks that the Australian National Audit Office has highlighted. The audit notes that the current processes to deliver naval capability into service are based upon best practice system engineering processes. The five 'post 2003' naval capability projects detailed by the audit team have been recognised as positive examples of better

[56] System Acceptance by DMO normally involves the issue of a Supplies Acceptance Certificate (Form SG1), which provides for an authorised representative of the supplier to certify that the supplies conform in all respects to the conditions and requirements of the contract. Provision is also made for the supplier to record details of any non-compliance with the terms and conditions of the contract. Any non-compliance with contractual requirements must be approved by, or on behalf of, the Commonwealth Representative prior to acceptance.

requirements management and the effective planning of test and acceptance regimes against the approved capability envelope.

Defence acknowledges that there is scope to achieve better capability outcomes through further process alignment, and some of these improvements can be made in the near term. However, the challenge for Defence will continue to be our ability to recruit, develop and retain suitably experienced people to manage the acquisition and transition into service of new capability.

Recommendations

Recommendation No.1

Paragraph 3.40

The ANAO recommends that in order to improve its systems engineering processes and efficiency, Defence:

(a) compile and promulgate authoritative systems engineering guidance applying to all materiel projects; and

(b) aligns the templates for Capability Definition Documents, Acquisition Project Management Plans and Engineering Management Plans accordingly.

Defence response: *Agreed.*

Recommendation No.2

Paragraph 4.56

The ANAO recommends that Defence improves its requirements management processes, by ensuring that:

(a) only approved requirements management systems are used by Defence personnel; and

(b) Defence personnel accessing those systems are adequately trained in their use.

Defence response: Agreed.

Recommendation No.3

Paragraph 4.68

The ANAO recommends that, in order to improve their efficiency and effectiveness, Defence streamline and integrate its processes for system verification and validation, acceptance into service and regulatory review. This should include ensuring that:

(a) Navy operational test and evaluation teams witness relevant acceptance testing, and in particular validation testing of systems in their intended environment;

(b) DMO provides Navy with access to its requirements management systems, improving Navy's visibility of the status of the naval Materiel Systems under development and acceptance test and evaluation; and

(c) DMO and Navy require Project Engineers, in their capacity as Design Acceptance Representatives, to provide Issues Papers regarding all mission critical and safety critical requirements found to be non-compliant to Head Navy Engineering.

Defence response: *Agreed.*

Recommendation No.4

Paragraph 4.86

The ANAO recommends that, in order to reduce technical integrity and logistics risk and to reduce delays in Navy's regulatory reviews, Defence:

(a) reinforces the need to maintain accurate configuration records; and

(b) requires Navy to reject materiel offered for Initial Materiel Release that has been the subject of insufficient Configuration Management.

Defence response: *Agreed.*

Recommendation No.5

Paragraph 4.109

The ANAO recommends that DMO ensure that the delegate authorised to approve Systems Acceptance is an executive with seniority commensurate with the importance of the project, who is external to the Systems Program Office, and who is designated in the Project Certification Plan.

Defence response: *Agreed.*

Recommendation No.6

Paragraph 5.38

The ANAO recommends that, in order to safeguard the quality of the overall Navy regulatory review process:

(a) Navy adopts streamlined regulatory review processes through improved verification information sharing with acquisition agencies; and

(b) DMO mandates adherence to Navy's regulatory review schedule requirements, as documented as part of future Acquisition Baselines and agreed via the Materiel Acquisition Agreements.

Defence response: *Agreed.*

Recommendation No.7

Paragraph 5.57

The ANAO recommends, in order to reduce the risks to Navy associated with requirements setting and the interpretation of international maritime codes and conventions, Navy and the DMO seek an early agreement on the arrangements for the Navy Flag Authority.

Defence response: *Agreed.*

Recommendation No.8

Paragraph 7.54

The ANAO recommends that, in order to ensure the efficient and effective management of both the Capability Manager's Acceptance into Operational Service requirements, and DMO's verification and validation program:

(a) both the Acceptance verification and validation program and the operational test and evaluation program are formally endorsed by CDG, DMO and Navy prior to materiel contract signature;

(b) once endorsed, these requirements and programs are entered into a project's Verification Cross Reference Matrix and controlled by the project's Engineering Manager, in the capacity of the Design Acceptance Representative; and

(c) significant changes to requirements and the applicable Verification Cross Reference Matrix are subject to an authorised Configuration Management process.

Defence response: *Agreed.*

Audit Findings

1. Introduction

This chapter provides an overview of Navy's capability acquisition program and sets out the audit objectives, scope and approach.

Background

1.1 The Australian Defence Force (ADF) is currently midway through a major Navy capability upgrade program. The Navy capability acquisition projects considered by the ANAO during the course of this audit are valued at over $23 billion,[57] and these projects are forerunners of potentially much larger acquisitions outlined in the Government's 2009 Defence White Paper. The White Paper indicates the Government's intention to further modernise and enhance the Royal Australian Navy (Navy), so that by the mid 2030s the Navy:

> …will have a more potent and heavier maritime force. The Government intends to replace and expand the current fleet of six Collins class with a more capable class of submarine, replace the current Anzac class frigate with a more capable Future Frigate optimised for ASW [anti-submarine warfare]; and enhance our capability for offshore maritime warfare, border protection and mine countermeasures.[58]

1.2 Naval capability comprises not only Mission Systems, such as ships and submarines, but also logistics (Support Systems),[59] which include maintenance planning, trained personnel, support equipment and maintenance spares, technical data and computer resources, facilities, transport and storage and other such investments that contribute to the success of naval operations. This audit focuses primarily on the delivery of Mission Systems to the Navy, as they form the foundation of naval capabilities now and for

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[57] Table 1.1, January 2011 prices.

[58] Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030*, Defence White Paper 2009, May 2009, pp. 13, 53, 60, 63-64, 67 70-73.

[59] In the military sense, logistics is the application of skills, knowledge and actions together with the provision of resources and supplies to enable technical equipment to be operated and maintained in its specified configuration. Royal Australian Navy, *Report on the Strategic Review of Naval Engineering,* November 2009, p. 2-1. In the industrial or commercial sector, logistics has been defined to include such activities as materiel flow, product distribution, transportation, purchasing and inventory control, warehousing, customer service and the like. Blanchard, Bengamin S., *Logistics Engineering and Management*, Prentice Hall, 4 Ed, p. 3.

decades into the future. While this report occasionally refers to Support Systems, they were not the main focus of this audit.[60]

1.3 The development of Navy capability involves, in the first instance, Defence's Capability Development Group (CDG)[61] defining Navy's capability requirements in accordance with strategic guidance and in consultation with Navy and other stakeholders. These requirements then form the basis for the development of options for consideration by government.

1.4 The Defence Materiel Organisation (DMO) is responsible for acquiring and sustaining the Mission System and Support System elements of defence capability approved by government. DMO manages and oversees the processes by which private sector firms design, manufacture and test Mission Systems and their Support Systems in accordance with function and performance requirements defined by CDG, the regulatory requirements defined by Navy, and the 'readiness' and 'sustainability' requirements directed by the Chief of the Defence Force (CDF).[62]

Audit objective and scope

1.5 This audit is intended to reinforce and inform the ongoing development of Navy capability acquisition and acceptance processes. It examined the two main milestones in the process of delivering Navy capability. These are:

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[60] It is important to note that this audit does not include the safety and suitability for service of munitions supplied to Navy. This aspect of Navy capability presents particular managerial complexity, and coverage of this aspect has been previously provided in ANAO Audit Report No.30, 2002–2003, *Defence Ordnance Safety and Suitability for Service*, February 2003.

[61] CDG is one of the groups within the Department of Defence. The Defence portfolio consists of a number of component organisations that together are responsible for supporting the defence of Australia and its national interests. The three most significant bodies are:

- the Department of Defence — a department of state headed by the Secretary of the Department of Defence;
- the ADF — which consists of the three Services (including Reserves) commanded by the Chief of the Defence Force (CDF);
- the Defence Materiel Organisation (DMO) — a prescribed agency within Defence, headed by its Chief Executive Officer (CEO) DMO.

In practice, these bodies work together closely and are broadly regarded as one organisation known as Defence (or the Australian Defence Organisation).

[62] Readiness is the ability to prepare a capability for operations within a designated time. Sustainability is the ability to maintain a capability on operations for a specified period.

- contractual acceptance by DMO, at which point sufficient test and evaluation should have verified compliance with acquisition and support contract specifications; and
- acceptance into service by the Chief of Navy, at which point Navy operational test and evaluation and safety and regulatory reviews should have proven that all elements of capability have met endorsed capability requirements and are assembled in such a way that all aspects of the capability have been realised, and are acceptable for operational service.

1.6 The objective of the audit was to report on the acceptance into service of Navy capability, and to identify where better practice may be used by CDG, DMO and Navy to achieve improved outcomes. The audit focussed on the Mission System element of Navy capability, and concentrated on the key management processes intended to ensure that the approved Mission and Support system function and performance requirements are achieved and Navy's regulatory requirements are satisfied to an extent that allows acceptance of the capability into Naval service.

Audit approach and criteria

1.7 The audit approach involved analysis of project records relating to a sample of 20 projects considered by the ANAO during the course of this audit, which are listed in Table 1.1.

Table 1.1

Projects considered in the audit and their Approved Budgets and Expenditure as at January 2011

Project Number and Phase	Project Name	Allocated DMO Budget as at Jan 2011 Prices $millions[63]	DMO Expenditure as at Jan 2011 $millions
SEA 1102 Phase 3A	Laser Airborne Depth Sounder	16	14
SEA 1348 Phase 3	ANZAC Harpoon Missile Capability	161	142
SEA 1390 Phase 2.1	FFG Upgrade	1,531	1,348
SEA 1390 Phase 4B	SM1 Missile Replacement	623	283
SEA 1401 Phase 2	Hydrographic Ship Construction	225	217
SEA 1405 Phase 1&2	Seahawk ESM & FLIR*	177	176
SEA 1429 Phase 2	Replacement Heavyweight Torpedo	430	280
SEA 1439 Phase 4A	Collins Replacement Combat System	450	425
SEA 1442 Phase 3	Maritime Tactical Wide Area Network	52	31
SEA 1444 Phase 1	Armidale Class Patrol Boat	537	482
SEA 1448 Phase 2A	ANZAC Anti-Ship Missile Defence	389	223
SEA 1654 Phase 2A	HMAS *Sirius* Acquisition	139	138
SEA 4000 Phase 3	Air Warfare Destroyer (AWD) Build	7,996	2,634
JP 2027 Phase 1&2	Landing Platform Amphibious (LPA)	210	206
JP 2008 Phase 3E	Satellite Terrestrial Infrastructure^	156	155
JP 2043 Phase 3A	High Frequency Modernisation	672	426
JP 2048 Phase 4A/B	Amphibious Deployment Sustainment	3,131	1,285
JP 2070 Phase 2&3	Lightweight Torpedo Replacement	646	452
AIR 87 Phase 2	Armed Reconnaissance Helicopter	2,062	1,684
AIR 9000 Phase 2	Multi-Role Helicopter-90	3,758	1,739
Total $millions		23,361	12,340

Source: ANAO compiled from Department of Defence, and Defence Materiel Organisation records.

Notes: (a) The 11 projects shaded in light blue are also included in the ANAO Report No.17, 2010-11, 2009–10 Major Projects Report Defence Materiel Organisation, November 2010;
(a) Seven of the projects have been the subject of ANAO performance audits – SEA 1390 Phase 2.1, SEA 1390 Phase 4B, SEA 1444 Phase 1, SEA 1654 Phase 2A, JP 2027 Phase 1&2, JP 2070 Phase 2&3 and AIR 87. See Appendix 2 for the performance audit list.
(b) Projects marked * and ^ are closed and their budget and expenditure figures are in January 2010, and September 2004 dollars respectively.[64]

[63] DMO Project budgets against which cost performance is measured are subject to variations arising from price indexation (inflationary) effects, exchange rate variations, changes in scope, transfers to Defence Groups and DMO cost performance. Source: Defence Materiel Organisation, January 2011. Rounded to the nearest $million.

1.8 In June 2011 Defence advised the ANAO that the aggregate of project budgets, based on the cost of the projects at the time of each project's approval by Government, was $20.50 billion. The following amounts were allocated within Defence:

- $282 million, which was transferred to the Defence Support Group (DSG);
- $4 million, which was transferred to the Defence Science and Technology Organisation (DSTO); and
- $86 million, which was withheld to the Defence Capability Plan.[65]

1.9 The aggregated DMO budget allocated for these projects, at January 2011 prices (with the exception of the closed projects SEA 1405 Phases 1 and 2, and JP 2027 Phases 1 and 2), was $23.361 billion with expenditure of $12.340 billion.[66]

1.10 Eight of the 20 projects in the ANAO's sample have Mission and Support Systems currently undergoing naval operational test and evaluation, following the Navy Initial Operational Release phase.[67] A further seven projects have successfully completed Navy's operational test and evaluation and have achieved Operational Release and therefore been accepted into Navy service. Of the remaining five projects, four are progressing through their development and contractual acceptance test and evaluation phase managed by the DMO. In May 2011, the remaining project, the JP 2027 Landing Platform Amphibious project was in a seaworthiness remediation phase for one ship (HMAS *Kanimbla)* and a decommissioning phase for the other (HMAS *Manoora)*.

1.11 Table 1.2 sets out each project's time-line.

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64 This DMO Major Projects Report was published in ANAO Report No.17, 2010-11, *2009–10 Major Projects Report Defence Materiel Organisation*, November 2010, pp. 67-128, 135-406.

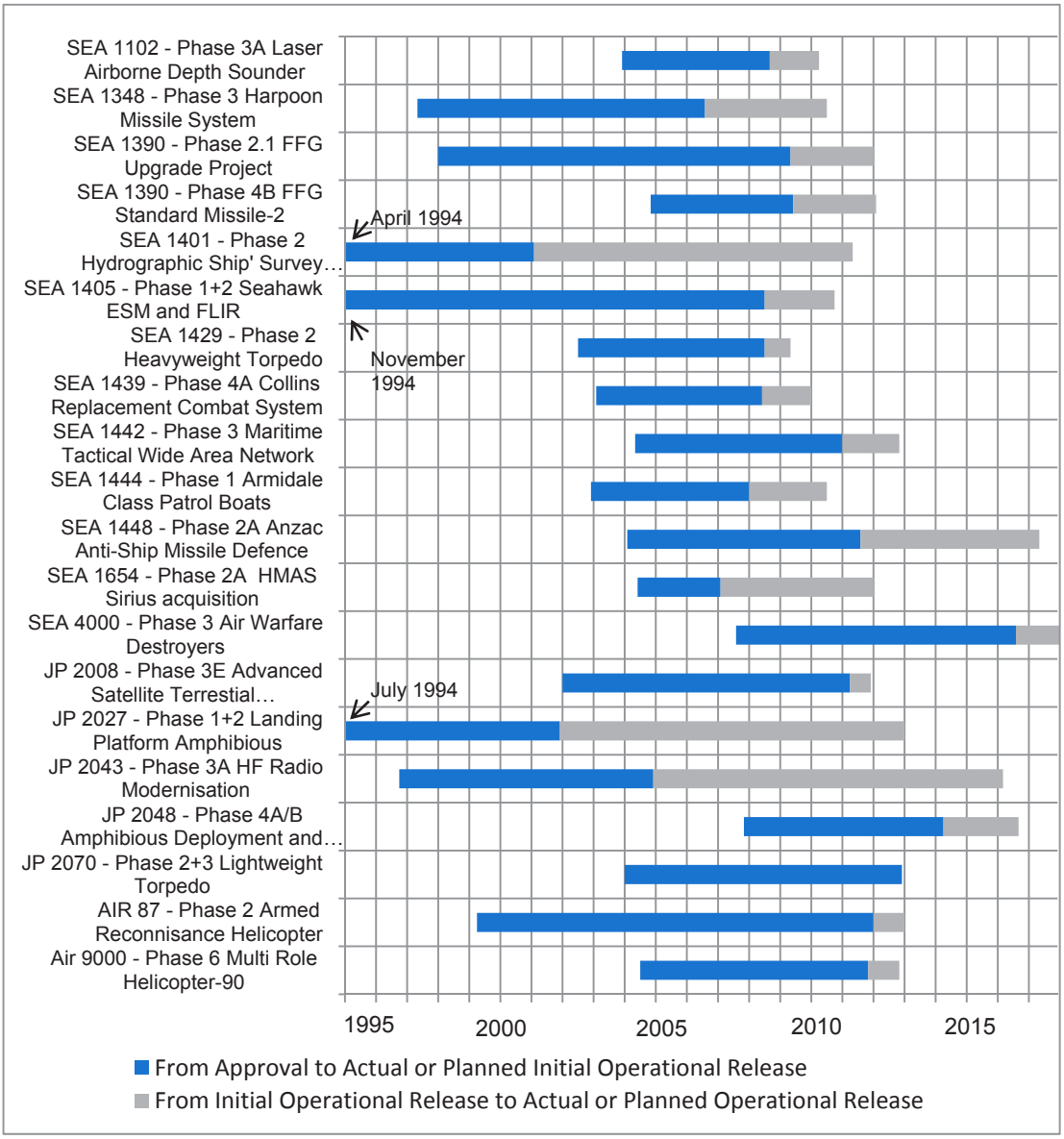
65 Defence advice to the ANAO 3 June 2011 and 7 June 2011.

66 Defence advice to the ANAO 3 June 2011 and 7 June 2011.

67 These projects include the AIR 9000 Multi-Role Helicopter Project, which contributes to Navy capability and, at the time of the audit, had commenced First of Class Flight Trials. Paragraph 2.35 and Figure 2.1 provide an explanation of Navy's Operational Release process.

Figure 1.1

Timelines of the Navy capability projects considered in the audit.



Source: ANAO analysis of Department of Defence records.

1.12 At the time of the audit, all the Navy vessels progressing through their naval operational test and evaluation phase were employed, with some operational limitations, within Navy's Fleet Activity Program. The audit scope includes two Army helicopter projects (AIR 87 Armed Reconnaissance Helicopter and AIR 9000 Multi-Role Helicopter), which are chiefly designed to

provide capability to Army, but as their specifications include operations from Navy platforms, they are included in the audit.[68]

1.13 The remaining project, JP 2027 Landing Platform Amphibious (LPA), completed its acquisition phase in 2003, following a provisional acceptance into service under processes that existed prior to Initial Operational Release and Operational Release. During the later stage of the audit, neither of the LPAs were available for service. Accordingly, the relevant DMO System Program Office was managing a seaworthiness remediation program aimed at ensuring the LPA HMAS *Kanimbla* can return to service in 2012, and it was also managing a decommissioning program for the HMAS *Manoora*.[69]

Audit approach

1.14 The audit involved the collection and analysis of key project management records covering Navy capability definition, test and evaluation and capability certification. Audit fieldwork extended to interviews with key DMO and Navy personnel responsible for managing the projects, at the project and program levels. The fieldwork was conducted from January 2010 to March 2011, at the Canberra central offices of CDG, DMO, and Navy, and at the RAN Test, Evaluation and Acceptance Authority (RANTEAA), Garden Island, Sydney; and at each project's System Program Office. Audit confirmation papers were provided to Defence and DMO in May and December 2010, with the aims of obtaining confirmation of the details of processes described in the audit report and of gaining clarity and perspective on issues emerging during the course of the audit.

1.15 The audit team held meetings with United States of America (US), United Kingdom (UK) and Canadian Defence authorities involved in Navy capability acquisition, test and evaluation and capability management. This

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[68] Amphibious Operations: The Armed Reconnaissance Helicopter shall enable the conduct of Amphibious Operations, primarily from RAN Landing Platform Amphibious class ships in their present configuration. Armed Reconnaissance Helicopter Specification, p. 13.

Maritime Operations: The design and construction of the Multi-Role Helicopter shall enable Maritime operations from an LPA, and its replacement, for a three month period without any Permanent Degradation or Permanent Performance Degradation. MRH 90 Function and Performance Specification, p. A-10.

[69] On 6 April the Minister for Defence and the Minister of Defence Materiel. confirmed that Australia had been successful in its bid to acquire a Bay Class ship, *Largs Bay* for £65 million (approximately $100 million). *Largs Bay* is a Landing Ship Dock (LSD) which was commissioned into service in 2006. It became surplus to UK requirements as a result of the UK Government's 2010 Defence Strategic Review. Minister for Defence, MIN80/11, *Largs Bay acquisition*, 6 April 2011, p. 1.

enabled international comparisons of initiatives used to address particularly challenging management issues revealed by the audit.

1.16 The following high-level audit criteria were adopted for their suitability for application to the 20 projects considered in the course of this audit:

- CDG has fully defined each project, and complied with the Navy Regulatory System, by developing approved:
    a. Operational Concepts;
    b. Function and Performance Specifications; and
    c. Test Concepts.
- DMO has produced approved Certification Plans and System Safety Program Plans, and has adequately verified and validated the achievement of each project's refined Mission System and Support System specifications that are developed in conjunction with the contractor and which are traceable to the Function and Performance Specifications. The verification and validation has occurred through approved:
    a. Acceptance Test Reports;
    b. Verification Cross Reference Matrix results and statistics
    c. Functional and Physical Configuration Audits; and
    d. Navy Regulatory System compliance.
- The Navy's regulators have reviewed Safety Case Reports and Reports of Equipment and Performance State (known as a TI 338) developed by the DMO, and have reported on shortfalls in regulation compliance;
- RANTEAA has evaluated the major systems' performance against the Operational Concept Document's Critical Operational Issues approved at Second Pass. RANTEAA may also report against current threats for the purpose of identifying potential capability deficiencies for operational tasking considerations. Any deficiencies identified may be the subject for future capability development; and
- Navy is responding effectively to the Government's acceptance of the 2008 Defence Procurement and Sustainment Review recommendations setting out the role of Capability Managers.

1.17 The audit relied on Defence and DMO management instructions, handbooks and manuals to provide certainty as to the processes required of CDG, DMO and Navy. The ANAO endeavoured to focus on enduring key

systems engineering management concepts that applied to all projects in the audit sample, regardless of the project's duration.

Report structure

1.18 The remainder of this report is structured into six chapters:

- Chapter 2 outlines the recent key changes to the Defence organisation that relate to the way Navy's capability is defined and acquired;
- Chapter 3 examines the requirements definition phase of Navy's capability, acquisition strategies and plans, and capability development policy and processes;
- Chapter 4 examines the acquisition phase of Navy's capability with emphasis placed on the verification that systems accepted from contractors comply with contracted requirements, and that DMO has complied with Navy's technical and safety regulations;
- Chapter 5 examines the processes involved in certifying the safety and fitness for service of systems offered by DMO to Navy;
- Chapter 6 examines the Operational Release phase of Navy capability with particular focus on operational test and evaluation, Navy's Materiel Condition Assessments and Combat System Qualification Trials; and
- Chapter 7 examines Navy's role of coordinating the delivery of all fundamental inputs to Navy capability.[70]

1.19 The audit was conducted in accordance with the ANAO audit standards, at a cost to the ANAO of $497 300.

[70] Appendix 1 provides the glossary of terms used throughout this report

2. Organisational arrangements

This chapter outlines the key organisational changes over the last 20 years, which have shaped the current organisational structures and management processes used to define and develop ADF capability.

Background

2.1 During the 1990s, ADF Major Capability Submissions to government were developed by Headquarters ADF (HQADF). Typically these submissions defined, in terms of detailed operational requirements, the new or upgraded equipment (materiel) the ADF needed in order to fill a capability need. When these submissions were approved by government, a sponsor within the Headquarters became responsible for monitoring the acquisition of the materiel to ensure fulfilment of the respective Major Capability Submission.[71]

2.2 A two star Military Officer, known as the Assistant Chief of Staff–Materiel (of the Navy, Army or Air Force) within the Defence Acquisition Organisation (DAO) was responsible to their Service Chief and to the Deputy Secretary Acquisition (the head of DAO), for acquiring the associated capital equipment, for establishing the equipment's initial Integrated Logistics Support, and for coordinating the introduction of the capital equipment into operational service with the ADF.[72]

2.3 In July 1997, logistics management organisations in each Service were combined to form Support Command Australia, which then provided logistics policy and logistics support for all ADF equipment placed into operational service.[73]

2.4 The Service Chiefs, with the support of their two star Military Officers in DAO and in Support Command Australia, were responsible for accepting

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[71] Department of Defence, Defence Instructions (General) ADMIN 05-1, *The Force Development Process,* January 1992, pp. 2-4, Annex A. This instruction was cancelled in 2002 and replaced with the Department of Defence, *Capability Systems Life Cycle Manual 2002,* May 2002.

[72] Department of Defence, *The Capital Equipment Procurement Manual (CEPMAN) 1*, April 1992, Part 1 Chapter 2, paras 211-213, Part 4 Chapter 20, paras 201-237.

[73] Support Command Australia (SCA) was headed by a Military Officer responsible to the Chief of the Defence Force and responsive to each Service Chief. Department of Defence, *Defence Annual Report 1997-1998*, pp. 221-224.

into operational service capital equipment from DAO, and for managing the resources necessary to maintain the agreed level of operational capability.[74]

2.5 From the late 1990s, Defence sought to improve the capability development process by more extensively defining the new or upgraded capability the ADF required, and improving the integration of all inputs to capability development. Integrated Project Teams were formed to manage the requirements definition and materiel acquisition phase of each capital acquisition project.[75] These teams, under the direction of Project Management Boards,[76] were to identify all required elements to bring new capability into service. This included identifying workforce requirements, training requirements, facilities requirements, the establishing the base-line whole-of-life-costs, and reviewing or developing doctrine.

2.6 Although the Integrated Project Teams were not required to deliver all the elements of capability, they were to coordinate their delivery. The organisations represented by the Project Management Board members were responsible for ensuring the delivery of their respective elements of capability, and the board Chair was accountable for the coordination of the delivery of all elements of capability to meet the required In-Service Date.[77] The overall accountability for the major capital equipment investment processes lay with:

- the sponsor within HQADF for ensuring the overall capability was properly defined;
- the provider (DAO) with its Chief of Staff–Materiel of the Navy, Army, Air Force or Electronics, for ensuring nominated inputs for a capability were acquired and supported while in service;

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74 Department of Defence, Defence Instructions (General) ADMIN 05-1, *The Force Development Process,* January 1992, Annex C. This instruction was cancelled in 2002 and replaced with the Department of Defence, *Capability Systems Life Cycle Manual 2002,* May 2002.

75 ANAO Audit Report No.13, 1999-2000, *Management of Major Equipment Acquisition Projects,* October 1999, pp. 22, 130-136. Department of Defence, *Capability Systems Life Cycle Management Manual 2002,* pp. 3-13 to 3-17.

76 The members of the Project Management Boards were representatives of the customer (user), the sponsor (project executive) and provider (supplier) organisations. See ANAO Audit Report No.13 1990-2000, *Management of Major Equipment Acquisition Projects, Department of Defence*, October 1999, pp. 118-132.

77 Draft Defence Instructions (General) ADMIN 05-1 (Complete Revision), *Defence Capability Management Cycle 2000*, Version 2.3, December 2000, paras 104, 108. Defence Instructions (General), OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. 9.

- Support Command Australia for logistics policy and support of equipment accepted into service; and
- the customer (the respective Service Chief) for ensuring all remaining inputs to capability were acquired and supported, and for formally accepting the capability into service and managing it while in service.

2.7 The sponsor and providers were to focus continuously and intensively on the needs of the Service Chief who was ultimately held accountable by the Secretary and Chief of the Defence Force (CDF) for the utility of the capabilities maintained by Defence.[78]

2.8 The following sections outline Defence's most recent reforms and reviews that relate to ADF capability acquisition and sustainment. Key features of Navy capability development are then discussed within the context of these developments.

The 1997 Defence Reform Program

2.9 Organisational structure changes arising from the 1997 Defence Efficiency Review and the Defence Reform Program effectively removed an important accountability element of the matrix organisational structure that once provided the Service Chiefs with a degree of authority over defence equipment acquisition and the establishment of its logistics support.[79] Until these changes were made, the Assistant Chiefs of Staff–Materiel for each of the three Services had been responsible to both DAO's Deputy Secretary Acquisition and Logistics (for ensuring equipment procured satisfied operational requirements, and was within approved resources and schedule) and to their Service Chief of Staff (for ensuring the equipment supplied was satisfactory and that adequate arrangements had been made for all aspects of the introduction of the equipment into service).[80] Following the Defence Efficiency Review and the Defence Reform Program the Assistant Chiefs of

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78 Department of Defence, *Capability Systems Life Cycle Management Manual 2002*, Chapter 5.

79 Department of Defence, *Capital Equipment Procurement Manual* (CEPMAN 1), April 1992, Part 1 Chapter 2.

80 Department of Defence, *Capital Equipment Procurement Manual* (CEPMAN 1), April 1992, Part 1 Chapter 2, paragraph 212. This matrix organisation, or dual line of responsibility structure, was not supported by the Defence Reform Program. Department of Defence, *Future Directions for the Management of Australia's Defence, Report of the Defence Efficiency Review,* 1997, pp. 27, E5. Department of Defence, *Future Directions for the Management of Australia's Defence, Addendum to the Report of the Defence Efficiency Review, Secretarial Papers*, 1997, pp. 21, 149-150, 165.

Staff – Materiel were made accountable solely to the Deputy Secretary Acquisition DAO, rather than being also accountable to their respective Service Chief of Staff.

2.10 Another Defence Reform Program initiative was the formation of DMO on 1 July 2000, which was responsible through 'customer-supplier agreements' for:

- the acquisition of new and upgraded materiel, formerly the responsibility of DAO; and
- the provision of logistics policy and logistics support of all equipment placed into operational service, formerly the responsibility of Support Command Australia (SCA).[81]

2.11 These structural changes were to be accompanied by management process and systems changes. In July 1998, the Defence Executive announced a fundamental review of Defence's capability management principles and practices across the whole capability continuum to ensure that Defence managed whole-of-life capability through 'seamless management'.[82] The Defence Executive decided that this would require it to:

> establish the appropriate underlying processes and systems needed for this, and we will assign capability output managers who are responsible for delivering effective capability. The result will be that our systems meld together all of the elements that go into building an effective defence force - people, equipment, training, acquisition, doctrine, logistic, disposition, facilities and so on.[83]

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[81] Department of Defence, *Defence Annual Report 2000-01*, pp. 7, 280.

[82] ANAO Audit Report No.13, 1999-2000, *Management of Major Equipment Acquisition Projects,* Department of Defence, October 1999, pp. 18, 19, 44, 58-65. When the Defence Executive was formed in 1998 it was to be Defence's highest decision making body and was comprised of all ten of the organisation's senior managers along with COMSPTAS [Commander Support Australia]. Two external members were to be invited to join the Executive to provide a wider perspective, The Defence Executive established a Capability Management Improvement Team to explore options, and to make recommendations for improving Defence's capability management. See Defence Executive: *A Message to all Defence Personnel from the Executive* (internal memorandum), Canberra 6 July 1998. Department of Defence, DEFGRAM NO 187/98, *Formation of Capability Management Improvement Team*, 6 August 1998, Annex A: Capability Management Improvement Terms of Reference.

[83] Defence Executive: *A Message to all Defence Personnel from the Executive* (internal memorandum), Canberra, 6 July 1998.

The Defence Procurement Review 2003

2.12 The Defence Procurement Review 2003 (also known as the Kinnaird review) strengthened Defence's two-pass project approval process for acquisitions, and lead to the formation of the Capability Development Group (CDG) in February 2004,[84] and to the DMO becoming a financially autonomous project management service delivery organisation within the Defence portfolio as of 1 July 2005.[85] Under these arrangements, the Service Chiefs relied on CDG, through the Defence-DMO Memorandum of Arrangements and the CDG-DMO Materiel Acquisition Agreement process,[86] to oversee, coordinate and report on all elements (including customer (Defence)) furnished supplies.

2.13 Materiel Acquisition Agreements between DMO and CDG, set out in broadly defined, major system-specific terms the materiel and acquisition services DMO as supplier is to deliver to Defence as the customer, with the Chief of CDG signing the agreement on behalf of Defence.[87] The Chief Executive Officer of DMO was accountable to project sponsors in CDG and

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[84] In 2005 the DMO became a Prescribed Agency under the provisions of the Financial Management and Accountability Act 1997. As a Prescribed Agency, the DMO remains part of the Department of Defence for the purposes of general administration, and the CEO of the DMO remains accountable to the Secretary of the Department of Defence under the Public Service Act 1999 and to the Chief of the Defence Force under the Defence Act 1903.

To reflect the agency status, a framework of agency agreements was established. At the highest level, these agency agreements involve a directive from the Minister for Defence to the CEO of the DMO. There is also a Memorandum of Arrangements between Defence and the DMO that outlines the responsibilities and arrangements existing between the two agencies. Below these high-level documents are detailed agency agreements to clarify what Defence expects of the DMO, in terms of outcomes, and what price Defence agrees to pay the DMO for those outcomes. They are the basis on which the DMO receives most of its budget. There are three main categories of agreement: Materiel Acquisition Agreements (MAAs), Materiel Sustainment Agreements (MSAs) and Shared Service Agreements (SSAs). The first category covers all major and minor acquisition projects managed by DMO; the second covers all fleets sustained by DMO; and the last outlines the allocation of responsibilities and services for which there is no transfer of funds. The suite of agreements was set up from the start of 2005-06. Available from <http://www.defence.gov.au/ defencemagazine/editions/200607/groups/dmo.htm, [accessed 28 March 2010]. Department of Defence, *Defence Procurement Review 2003*, August 2003, pp. iv, v, 11.

[85] Department of Defence, *Defence Procurement Review 2003*, August 2003, pp. iv, 33-37. Department of Defence, Annual Report 2005-2006 Vol. 2, Defence Materiel Organisation.

[86] Department of Defence, *Defence Capability Development Manual 2006*, February 2006, pp. 71, 72. Capability Development Group, *Defence Capability Development Handbook,* various initial editions since 2009.

[87] This is consistent with the 'customer supplier agreements' policy announced as part of the Defence Reform Program, which was finalised in June 2000. Department of Defence, *Defence Annual Report 2000-01*, pp. 3-5. Capability Development Group, *Defence Capability Development Manual 2005*, p. 40 Department of Defence, Capability Development Group, *Defence Capability Development Manual 2005*, p. 40, Department of Defence, *Defence Capability Development Manual 2006*, p. 111. Capability Development Group, *Defence Capability Development Handbook,* various initial editions since 2009.

government for the delivery of the products and services specified in the CDG-DMO Materiel Acquisition Agreements, and could delegate authority for signing Materiel Acquisition Agreements to senior executives within the DMO, usually Division Heads.[88]

2.14 CDG, in conjunction with the Capability Managers, was responsible for monitoring the performance of DMO via monthly progress reports against these agreements. CDG, in conjunction with Capability Managers, was also responsible for managing agreed changes to ADF capability requirements, and for closing the Business Case against the original project approval once the project had achieved its Final Operating Capability. The CDG also had a supporting role in development of capability elements that were not under the management of the Chief Executive Officer of DMO.[89]

The 2008 Defence Procurement and Sustainment Review

2.15 Following the Government's acceptance of the recommendations of the 2008 Defence Procurement and Sustainment Review (Mortimer Review), the Service Chiefs became responsible for not only monitoring the development of ADF capability, but also being the single point of accountability for oversighting, coordinating, and reporting all elements necessary for the development of that capability, and for reporting regularly to government on the status of the capability development initiatives.[90]

2.16 This requires the Service Chiefs to maintain managerial oversight of DMO's Mission and Support System acquisition processes, albeit without extending authority over DMO officers, or re-instating the matrix organisational structure in place prior to the Defence Reform Program. The Service Chiefs, in their role of Capability Managers, rely on Materiel Acquisition Agreements to fully define the acquisition services DMO is to provide in terms of delivering Mission and Support Systems to cost, schedule and quality.

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88 Defence Materiel Organisation, *DMO Project Management Manual (PMM) 2009 (Interim)*, August 2009, p. 28.

89 Department of Defence, Capability Development Group, *Defence Capability Development Manual 2006*, pp. vii, 7, 70-73.

90 Defence Materiel Organisation, *GOING TO THE NEXT LEVEL the report of the Defence Procurement and Sustainment Review*, September 2008, pp. 33-34. Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review,* May 2009, pp. 12, 26-27.

2.17 Navy has responded to the 2008 Defence Procurement and Sustainment Review by establishing Capability Implementation Teams to identify and coordinate the delivery of all required elements needed to bring into service capabilities for which they are responsible. As at February 2011, Navy had 17 personnel employed in five Navy Capability Implementation Teams. In addition, six Army personnel assisted Navy with the Army aspects of the JP 2048 Amphibious Deployment and Sustainment (Landing Helicopter Dock) project.

2.18 This program management role now held by the Service Chiefs, reflects the reality that ADF capability development and support typically consists of a large-scale, complicated portfolio of projects requiring the coordinated efforts of at least three of Defence's largest groups–CDG, DMO and one or more of the Services. Success depends upon Service Chiefs, in their Capability Manager role, integrating the eight Fundamental Inputs to Capability (FIC), many of which involve significant project management responsibilities in their own right.[91] The eight Fundamental Inputs to Capability are set out in Table 2.1.

2.19 Until 2010, the Service Chiefs were not party to the Mission System-specific Materiel Acquisition Agreements between DMO and CDG. CDG, as the capability project sponsor, had the leading role in coordinating the overall integration of the eight fundamental inputs to ADF capability, the majority of which are supplied or supported by the DMO. The CEO DMO was accountable to the Defence project sponsor in CDG and to government for the delivery of the products and services specified in the Materiel Acquisition Agreements.[92] Even though the Service Chiefs were not signatories to these agreements, they could request CDG to amend them.

2.20 At the highest level, the Acquisition Business Cases, project plans and inter-group agreements for the 20 projects examined during this audit did not set out clearly the Government-authorised parameters for each project in terms of scope, cost and schedule at the time of each project's approval.

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[91] Defence Instructions (Navy) ADMIN 37-11, *Capability Management in the Royal Australian Navy*, March 2004.

[92] Department of Defence, Defence Materiel Organisation, *Defence Materiel Manual (PROJ) DMM(PROJ)11-0-001 DMO Project Management Manual (PMM) 2009 (Interim)*, August 2009, p. 28.

Consequently, compliance with government requirements, which is a fundamental responsibility of Defence, was not able to be readily confirmed.[93]

2.21 Defence has recognised the need to ensure government-authorised project parameters are included in Acquisition Business Cases, project management documents and plans and inter-group agreements.[94] In January 2010, the CDF and the Secretary endorsed a revised Materiel Acquisition Agreement arrangement in order to commence addressing this issue and other key areas of the 2008 Defence Procurement and Sustainment Review recommendations. This arrangement became effective for all new Materiel Acquisition Agreements from 1 February 2010, with extant agreements migrating progressively to the new format and content as their required reviews take place (see paragraphs 3.42 to 3.50). As at March 2011, Project Directives by the CDF and the Secretary were being drafted for projects approved in 2011. These directives are to include the government-authorised project parameters, which are to be included in Capability Realisation Plans, subordinate plans, and inter-group agreements including Materiel Acquisition Agreements.

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[93] At the time of the audit, DMO was not able to provide the relevant government approval for the 20 projects in the audit sample. In May 2011, Defence advised the ANAO that:

> In early 2011, the DMO started a Project Baseline Review (otherwise known as a project 'due diligence') to ensure alignment between current project objectives and each corresponding Government project approval. Noting the extended duration of many major capital acquisition projects, the DMO is conducting this review to ensure the current key project elements of scope, budget and schedule match each related Government project approval (tracing from the original approval through to any subsequent Government-authorised changes). This work requires reference to Cabinet and other Government documents from across each project's life; as the majority of these documents are not held in the DMO (or Defence), external liaison is required to establish an authoritative record. Once this research is completed, the DMO will then assess the degree of alignment between the current project objectives and Government approval. Any significant deviation is then expected to be addressed with Government. The DMO plans to finalise this work by December 2011. Defence advice to the ANAO 29 May 2011.

[94] Project parameters include:

- Scope, as outlined in the project's Acquisition Business Case;
- approved budget and schedule;
- Defence and DMO workforce allocations; and
- risk profile relating to capability, technical, cost, schedule and workforce, as advised to government at the time of Second Pass project approval.

Department of Defence, *Joint Directive by Chief of the Defence Force and Secretary, Department of Defence for Project XXX Phase NN, Post Second Pass Implementation Stage,* Draft declassified template, March 2011.

Program Management and Budgeting

2.22 Defence is implementing many of the recommendations of the 2008 Defence Procurement and Sustainment Review and the 2008 Audit of the Defence Budget,[95] through the Defence Strategic Reform Program that commenced in 2009. One of the intended outcomes of the Strategic Reform Program is for the Services and the other Defence groups to have more authority to manage their budgets and their non-financial inputs. This is to be achieved through the introduction of an outputs-driven budget management model, designed to improve accountability and resource management. The five objectives of this model are:

- to make people accountable for outcomes and cost management;
- to create transparency on cost and performance;
- to capture the scope and scale advantages of being an integrated Defence force;
- to develop a culture of continuous improvement; and
- to manage the uneven year on year profile of major military equipment purchases.[96]

2.23 Accountability for outcomes and cost management is not straightforward in Defence, as the Australian Defence Organisation's[97] three outcomes are to be achieved by 16 departmental programs through 16 outputs, which are managed by 19 Deputy Secretary-level Senior Executives.[98] The departmental programs are coordinated by eight Senior Management Committees,[99] using a complex series of agreements.

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95 McKinsey & Company, *2008 Audit of the Defence Budget,* Department of Defence, April 2009. Also known as the Pappas Report.

96 Department of Defence, *The Strategic Reform Program 2009, Delivering Force 2030,* 2010, p. 10.

97 The Australian Defence Organisation, consists of the Department, the three Services and DMO.

98 Department of Defence, Defence Annual Report, 2009-10, Vol. 1, Department of Defence, pp. 44, 50, 136, 148. The number of Defence groups (or programs) has increased from the 12 groups in place in July 1999 to 19, and the number of outputs has decreased from 22 in July 1999, to 16. See ANAO Audit Report No.13 1999-2000, *Management of Major Equipment Acquisition Projects*, October 1999, pp. 24 (Recommendation No.1), 39-42, 70-77.

99 Department of Defence, *Defence Annual Report 2009-10*, Vol. 1, Department of Defence, pp. 156, 157.

2.24 The Materiel Acquisition Agreements between CDG, DMO and the Navy, define the customer-supplier arrangements with respect to the acquisition of Navy materiel. However, the Chief of Navy has no direct authority over key Defence Groups (such as DMO) that develop capability inputs needed to achieve the capability outcomes agreed to by government for which he has overall responsibility.[100] This is a significant issue in the matrix management model employed by Defence for over a decade.[101] At the time of the audit, CDF and the Secretary were considering proposed changes to Defence's accountability and authority structure.[102]

Key features of Navy capability development

2.25 Capability in the Defence context, comprises the synergy realised by combining the eight 'Fundamental Inputs to Capability' (FIC) categorised and broadly defined in Table 2.1.

Table 2.1

The Fundamental Inputs to Capability (FIC)

Input	Key Provider
1. Personnel. All people within Defence, both military (permanent and Reserves) and civilian. The input incorporates recruiting, individual training and all conditions of service and employment, including entitlements, salaries and wages, superannuation and allowances;	Capability Manager
2. Organisation. Flexible functional groupings with an appropriate balance of competency, structure and command and control to accomplish their tasks. This input also includes critical organisations that directly support the ADF effort;	Capability Manager
3. Collective training A defined training regime undertaken by organisations that is validated against the preparedness requirements for operations, derived from government guidance. The regime is to include frequency and depth of competency in skills, with a particular emphasis on long-term readiness critical warfighting skills;	Capability Manager and Chief Joint Operations Command

[100] The Chief of Navy is responsible for exercising oversight and coordination of all elements necessary to introduce the full level of operational capability into service within scope, cost, workforce, schedule and risk parameters agreed to by government. Department of Defence, *Joint Directive by Chief of the Defence Force and Secretary, Department of Defence for Project XXX Phase NN, Post Second Pass Implementation Stage,* Draft declassified template, March 2011.

[101] The matrix management model reflects organisational arrangements where the traditional hierarchical functional group structures, that have vertical authority and accountability for function (process) execution and skills development; are supplemented by project management structures that have horizontal authority and accountability for product development coordination and delivery, across multiple functional groups.

[102] Department of Defence, *The Defence Accountability Framework, Review of accountability and governance in the Department of Defence,* January 2011.

Input	Key Provider
4. Major Systems. Systems that have a unit cost of A$1 million or more or have significant Defence policy or joint service implications designed to enhance Defence's ability to engage military power. Input includes, but is not limited to, ships, tanks, missile systems, armoured personnel carriers, major surveillance or electronic systems and aircraft;	DMO
5. Supplies. Supplies needed for Defence to operate, including stock holdings, provisioning lead times, serviceability and configuration status;	DMO
6. Facilities and training areas. Buildings, structures, property, plant, equipment, training areas, civil engineering works, through-life maintenance and utilities necessary to support capabilities, both at the home base and at a deployed location. Input may involve direct ownership or leasing;	DMO for equipment and systems, Defence Support Group for facilities
7. Support. Infrastructure and services from the wider national support base in Australia or offshore which are integral to the maintenance of Defence effort. The input is encompassing and could originate from civil/private industry/contractors, other government agencies and international support base agencies; and	Suppliers to DMO for Mission and Support Systems
8. Command and Management. Written guidance such as regulations, instructions, publications, directions, doctrine, tactical level procedures and preparedness documents required for Defence to support decision making, administration and operations. Input also includes funding not readily attributable to any other FIC element (e.g. discretionary funding).	Capability Manager, for regulations and service–specific command and management. DMO for system acquisition and logistics management

Source: ANAO, adapted from Defence Materiel Organisation, *DMO Acquisition and Sustainment Manual*, 2007, pp. 74-75.

2.26 This audit primarily focuses on the Major Systems and Supplies (shaded in blue) that contribute to Navy capability development, and analyses accordingly the working relationship between Navy and DMO.

2.27 The Service Chiefs are accountable to the CDF and the Secretary for ensuring that ADF materiel is fit for service, and poses no undue hazard to personnel, public safety, or the environment. The application of technical and operational regulations provide the means by which Service Chiefs, as Capability Managers, establish confidence in the processes by which those requirements are achieved.[103] In practice this requires the DMO, which is responsible for equipping and sustaining ADF materiel,[104] to identify materiel acquisition and sustainment risks and issues early and to resolve them before

[103] Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel,* June 2004, p. 1. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010. Defence Instructions (Navy) ADMIN 37-15, *Assuring the safety, fitness for service and environmental compliance of naval capability*, April 2007, p. 1

[104] Department of Defence, Defence Materiel Organisation, DMO Acquisition and Sustainment Manual, 2007, p. 2.

they escalate or are realised as consequential cost or schedule overruns, or as unacceptable risks to ADF personnel, capability or the natural environment.[105]

2.28 Defence has sought to put in place standardised management policies and processes that develop and integrate the Fundamental Inputs to Capability to obtain an approved capability, and to minimise complications that may arise from differing interpretations of policies and processes.

2.29 This is necessary for the development and sustainment of Navy capability, which often involves organisationally and technologically advanced systems engineering spread well over a decade, with complicated interfaces and work handovers between several Defence organisations. To this end, Defence has adopted a systems engineering approach to complex acquisitions, in line with the practices in other jurisdictions. For instance the United States Department of Defense places systems engineering processes central to its weapon system acquisition management. The Defense Acquisition University considers the Department of Defense acquisition process to be:

> ….critically dependent on effective and rigorous engineering processes - without them, operationally affordable and sustainable weapon systems cannot be built. Overarching all engineering efforts is a technical discipline called systems engineering. Systems engineering is applied at the initial stages of program formulation, and it continues throughout a system's life cycle. It transforms needed operational capabilities into an integrated system design through concurrent consideration of all life cycle needs; integrates the technical efforts related to system and software development, manufacturing, verification, deployment, operations and support, disposal and user training for systems and their life cycle supporting products and services; and develops credible and timely technical information to support the program management decision-making process.[106]

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[105] *The identification of acquisition project risks and their mitigation strategies should commence before acquisition contracts are signed. This principle has been factored into Defence's major capital equipment projects First and Second Pass planning and approval processes, which require Defence Science and Technology Organisation (DSTO) Technical Risk Assessments to be presented for each equipment option at First and Second Pass. Department of Defence, Defence Capability Development Handbook (Interim), April 2010, pp. 48, 65, 101,113.*

Prior to the First and Second Pass process being transitioned into operation, which occurred for projects with a year of decision of 2003-04 or 2004-05, DMO conducted some pre-contract risk reduction activities. An example of those activities are the Wedgetail project's Initial Design Activity contracts outlined in ANAO Report 32, 2003-04, 'Wedgetail' Airborne Early Warning and Control Aircraft: Project Management, March 2004, pp. 109, 111.

[106] Defense Acquisition University, *Introduction to Defense Acquisition Management*, September 2009. p. 53

2.30 For example, the acquisition of Navy Mission Systems normally requires DMO to integrate a diverse range of technology, including sonar and radar systems, guided missile and gunnery systems, electronic warfare systems, combat information systems, data communication systems, and complex ship structures and propulsion systems. This is complicated by Defence's long-standing practice of selecting these systems from various countries and manufacturers. This includes some systems that have not completed development test and evaluation by their manufacturers at the time they were selected for integration into new or upgraded Navy platforms.

2.31 The Chief of Navy, in the capacity of Navy Capability Manager, is ultimately responsible and accountable for releasing into service Navy capability that achieves acceptable standards of safety, performance and reliability. Navy implements an assurance system based on a regulatory system, designed to specify approved design, construction and management standards, to audit against those standards and to assess the implications of any deviations from those standards.[107] At a minimum, the assurance system is intended to demonstrate compliance with appropriate ship construction and maintenance conventions, where it is practical and does not compromise military operational demands.[108] Navy relies on CDG and DMO to define and acquire materiel that satisfies those standards, in accordance with government approval.

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[107] The standards include AS/NZS ISO 9000 - Quality Management Systems, for ensuring consistent and effective regulation; AS/NZS 4360 - Risk Management, for establishing appropriate regulation to identify, assess, and if not eliminated, then control the risks and consequences of the hazards that are associated with Naval capability. AS/NZS 3806 - Compliance Programs, to provide rigor and standardised processes by which due diligence and residual risk management are achieved. Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* Draft January 2009. At the time of the audit, ABR 5454 had been cancelled. However in March 2011, Navy's Director Navy Certification confirmed that the ANAO's references to ABR 5454 were correct as it was relevant guidance at that time, and that where the draft edition was quoted, those management concepts remain valid.

[108] International non-military shipping is governed by the codes and conventions of the International Maritime Organisation (IMO). These codes and conventions include:

a. Safety of Life at Sea (SOLAS) 1974;

b. International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW);

c. International Code for the Security of Ships and of Port Facilities (ISPS);

d. Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS); and

e. Convention for the Prevention of Pollution from Ships (MARPOL) 1973, as modified by the Protocol of 1978.

Relevant national bodies administer and enforce these International Maritime Organisation codes and conventions. Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* Draft January 2009, Chapter 12.

2.32 Until recently, the Chief of Navy relied on Materiel Acquisition Agreements between CDG and the DMO, to define the products and services DMO was to deliver to Navy covering each Navy materiel acquisition project. During 2010, Defence commenced including the respective Capability Manager as a co-signatory to new and updated Materiel Acquisition Agreements. (Paragraphs 2.37 and 2.39 outline the status of the new Navy materiel agreements.) Following agreement by government on the capability to be delivered being, the Chief of Navy has no authority to change the detail of Navy Mission System function and performance specifications, or their designs. In June 2011, Defence advised the ANAO that:

> If the parameters agreed by Government at project approval provide for changes in scope and other flexibility, then Chief of Navy may be able to direct such changes, within the limits of the project approval. In all other circumstances, none of these three agents (Navy, CDG or the DMO) has the authority, unilateral or severally, to change Navy Mission System function and performance specifications, or their designs, following government agreement on the capability to be delivered.[109]

2.33 At the time of the audit, Defence was seeking to make the organisational relationships and the various accountabilities for delivering ADF capability more explicit through issuance of a Project Directive immediately following government approval at Second Pass.[110] Each Project Directive will provide the top-level direction from the CDF to the Capability Manager to introduce the full operational level capability into service by the date agreed by government. The Project Directives are to articulate the roles of each Defence Group, the Service and the DMO in delivering their respective elements of the project. This approach is seen to ensure and assure total alignment between each government decision and the Project Directive.[111]

2.34 Defence was also seeking to ensure the capability Defence was to deliver, aligned with that approved by government. In May 2011 Defence advised the ANAO that DMO had commenced a Project Baseline Review (otherwise known as a project due diligence review) to ensure alignment

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[109] Defence advice to the ANAO, *DMO Additional Information and Proposed Amendments – Revised S.19 Summary*, 8 June 2011.

[110] Department of Defence, *Defence Capability Development Handbook (Interim)*, April 2010, paragraph 4.58.

[111] Defence advice to the ANAO, *DMO Additional Information and Proposed Amendments – Revised S.19 Summary*, 8 June 2011.

between current project objectives and each corresponding project approval by government. Noting the extended duration of many major capital acquisition projects, the DMO was conducting this review to ensure the current key project elements of scope, budget and schedule match each related government project approval (tracing from the original approval through to any subsequent government-authorised changes). This work requires reference to Cabinet and other government documents over the duration of each project's life. As the majority of these documents are not held in the DMO (or Defence), external liaison is required to establish an authoritative record. Once this research is completed, the DMO advised it will then assess the degree of alignment between the current project objectives and government approval. Any significant deviation is then expected to be addressed with government. The DMO plans to finalise this work by December 2011.[112]

2.35 Figure 2.1 outlines the division of responsibility between Capability Managers and the DMO, and the ADF capability development milestones involving. In the case of Navy capability:

- Initial Operational Release (IOR) consideration by Navy, which commences after DMO has completed the System Acceptance test and evaluation phase and has satisfied the Initial Materiel Release criteria, as set out in Materiel Acquisition Agreement. IOR is the milestone at which the Capability Manager is satisfied that the initial operational and materiel state of the Capability System—including any deficiencies in the Fundamental Inputs to Capability—is such that it is sufficiently safe, fit for service and environmentally compliant to proceed into a period of operational test and evaluation (OT&E) leading to an endorsed capability state;

  Following IOR, Navy conducts operational test and evaluation with the view to determine when the Capability System has reached the level of Initial Operational Capability (IOC). IOC is an *initial* capability state endorsed at project approval at Second Pass, and is reported as having been reached by the Capability Manager;

  Navy's operational test and evaluation continues past IOC to determine when the Capability System has reached Final Operational Capability (FOC). FOC is the final capability state endorsed at project approval at

[112] Defence advice to the ANAO 29 May 2011.

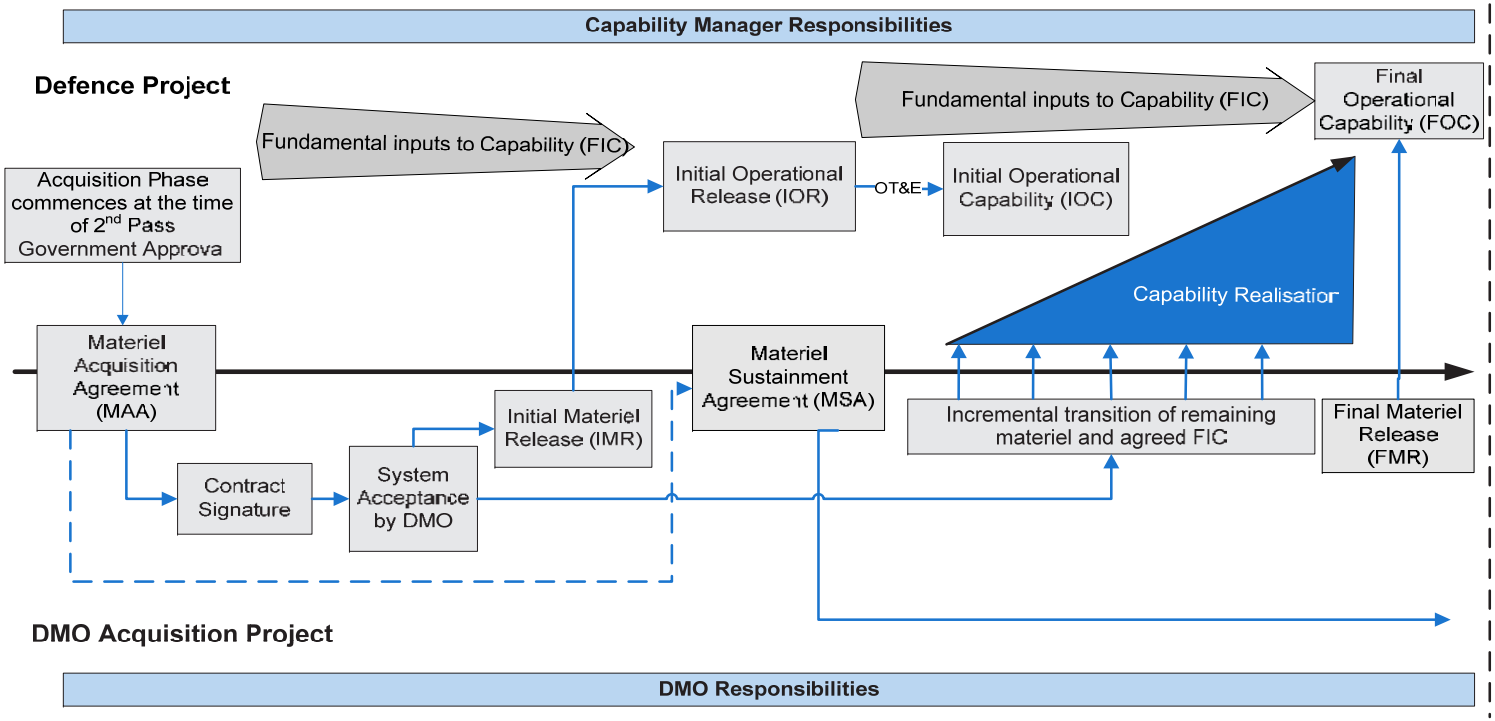
Second Pass, and is to be determined by the Capability Manager. It occurs after the operational test and evaluation phase has completed, at which time it is expected that DMO would have satisfied the Final Materiel Release criteria set out in Materiel Acquisition Agreement; and

- Operational Release (OR), is the milestone at which the Capability Manager is satisfied that a Capability System, or subset, has proven effective and suitable for the intended role and, that in all respects, it is ready for operational service.[113]

[113] Defence Instructions (General), OPS 45-2, *Capability Acceptance into Operational Service*, February 2008.

Figure 2.1

Division of Responsibility between Capability Managers and the DMO

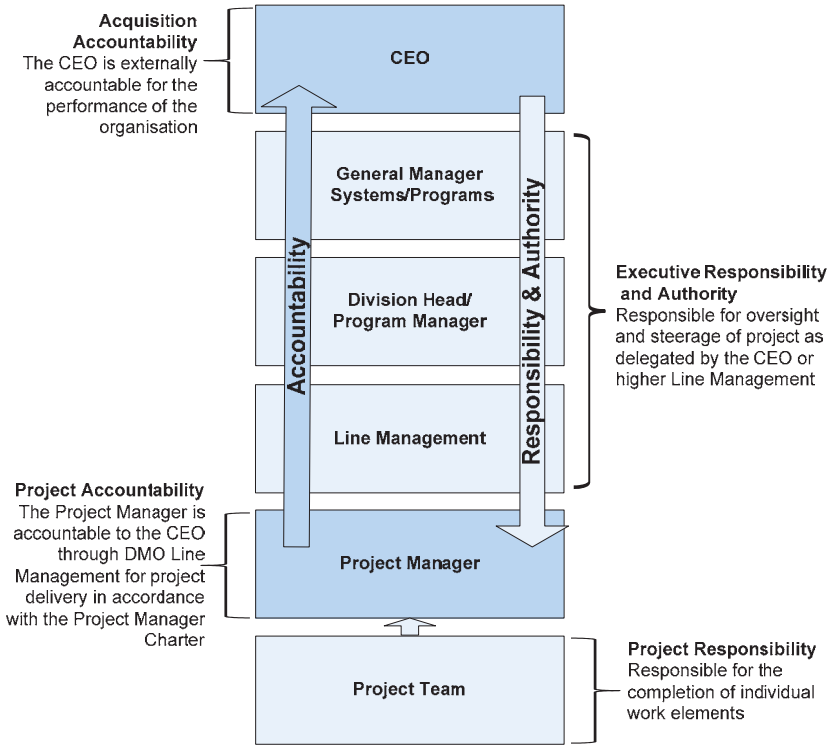


Source: Defence Materiel Organisation, *DMO Project Management Manual 2009*, August 2009, p. 37.

2.36 Figure 2.2 shows the authority, responsibility and accountability structure of a typical DMO project.

Figure 2.2

DMO Project authority, responsibility and accountability



Source: Defence Materiel Organisation, *Project Management Manual (PMM)* 11-0-011, Version 1, August 2009, p. 30.

2.37 The Navy's technical regulations apply to DMO's Authorised Engineering Organisations and to the products and services they deliver to Navy. However Navy's Technical Regulatory System exercises no authority or control over how programs and commands are organised or administered.[114] Rather, the Materiel Acquisition Agreements between CDG, DMO and the Services embody the customer-supplier relationship that specifies the levels of performance to be achieved in the delivery of materiel to the ADF, in terms specified cost, schedule and performance requirements. During this audit the

[114] Defence Instructions (Navy) LOG 47-3, *Regulation of technical integrity of Australian Defence Force maritime materiel*, January 2009, p. 3

Materiel Acquisition Agreements were being redrafted to reflect changes resulting from the 2008 Defence Procurement and Sustainment Review.

2.38 As at February 2011, for the 19 projects included in the audit, which were in their acquisition phase, only JP 2070 Phase 1&2 had Materiel Acquisition Agreements that had been revised to include the Service Capability Manager as part of the agreements.[115] In May 2011 Defence advised the ANAO that:

> Revision of the MAAs [Materiel Acquisition Agreements] to the new template [that includes the Capability Manager as part of the agreements] is due by Dec 11 [December 2011]; the rate of progress in update before then is not materiel.[116]

2.39 In February 2011, Defence advised the ANAO that Materiel Acquisition Agreements for a further 13 of the 19 acquisition projects in the ANAO's sample were being updated or were awaiting signature.[117] A further five projects will not receive updated Materiel Acquisition Agreements because they are either closed or are scheduled to close in 2011.[118]

Capability development policy and processes

2.40 Since the early 1990s, Defence has published capability development policy, guidance manuals and handbooks commencing with the Defence Instructions (General) Admin 05-1, *The Force Development Process*, which provided an overall policy framework for developing ADF capability, and the *Capital Equipment Procurement Manual 1 (CEPMAN 1),* which described in detail the capital equipment procurement processes to be followed by DAO personnel. From 2000, these were followed by the then Vice Chief of the Defence Force's (VCDF's) Capability Systems Development Manual, and a

[115] One project, JP 2027 Phase 1&2, did not have Materiel Acquisition Agreement as the acquisition phase of this project was completed in 2003, and is now the subject of a Materiel Sustainment Agreement (see Figure 2.1).

[116] Department of Defence, DMO, Navy & CDG, *Additional Information and Proposed Amendments*, 24 May 2011, p. 14.

[117] SEA 1348 Ph 3, SEA 1390 Ph 2.1, SEA 1390 Ph 4B, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1442 Ph 3, SEA 1444 Ph 3, SEA 1448 Ph 2A, SEA 4000 Ph 3, JP 2043 Ph 3A, JP 2048 Ph 4A/B, AIR 87 Ph 2 and AIR 9000 Ph 2.

[118] SEA 1102 Ph 3A, SEA 1401 Ph 2-Survey Motor Boats, SEA 1405 Ph 1 and 2, SEA 1654 Ph 2A and JP 2008 Ph 3E.

succession of manuals and handbooks developed by CDG and the DMO.[119] Each of these publications sought improvements in defence capability requirements definition, set out in terms of operational concepts, function and performance specifications, and test and evaluation concepts. These are covered in Chapter 3.

2.41 Since 2002, Defence sought to better align the DMO's major system development processes with the Terms and Conditions and Statement of Work set out in defence system acquisition contracts.[120] Alignment is necessary to achieve efficient and effective integration of all the engineering disciplines involved in systems acquisition contract execution. These issues are covered in Chapter 4.

2.42 In 2007, Defence issued a fundamentally revised set of test and evaluation and acceptance into service Defence Instructions that clarified the test and evaluation and acceptance into service responsibilities of each Defence group involved in defence capability development.[121] The instructions, amongst other things, sought improved collection of evidence to support capital equipment acceptance from contractors by the DMO, and the Operational Release of new or upgraded ADF capability by the Service Chiefs. These issues are covered in Chapters 5 and 6.

2.43 As mentioned earlier, in response to the 2008 Defence Procurement and Sustainment Review, Navy formed five Capability Implementation Teams-the

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[119] Vice Chief of the Defence Force, *Capability Systems Life Cycle Management Guide 2002*, May 2002. Capability Development Group, *Defence Capability Development Manual 2006,* February 2006. Capability Development Group, *Defence Capability Definition Documents Guide*, March 2005. Defence Materiel Organisation, *DMO Acquisition and Sustainment Manual*, 2007. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008. Department of Defence, *Defence Capability Definition Documents Guide*, 2009. Capability Development Group, *Defence Capability Development Handbook,* various initial editions since 2009.

[120] Electronic Industries Association, EIA-632 - *Processes for Engineering a System*, January 1999; and ASDEFCON (Strategic Materiel). In March 2002, Defence published ASDEFCON (Strategic Materiel) to assist drafters in preparing Requests for Tender suitable for acquisition project requirements. These ASDFECON publications provide extensive advice and instructions concerning acquisition contract drafting, and details mandatory entry and exit criteria for system design reviews, test and evaluation processes and contractual acceptance. ASDEFCON publications are sponsored by the DMO.

[121] Department of Defence, Defence Instructions (General) OPS 43-1, *Defence test and evaluation policy*, November 2007. Department of Defence, Defence Instructions (General) ADMIN 06-1, *Policy and procedures for the implementation of Defence Trials*, November 2007. Department of Defence, Defence Instructions (General) OPS 45-2 *Capability Acceptance into Operational Service*, February 2008. Defence advised the ANAO in February 2011, that Defence Instructions (General) OPS 45-2 *Capability Acceptance Into Operational Service* is being updated to incorporate the outcomes of the Defence Procurement and Sustainment Review, and to include Materiel Release milestones.

two most relevant to this audit cover the $7.740 billion[122] SEA 4000 Phase 3 Air Warfare Destroyer Project and the $3.267 billion[123] JP 2048 Phase 4A Amphibious Deployment and Sustainment Project.[124] Navy's response to the 2008 Defence Procurement and Sustainment Review is discussed Chapter 7.

Conclusion

2.44 Defence's organisational arrangements for the acquisition of ADF capability have changed significantly over the last decade or so. In the broadest terms, successive reforms removed the primary responsibility for acquiring materiel from the three Service Chiefs, later consolidating that role into a single Defence organisation also charged with maintaining materiel (DMO). Subsequently, responsibility for defining the capability to be acquired was split off into a new group within Defence (CDG). Most recently, Service Chiefs were once again given responsibility for coordinating all the elements required to ensure that capability is achieved, albeit without the overarching authority they formerly exercised when solely responsible for acquiring and bringing capability into service.

2.45 The 1997 Defence Reform Program, introduced the notion of the 'seamless management' of whole-of-life capability. This culminated in DMO becoming responsible from June 2000 for acquiring and supporting ADF equipment (through 'customer-supplier agreements').[125] The 2003 Defence Procurement Review sought improvements in ADF capability definition through a strengthened two-pass government approval process, with CDG formed to take primary responsibility for defining the capability to be acquired. The 2008 Defence Procurement and Sustainment Review resulted in the Service Chiefs, as part of their Capability Management role, becoming responsible (through Project Directives) for bringing together all the

[122] December 2010 prices.

[123] January 2010 prices.

[124] These projects are included in ANAO Report No.13, 2009-10, *2008-09 Major Projects Report Defence Materiel Organisation*, November 2009, pp. 62-64, 75-77, 139-145 and 169-175; and ANAO Report No.17, 2010-11, *Defence Materiel Organisation Major Projects Report 2009-10*, November 2010, pp. 141-151 and 185-194.

[125] Department of Defence, *Defence Annual Report 2000-01*, pp. 7, 280.

Fundamental Inputs to Capability required to achieve the capability outcomes agreed to by government.[126]

2.46 The administrative arrangements accompanying these successive organisational reforms have not always been fully implemented before the next round of reform. For instance, the 'customer-supplier agreements' originally envisaged in 2000, and adjusted as a result of the Defence Procurement Review 2003, were not implemented by DMO and CDG until 2005, at which time they took the form of CDG-DMO Materiel Acquisition Agreements. These agreements are now, in turn, in the process of being redrafted to reflect the role of Capability Managers agreed as the result of the 2008 Defence Procurement and Sustainment Review.

2.47 As of February 2011, the Capability Managers' role of bringing together all fundamental inputs required to achieve the capability outcomes agreed to by government, had yet to be drafted into Project Directives for any of the 19 projects included in this audit, which were in their acquisition phase. Rather Defence is producing Project Directives only for projects currently being approved by government. With respect to the 19 acquisition projects, Materiel Acquisition Agreements that include the Capability Manager had only been signed for the JP 2070 Lightweight Torpedo Replacement project. Consequently, the effectiveness of these new arrangements could not be examined during this audit.

2.48 The customer-supplier model adopted by Defence results in the Chief of Navy having no direct authority over key Defence Groups (such as DMO) that develop capability inputs needed to achieve the capability outcomes agreed to by government for which he has overall responsibility.[127] This has been a significant issue in the matrix management model employed by Defence for over a decade.[128] At the time of the audit, CDF and the Secretary

[126] Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review*, May 2009, p. 8.

[127] The Chief of Navy is responsible for exercising oversight and coordination of all elements necessary to introduce the full level of operational capability into service within scope, cost, workforce, schedule and risk parameters agreed to by government. Department of Defence, *Joint Directive by Chief of the Defence Force and Secretary, Department of Defence for Project XXX Phase NN, Post Second Pass Implementation Stage*, Draft declassified template, March 2011.

[128] The matrix management model reflects organisational arrangements where the traditional hierarchical functional group structures, that have vertical authority and accountability for function (process) execution and skills development; are supplemented by project management structures that have horizontal authority and accountability for product development coordination and delivery, across multiple functional groups.

were considering proposed changes to Defence's accountability and authority structure.[129]

2.49 At the heart of the process of developing new materiel are the disciplines of systems engineering and program management, which combine to bring complex systems into being. The development and sustainment of Navy capability often involves organisationally and technologically advanced systems engineering spread over periods of more than a decade, with complicated interfaces and work handovers between several Defence organisations.

2.50 The Chief of Navy, in the capacity of Navy Capability Manager, is ultimately responsible and accountable for releasing into service Navy capability that achieves acceptable standards of safety, performance and reliability. Navy relies on CDG and DMO respectively to define and acquire materiel that satisfies those standards, in accordance with government approval. Navy implements an assurance system based on a regulatory system, designed to specify approved design, construction and management standards, to audit against those standards and to assess the implications of any deviations from those standards.

[129] Department of Defence, *The Defence Accountability Framework, Review of accountability and governance in the Department of Defence*, January 2011.

3. Capability requirements definition

This chapter examines the requirements definition phase of Navy capability, acquisition strategies and plans, and capability development policy and processes. It considers requirements in terms of the functions the Navy capability is to perform and the standards to be achieved under specified conditions.

Introduction

3.1 CDG's role is to develop and manage the Defence Capability Plan,[130] to develop capability investment proposals for government consideration, and to act as a project sponsor during the acquisition and delivery of new or upgraded capability to Capability Managers.[131] CDG, which is organisationally part of the Department of Defence, is required to base investment proposals for ADF materiel acquisitions, on clearly defined capability requirements, including compliance with the ADF technical, operational and safety regulations.

3.2 The scope of each new or upgraded capability acquisition is defined in documentation supporting the Government's Second Pass approval of a specific proposed capability.[132] These documents address:

(a) the budget and schedule of the proposed capability;

(b) the specific functions and performance of the proposed capability;

(c) the implications of any identified changes to each of the Fundamental Inputs to Capability elements;

(d) the planned Initial Operational Capability date and Final Operational Capability date;

(e) budgetary provision for acquisition and operation of the capability solution, including all relevant Fundamental Inputs to Capability

[130] The Defence Capability Plan provides an account of major capital equipment proposals that are planned for Government consideration.

[131] Department of Defence, *Defence Annual Report 2008-09*, Vol. 1, p. 111.

[132] This specific capability is selected from a narrow band of options previously approved at the project's First Pass approval stage. Department of Defence, *Defence Capability Development Handbook (Interim)*, April 2010, Chapter 4.

aspects and Net Personnel Operating Cost (including workforce numbers);

(f) the risk to achieving and sustaining the workforce required;

(g) the technical, cost, schedule and commercial risks for the capability solution and their treatment strategies;

(h) the acquisition strategy for the proposed capability;

(i) transition to in-service; and

(j) critical issues to be tested, the associated test and evaluation strategy and the resource and funding requirements to support that strategy.[133]

3.3 Once the proposed capability is approved by government, and the acquisition phase commences, stewardship of the capability requirements passes to the DMO Project Manager. CDG's sponsor role includes ensuring that the materiel elements of capability delivered by DMO during the acquisition phase comply with the requirements approved by government at Second Pass approval. Changes to the requirements can only be approved by the CDG Executive, if they fall within the basis of the Government's Project Approval and/or delegations under the Project Approval framework. These include changes to the performance measurement of critical operational issues, and measures of effectiveness and measures of supportability in Materiel Acquisition Agreements.[134]

3.4 CDG monitors DMO's progress in acquiring materiel elements of capability by attending regular meetings of the project's stakeholders within Defence. When acquiring the Mission and Support Systems, DMO may raise with CDG potential changes to project requirements.[135]

3.5 Defence made changes to the capability development process in response to the 2008 Defence Procurement and Sustainment Review including having Capability Managers responsible for monitoring a project's progress through the Acquisition Phase and the Acceptance into Operational Service Process. They are also responsible for reporting to government, through the

[133] Department of Defence, *Defence Capability Development Handbook (Interim)*, April 2010, Chapter 4.

[134] Department of Defence, *DMO Acquisition and Sustainment Manual*, 2007, p. 24.

[135] ibid., p. 24.

Secretary of Defence and the Chief of the Defence Force, the progress of acquiring the capability.[136]

3.6 All proposed changes to the capability requirements must be cleared by Chief of CDG, in consultation with Defence's Strategic Policy Division and the Capability Manager, before DMO approves any engineering change proposal, contract change proposal, waiver or deviation that affects the approved baseline.[137]

3.7 As at June 2010, CDG had a workforce of 183 uniformed personnel and 135 Australian Public Service personnel, and a staff turnover rate of six per cent of Australian Public Service leaving the Department over the previous 12 months and the uniform personnel rotating every two to three years.

3.8 Within this context the ANAO examined the key stages in defining each project's:

- requirements in terms of operational concepts, capability functions and performance, and test concepts;
- acquisition strategies and management plans;
- project management guidance and systems engineering approach;
- agreements between DMO and Navy; and
- arrangements for certifying that the materiel acquired complies with regulatory requirements.

Defining ADF capability requirements

3.9 In May 2002, the then Vice Chief of the Defence Force set out the capability development documents that define what the ADF requires and how compliance with ADF requirements is to be verified.[138] They are:[139]

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[136] Department of Defence, *Defence Capability Development Handbook (Interim),* April 2010, p. 72, 74.

[137] Ibid.,p. 73.

[138] Department of Defence, *Capability Systems Life Cycle Management Guide 2002*, May 2002, pp. 3-9 to 3-11, Annex D to Part 3

[139] Department of Defence, Defence Materiel Organisation, *Guidance for the Preparation of an OCD, FPS and TCD*, April 2002, pp. 11-13, 22-23. Department of Defence, *Defence Capability Definition Documents Guide*, March 2005, pp. 11, 13-23. Department of Defence, *Defence Capability Definition Documents Guide*, 2009.

- *Operational Concept Documents (OCDs)*, which are intended to inform system acquirers and developers of the ADF's operational requirements. Without specifying particular solutions, OCDs:

  (a) describe the characteristics of the required capability from an operational perspective;

  (b) facilitate an understanding of the overall system goals from both the Mission System and Support System perspectives;

  (c) detail missions and scenarios associated with operations and support from both the Mission System and Support System perspectives;

  (d) provide a reference for determining 'fitness for service'; and

  (e) provide a justifiable basis for the formal requirements for both the Mission System and Support System.

- *Function and Performance Specifications (FPSs)*, which define what the ADF requires. These documents:[140]

  (a) specify the system's functional requirements from the perspective of the needs of final users;

  (b) specify, in quantifiable terms, the system's critical performance requirements that are the basis for design acceptance and qualification testing of the system;[141] and

  (c) provide the basis for the contracted Mission System and Support Systems' design specifications.[142]

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[140] Department of Defence, Defence Materiel Organisation, *Guidance for the Preparation of an OCD, FPS and TCD*, April 2002, pp. 12-14. Department of Defence, *Defence Capability Definition Documents Guide*, March 2005, pp. 11, 12. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, pp. 16-18. Department of Defence, *Defence Capability Definition Documents Guide*, 2009.

[141] These are the requirements that, if not met, mean that the capability will not be achieved. Qualification testing verifies that the design and manufacturing processes comply with mandated specifications and standards and provides a baseline for subsequent acceptance/production tests. Qualification of a product is conducted against set standards. When a design is qualified, the product that complies with the design does not need to undergo additional testing against those standards each time it is manufactured. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. B-6.

[142] Function and Performance Specifications are the basis for the contractor derived detailed design specifications, which take the form of System and Sub-System Specifications and Support System Specifications.

- *Test Concept Documents (TCDs)*, which are intended to provide an outline of the test approach and strategy to be use to verify and validate that the design and operational requirements of the new or upgraded capability have been met.[143] Test Concept Documents:[144]

  (a) define the ADF's intended test and evaluation approach and strategy for accepting the system, which are agreed between the DMO and Defence;

  (b) form the basis for the project's Test and Evaluation Master Plan, as well as identifying the funding and resources required for the project's total test and evaluation program, culminating with System Acceptance and Operational Release;

  (c) define the Critical Operational Issues (identified in the Operational Concept Document), that are to be tested and evaluated to assess the system's ability to perform its mission;

  (d) define the Critical Technical Parameters derived from the critical requirements identified in the Function and Performance Specification;[145] and

  (e) define the agreed operational scenarios that need to be successfully trialled in order for the delivered capability to receive Operational Release.

3.10 These Capability Definition Documents are developed during a project's definition phase, and form part of the supporting documentation for the Second Pass capability proposal to government.[146] The aggregation of the requirements specified in these documents should align with Navy's criteria

[143] Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. 2.

[144] Department of Defence, Defence Materiel Organisation, *Guidance for the Preparation of an OCD, FPS and TCD*, April 2002, pp. 14, 22. Department of Defence, *Defence Capability Definition Documents Guide*, March 2005, pp. 11-12. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, pp. 17, 19-25. Department of Defence, *Defence Capability Definition Documents Guide*, 2009.

[145] Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. 20.

[146] Department of Defence, *Capability Systems Life Cycle Management Guide 2002*, May 2002, pp. 3-6 Department of Defence, *Defence Capability Development Manual 2006*, February 2006, p. 66. Department of Defence, *Defence Capability Development Handbook 2010 (Interim)*, April 2010, pp. 32, 62. ANAO Audit Report No.48, 2008-09, *Planning and Approval of Defence Major Capital Equipment Projects, Department of Defence,* June 2009, p. 131.

for determining that materiel offered by DMO at the end of the acquisition phase is 'fit for service'.[147]

3.11 When government approval at Second Pass occurs, the Capability Definition Documents define the materiel system requirements that comprise the Capability Baseline. The Capability Baseline:[148]

- defines the materiel scope of the project; and
- documents the requirements against which the acquisition agency [DMO] and the Fundamental Inputs to Capability providers are to deliver; and the testing framework with which they must comply.

3.12 Consequently, Capability Definition Documents need to be well prepared and accurately reflect the user's expectations of the system and how it will be tested and evaluated in order to demonstrate that the acquired Mission and Support Systems comply with specified requirements.[149]

3.13 It is CDG's responsibility to develop these documents for endorsement by key stakeholders and approval by CDG's Head Capability Systems.[150]

3.14 The ANAO found that, of the 20 projects included in the audit, seven had a complete set of approved Capability Definition Documents from the time of their Second Pass approval.[151] A further eight projects developed the Operational Concepts and Test Concept Documents after project approval by government and after their acquisition contract was signed.[152]

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147 Fitness for service relates to the materiel's ability to satisfy operational requirements. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 2 and Definition of Terms.

148 Department of Defence, Defence Capability Group, *Defence Capability Development Manual 2006*, February 2006, pp. 70-73. Elements of the TCD may also be included in contract Statements of Work, and along with scenarios outlined in the OCD are to inform the system verification and validation processes. Department of Defence, *Defence Capability Development Handbook 2010 (Interim)*, April 2010, p. 71.

149 Department of Defence, Defence Capability Group, *Defence Capability Definition Documents Guide*, March 2005, p. 93. Department of Defence, *Defence Capability Definition Documents Guide*, 2009.

150 Department of Defence, *Defence Capability Development Handbook 2010 (Interim)*, April 2010, p. 48.

151 SEA 1390 Ph 4B, SEA 1442 Ph 3, SEA 1444 Ph 1, SEA 1654 Ph 2A, SEA 4000 Ph 3, JP2048 Ph 4A/B, and AIR 9000 Ph 2.

152 SEA 1102 Ph 3A, SEA 1390 Ph 2.1, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1448 Ph 2A, JP 2008 Ph 3E, JP 2070 Ph 2&3 and AIR 87 Ph 2.

3.15 Six projects did not have Test Concept Documents,[153] as they commenced prior to the requirement to produce these documents, which was first specified in Defence's May 2002 *Capability Systems Life Cycle Management Guide.* These projects are considered by DMO to be legacy projects, and they have experienced significant schedule delays in achieving Initial Operational Release or Operational Release. These delays have for the most part been the result of extended test and evaluation phases and regulatory review processes due to inadequate provision of information. Absence of a Test Concept Document is potentially a cause for instability in project test and evaluation, and disagreements between the parties on how to assess compliance with contractual and technical regulation requirements.

3.16 The project with the most schedule delays is Project JP 2027 - Landing Platform Amphibious (LPA) ships, HMAS *Manoora* and HMAS *Kanimbla.* These ships were acquired in August 1994,[154] and after extensive refits and modifications, commenced operational test and evaluation in 2001.[155] This project completed its acquisition phase in 2003, following a provisional acceptance into service under processes that existed prior to Initial Operational Release and Operational Release. As of April 2011, the LPAs had wide-ranging defects and deficiencies, including numerous non-compliances against Classification Society rules.[156] In September 2010 they were the subject of a Navy Seaworthiness Board review (see paragraph 4.66), and shortly thereafter the Chief of Navy initiated an 'operational pause' to enable DMO to address significant seaworthiness issues identified by the Seaworthiness Board.[157] As mentioned previously, as at May 2011 the relevant DMO System Program Office was managing a seaworthiness remediation program aimed at ensuring the LPA HMAS *Kanimbla* can return to service in 2012, and was also managing a decommissioning program for the HMAS *Manoora.*

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153 SEA 1348 Ph 3, SEA 1390 Ph 2.1, SEA 1401, SEA 1405 Ph 1&2, JP 2027 Ph 1&2 and JP 2043 Ph 3A.

154 ANAO Audit Report No.8, 2000-01, *Amphibious Transport Ship Project*, 7 September 2000, p. 11.

155 Navy Strategic Command, Minute RANTEAA/OUT/2009/136, *Operational Release Brief for JP 2027 Amphibious Transport,* 26 October 2009, p. 2.

156 Navy Strategic Command, Minute RANTEAA/OUT/2009/136, *Operational Release Brief for JP 2027 Amphibious Transport,* 26 October 2009, p. 8. Det Norske Veritas, HMAS *Manoora*, *Review of certification of LPA vessels against DNV Rule Set*, 4 October 2007. This review found 193 non-compliances against the Det Norske Veritas Rule Set. Det Norske Veritas, HMAS *Kanimbla*, *Review of certification of LPA vessels against DNV Rule Set*, 17 October 2007. This review found 127 non-compliances against the Det Norske Veritas Rule Set.

157 Department of Defence, Media Release, *HMA Ships Manoora and Kanimbla alongside for maintenance*, 27 September 2010.

3.17 SEA 1405 Phase 1 and 2 Seahawk helicopter Electronic Warfare and Forward Looking Infrared upgrade project, was approved by government in 1997. It involved the integration into the Navy's 16 S-70B-2 Seahawk helicopters, of a Forward Looking Infrared system, a Missile Approach Warning system, a Countermeasures Dispensing System, a Radar Warning Receiver and an Electronic Support Measures System.

3.18 After a series of schedule slippages due to system development and integration problems, the helicopters received:

- Initial Operational Release of the Missile Approach Warning System and the Countermeasures Dispensing System in May 2008;[158]
- Supplementary Type Certification and Service Release for the entire upgrade in March 2010; and
- Operational Release of all systems in June 2010.

3.19 SEA 1390 Phase 2.1 FFG Upgrade project was approved by government in December 1997. The first of the upgraded FFGs commenced Sea Acceptance Trials in mid-2005, and was scheduled to achieve Initial Operational Release in May 2007.[159] To assist in the release of operational capability the Chief of Navy approved a staged process for Initial Operational Release. In August 2010 Chief of Navy had granted Initial Operational Release for all three stages, albeit with some considerable systems-specific reservations.[160] Operational Release is scheduled for the third quarter 2011, six years after commencing Sea Acceptance Trials. This delay is occurring despite the project being the subject of intense DMO and Navy managerial effort since 2002,[161] and the project's scope being reduced from upgrading six FFGs to upgrading four.[162] The Government decided that the two oldest FFGs, HMAS *Canberra* and HMAS

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158 Australian Navy Systems Command, Minute RANTEAA/OUT/2008/043, *Initial Operational Release–SEA 1405 (SEAHAWK) MAUS/CMDS Capability for FFH (Only),* 6 May 2008, p. 3. Australian Navy Systems Command, Minute RANTEAA/OUT/2008/043, Initial Operational Release–SEA 1405 (SEAHAWK) MAUS/CMDS Capability for FFH (Only), 6 May 2008, p. 5.

159 ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, p. 38.

160 Chief of Navy Minute, CN/OUT/2010/017, *FFG Upgrade Initial Operational Release Phase III*, 27 January 2010.

161 ANAO Audit Report No.45, 2004-05, *Management of Selected Defence System Program Offices*, Department of Defence, May 2005, pp. 71-73, 31.

162 ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, pp. 18-24, 31.

Adelaide, were not to be upgraded and they were withdrawn from service in November 2005 and January 2008 respectively.[163]

3.20 Projects that proceeded on the basis of extensively defined Operational Concept Documents, Test Concept Document and Function and Performance Specifications developed after project approval, include the following projects approved in March 2004:

- SEA 1442 Maritime Tactical Wide Area Network, this project achieved Initial Operational Release in December 2010;
- SEA 1448 Phase 2A Anzac Ship Anti Ship Missile Defence Upgrade, this project is yet to achieve Initial Operational Release; and
- SEA 1654 Phase 2A HMAS *Sirius* acquisition project, which received Initial Operational Release in October 2006, but because of operational limitations and Support System issues, did not achieve Operational Release until January 2011.[164]

3.21 Analysis of project documentation by the ANAO shows overall project management improvements have occurred since around 2003, when Defence increased the application of systems engineering concepts to the requirements definition phase of its projects, resulting in better developed operational concepts, function and performance specifications and test concepts. Those improvements are reflected in Defence's contracting template, which clarifies the accountability for design, and underscores the vital importance of progressive verification and validation that ADF capability design and operational requirements have been met (as outlined in paragraphs 4.38 to 4.45). These improvements apply to the five post-2003 projects,[165] and to a much lesser extent to the remaining 15 projects, as most of the improvements could not be retrospectively applied.

3.22 The improved systems engineering approach replaced the former capability development process,[166] which placed less emphasis on fully defining operational concepts, function and performance specifications and

[163] ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, pp. 11, 29-32.

[164] CN Australia Signal. P 170702Z Oct 06, *Initial Operational Release–HMAS Sirius*.

[165] SEA 1390 Ph 4B, SEA 1448 Ph 2A, SEA 4000 Ph 3, JP 2048 Ph 4A/B and AIR 9000 Ph 2.

[166] The former process was based on Major Capability Submissions supported by Detailed Operational Requirements.

test concepts prior to project approval and acquisition contract signature.[167] That reduced emphasis led to difficulties gaining agreement with contractors, often a year or more into a fixed-price contract, on Defence's requirements for system function and performance.[168] The difficulties also extended to gaining agreement for the test plans and procedures used by contractors to verify and validate compliance with contractually specified requirements.[169]

3.23 The above findings reinforce the advantages of Capability Definition Documents being developed to an extent that provides a sound basis for each project to proceed into its acquisition phase, and the advantages of contracts aligned with systems engineering principles. It is important that the Integrated Project Teams (IPTs),[170] comprising of representatives from CDG, DMO and the Capability Manager's Capability Implementation Teams, ensure that, prior to executing acquisition contracts, Capability Definition Documents are complete and agreed between the parties. The IPTs should also ensure that draft contracts contain systems engineering provisions that enable efficient and effective verification and validation of contractual requirements (this issue is discussed further in Chapter 4). The importance of the IPTs to CDG is underscored by Defence's May 2011 advice that:

> Capability Development Group has limited systems engineering capability and may lack the necessary capability to develop the requirements definition

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[167] ANAO Audit Report No.45, 2004-05, *Management of Selected Defence System Program Offices*, May 2005, pp. 72-73.

[168] This situation presented particular difficulties for DMO Project Directors. ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade,* Department of Defence, Defence Materiel Organisation, October 2007, pp. 14, 15, 66-67. Fixed-price contracts are generally considered to be the lowest risk to the government, because the onus is on the contractor to provide the deliverable at the time, place, and price specified in the contract. In addition, the contractor is responsible for bearing any costs associated with a delay or inadequate performance, assuming that the government has not contributed to contractor performance issues through issues such as late delivery of government-furnished equipment or changed requirements.

[169] ANAO Audit Report No.11, 2007-08, *Management of the FFG Upgrade*, October 2007, pp. 14,15, 58-60,66-68.

[170] The basic principle behind the IPT concept is that decisions should be made at the lowest level commensurate with technical knowledge requirements and effective risk management. Collectively, the IPT members should represent the know-how needed, and have the ability to control the resources necessary, for the delivery of quality products. Individually, the team members should be empowered and authorised within agreed limits to make commitments for the organisation or functional area they represent. Department of Defence, *Capability Systems Life Cycle Management Manual 2002*, November 2002, paras, 3.94-3.99.

During the project definition phase (which ends at Second Pass approval), IPTs are chaired by CDG Capability Systems Division Desk Officers, and have a collective responsibility for the success of the project by ensuring that the project is defined (including system and FIC integration activities), costed, and scheduled with risks identified and treated. Department of Defence, *Defence Capability Development Handbook (Interim),* April 2010, p. 32.

> documentation for both first and second pass submission to the level of rigour necessary to ensure that an appropriate level of risk analysis and costs for the associated risk mitigation strategies are included, particularly in the second pass approval submission…
>
> A tripartite approach [involving CDG-DMO-Capability Management personnel] that enables the DMO to engage with and bring its Systems engineering expertise to the initial requirements development process could deliver substantial benefits to this critical and initiating process with significant benefits in the subsequent capability delivery process.[171]

Acquisition Strategies and Acquisition Project Management Plans

3.24 Acquisition Strategies are intended to ensure that there is a common understanding of why a specific strategy delivers value for money, and how sound management and reviews will be applied to the project during its acquisition phase.[172] Acquisition Strategies are accompanied by Acquisition Project Management Plans, which are aimed at assisting DMO to:[173]

- achieve desired targets;
- obtain the resources needed to achieve the targets within a timeframe;
- give guidance to all project staff, stakeholders and contractors where applicable; and
- gain commitment from the Project Management Stakeholder Group.

3.25 The ANAO examined the Acquisition Project Management Plans for the 20 projects included in the audit, and seven were found to comply with guidance provided by the DMO's Quality and Environmental Management System (QEMS).[174] A further five projects had Project Management Plans,

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[171] Department of Defence, DMO, Navy & CDG, *Additional Information and Proposed Amendments*, 24 May 2011, p. 16.

[172] Department of Defence, Capability Development Group, *Defence Capability Development Manual 2006*, p. 66. Department of Defence, *Defence Capability Development Handbook 2010 (Interim)*, April 2010, pp. 14, 34, 47, 64, 99.

[173] Department of Defence, Capability Development Group, *Defence Capability Development Manual 2006*, p. 66. However, the *Defence Capability Development Handbook 2010* (Interim), April 2010, p. 65, places lesser emphasis on the importance of the Acquisition Project Management Plan than did the 2006 edition.

[174] SEA 1348 Ph 3, SEA 1390 Ph 4B, SEA 1442 Ph 3, SEA 1448 Ph 2A, SEA 4000 Ph 3, JP2048 Ph 4A/B and AIR 9000 Ph 2.

which had been updated to reflect key elements of the Acquisition Project Management Plan guidance in QEMS.[175] The remaining eight projects had Project Management and Acquisition Plans (PMAPs), which were structured according to project management planning policy in force prior to DMO's formation in 2000, and updated to include post-2000 policy.[176]

3.26 DMO's Acquisition Project Management Plan Template and associated QEMS process identified the need for the plans to reference subordinate plans covering, amongst other things, safety management and certification.[177] However, even though many projects examined during the audit had plans that included QEMS processes, the processes themselves needed updating to reflect current Defence Instructions and regulations. For example, the QEMS process for capability certification refers to Defence Instructions (Navy) Tech 9-1, *Design Approval of RAN Systems and Equipment* regulation, which was superseded in 2003 by the current Navy Technical Regulations. The ANAO is of the view that QEMS would benefit from a thorough quality assurance review, to ensure it reflects current Defence Instructions and technical regulations.

3.27 The ANAO examined the CDG's Defence Capability Development Handbook 2010,[178] the DMO's Project Management Manual 2009,[179] and the DMO's Defence Procurement Policy Manual,[180] and found they similarly needed updating. For example, while mention was made of safety, none of these documents specified that DMO Project Offices were required to develop Safety Cases. Safety Cases are a key element of the Navy Regulatory System's safety and certification requirements, and the requirement for Safety Cases has been raised in other DMO and Navy publications since 2002-03.[181] Safety Cases

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175 SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1444 Ph 1, JP 2070 Ph 2&3 and AIR 87 Ph 2.

176 SEA 1102 Ph 3A, SEA 1390 Ph 2.1, SEA 1401 Ph 2 – Survey Motor Boats, SEA 1405 Ph 1&2, SEA 1654 Ph 2A, JP 2008 Ph 3E, JP 2027 Ph 1&2 and JP 2043 Ph 3A.

177 The Defence Materiel Organisation, QEMS UI2153 *Acquisition Project Management Plan Template*, V1.0 process element UI2305.

178 Department of Defence, *The Defence Capability Development Handbook 2010 (Interim),* April 2010.

179 Defence Materiel Organisation, *DMO Project Management Manual (PMM) 2*009, August 2009.

180 Department of Defence, *The Defence Procurement Policy Manual (DPPM),* June 2010.

181 Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual* 2002, Chapter 6. Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual* Edition 4, 2007, Annex F to Chapter 5. Department of Defence, Defence Materiel Organisation, SAMS [Standard Acquisition Management System] *Systems Safety Guide*, Edition 1, November 2003, pp. 4, 9, 33.

require significant long-term effort by project personnel to develop and maintain (see paragraphs 5.14 to 5.21), and so it would be preferable that key CDG and DMO acquisition planning documents adequately address this important technical, operational and safety regulatory requirement. In May 2011, Defence advised the ANAO that:

> … System Safety is one of the highest policy priorities of the Engineering BPO [Business Process Office] and the Materiel Engineering Council (MEC), and development of a DMO System Safety policy is programmed in the MEC endorsed work program, and, at the time of the audit, the subject DMI [Defence Materiel Instruction] was in the final stages of development … This DMI policy is the replacement for the SAMS Safety guide …[182]

Project management guidance

3.28 More generally, DMO project managers face a complex range of project management policies and processes that have grown in volume over the last decade. Many have evolved in CDG, DMO and Navy in relative isolation from each other. Although the individual documents often address particular systems engineering policies and processes, they lack an integrated inter-organisational perspective. This raises the potential for Defence to gain increased operational efficiency by rationalising and streamlining its processes for acquiring and accepting into service Mission Systems and Support Systems, commencing with requirements definition in CDG, and ending with the disposal of the capability once it has been withdrawn from service.

3.29 This assessment is supported by DMO's advice to the ANAO in June 2010 that while many extant policy requirements make eminent sense when taken in isolation, they have been written and authorised often with 'minimal' consultation with DMO. Accordingly, DMO considers that there has been little consideration of the cost or schedule impost of implementing them.[183] This underscores the importance of an integrated approach to formulating capability development and sustainment policy within Defence.

3.30 The need for an integrated approach is well established. Important goals of the 1997 Defence Reform Program included improving management

[182] Department of Defence, DMO, Navy & CDG, *Additional Information and Proposed Amendments*, 24 May 2011, p. 17.

[183] Department of Defence, Chief Audit Executive, OCAE/OUT/2010, *Performance Audit–Acceptance into Service of Naval Capability*, June 2010, Annex A, A-4.

through streamlining processes and management structures.[184] This was reflected in the first business process principles supporting the July 2000 merger of the former Defence Acquisition Organisation with the Support Command Australia to form DMO, which included:

a) Management of whole-of-life cycle should use one complete, high-level process that covers all the materiel and materiel support activities from when a capability need has been defined through the disposal of the resulting materiel supporting that capability; and

b) There should be one nominated owner of this 'capability need to disposal' process from within the very senior management of defence who is accountable for:

   i. Process effectiveness;

   ii. Process design changes and configuration management;

   iii. monitoring compliance with the process. [185]

3.31 While these principles remain valid with respect to materiel acquisition and sustainment, they have proven difficult for Defence to implement.

Systems Engineering Improvement Program

3.32 DMO records indicate that between 1996 and 2001, five major reviews examined the application of systems engineering in the Defence Acquisition Organisation (DAO) and DMO. The reviews were the:

- Auditor-General Performance Audit - Jindalee Operational Radar Network Project-1995-96;[186]
- DAO Systems Engineering Study-1998;
- Cook Study on Systems Engineering Capability in DAO-1999;
- Management Audit Branch Issues Paper CAMM2 Project-2000; and
- Management Audit Branch Review-Mine Warfare Command Support System Project-2001.[187]

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[184] Department of Defence, *Defence Annual Report 1998-99*, p. 12.

[185] Department of Defence, *Defence Governance and Accountability*, Final Report, 27 April 2000, p. 40.

[186] ANAO Audit Report No.28, 1995-96, *Jindalee Operational Radar Network Project*, Department of Defence, June 1996, pp. xiv, 26, 27.

3.33 DMO identified a number of consistent themes from the reviews:

- The level of systems engineering capability in Defence was low to very low, with a limited number of localised areas of expertise;
- The Australian Government was inexperienced with current systems engineering processes;
- The application of systems engineering processes by project offices was highly variable, ranging from practically non-existent to reasonable;
- Project office staff expressed dissatisfaction with the interface to the development divisions and the process products which they were given (e.g. concept of operations and the user requirements documents);
- There was a lack of end-user input to design;
- End-user expectations changed significantly over the life of a project;
- Requirements management and requirements development processes were inadequate;
- External interfaces [with DMO] were undefined;
- The product structure and contractor work breakdown structures were inappropriate;
- The operational testing program was poorly defined; and
- Project staff overwhelmingly stated that some enterprise-level framework for systems engineering together with a support environment would be useful.[188]

3.34 The Defence internal audit of the Mine Warfare Command Support System project in 2001 recommended that the Head of Electronic Systems Division (HES) within the DMO introduce measures to improve System

[187] Department of Defence, Defence Materiel Organisation, *Systems Engineering Improvement Program (SEIP) Phase One Overview, Improving Capability Through the Application of Systems Engineering*, Edition 1, September 2003, p. 2.

[188] Department of Defence, Defence Materiel Organisation, *Systems Engineering Improvement Program (SEIP) Phase One Overview, Improving Capability Through the Application of Systems Engineering*, Edition 1, September 2003, pp. 2-3.

Engineering skills in the organisation, particularly within projects requiring intensive software development.[189]

3.35 In February 2002, DMO commenced a Systems Engineering Improvement Program, with phase one of that program concentrating on developing DMO policy and procedures, a DMO Systems Engineering Manual, a Systems Engineering Training Program, and a Systems Engineering mentoring program. It also included the development of a Systems Review Guide for the ASDEFCON (Strategic Materiel), and an engineering management guide covering verification and validation.

3.36 DMO first published the ASDEFCON (Strategic Materiel) Systems Review Guide in September 2003,[190] issued an exposure draft of a DMO Verification and Validation Manual in November 2003, and published a final version of its Verification and Validation Manual in November 2008.[191] As at February 2011, the DMO Systems Engineering Manual envisaged in 2001 and scheduled to be available in 2004,[192] had not been published.

3.37 In October 2010, DMO published its Policy on Engineering and its Engineering Business Model.[193] It is now embarking on a major program of standardising its:

- engineering policies, procedures and guidance;
- information systems (tools) that support the engineering policies and procedures;
- engineering policies and procedure training; and
- engineering and technical contract requirements.

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189 ibid.,p. 3.

190 Department of Defence, *System Review Guide for Australian Defence Contract (Strategic Materiel) ASDEFCON (SM)*, Version 1.0, September 2003. This guide drew extensively from the Department of Defence, *ASDEFCON (Strategic Materiel) Handbook*, March 2002.

191 Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008.

192 Defence Materiel Organisation, *Systems Engineering Improvement Program (SEIP) Phase One Overview, Improving Capability through the Application of Systems Engineering*, Edition 1, September 2003, pp. 3, 6.

193 Defence Materiel Organisation, Defence Materiel Standard Procedure (DMSP), DNSP (ENG) 12-0- 001, *DMO Engineering Model*, October 2010, Defence Materiel Organisation, Defence Materiel Instruction DMI (ENG) 12-0-001, *Defence Materiel Organisation (DMO) Policy on Engineering*, October 2010.

3.38 There is a need to improve the guidance available for developers of Acquisition Project Management Plans. These plans are to provide an important basis for project teams to develop and integrate the many project management and systems engineering processes needed to deliver successful outcomes. DMO has commenced a standardisation program, elements of which are focused on systems engineering. However, the benefits from that program are yet to be rolled out.

3.39 The ANAO considers that Defence would benefit from these renewed efforts to standardise and streamline the management processes for defining, acquiring and accepting into service ADF Mission Systems and Support Systems. It would improve the clarity of requirements and generate efficiencies if Defence were to leverage from DMO's standardisation program to achieve the seamless management of capability envisaged in 1998. The focus should be on consolidating current processes and the culling of redundant guidance.

Recommendation No.1

3.40 The ANAO recommends that in order to improve its systems engineering processes and efficiency, Defence:

(a) compile and promulgate authoritative systems engineering guidance applying to all materiel projects; and

(b) aligns the templates for Capability Definition Documents, Acquisition Project Management Plans and Engineering Management Plans accordingly.

Defence response

3.41 Defence agreed to the recommendation and stated as follows:

> This will be addressed through the development of the DMO Systems Engineering Manual(s).
>
> Subsequent review of the Capability Definition Documents and Acquisition Project and Engineering Management Plans will occur when the Systems Engineering Manual is promulgated.

Materiel Acquisition Agreements

3.42 Materiel Acquisition Agreements between CDG and DMO were introduced in 2005 in response to the 'customer-supplier agreements' envisaged in 2000,[194] and to the 2003 Defence Procurement Review.[195] These agreements set out the acquisition services that DMO delivers to Defence, and contain system-specific acquisition performance measures in the form of:[196]

- project costs and budgets;
- schedule (particularly delivery against key milestones[197]) for which DMO is responsible, forming the basis for the achievement of Initial Operational Capability and Final Operational Capability;[198]
- key capability measures or Measures of Effectiveness; and
- customer-furnished supplies.[199]

3.43 In response to the 2008 Defence Procurement and Sustainment Review, Defence has commenced progressively redrafting the Materiel Acquisition

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194 Department of Defence, *Defence Annual Report 2000-01*, pp. 7, 280.

195 The report of this review noted that the separation of the DMO from Defence, which it recommended, would inevitably lead to a more formal relationship with Defence. For example, the new relationship would need to be underpinned by better defined Customer Supplier Agreements and Service Level Agreements. The review noted that there needed to be clearer and more transparent enunciation of the roles, responsibilities and accountabilities of Defence and the DMO throughout the capability development and procurement process. This will help address the underlying issue of diffused accountability and performance assessment. Department of Defence, *Defence Procurement Review 2003*, (Kinnaird Review), August 2003, p. 34

196 Department of Defence, Capability Development Group, *Defence Capability Development Manual 2005*, p. 40, Department of Defence, *Defence Capability Development Manual 2006*, p. 71. Department of Defence, *Defence Capability Development Handbook (Interim),* April 2010, pp. 15, 47, 64, 100, 151.

197 These milestones include Initial Materiel Release and Final Materiel Release (see paragraphs 5.18 to 5.22).

198 Initial Operational Capability, is the point when the first subset of a capability system that can be operationally employed is realised. IOC is a capability state endorsed at project approval at Second Pass, and reported as having been reached by the Capability Manager.

Final Operational Capability (FOC) is the point when the final subset of a capability system that can be operationally employed is realised. FOC is a capability state endorsed at project approval at Second Pass, and reported as having been reached by the Capability Manager. Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, Annex A. Department of Defence, *The Defence Capability Development Handbook (Interim),* April 2010, p. 150. Defence advised the ANAO in February 2011, that Defence Instructions (General) OPS 45-2 *Capability Acceptance Into Operational Service* is being updated to incorporate the outcomes of the Defence Procurement and Sustainment Review, and to include Materiel Release milestones.

199 Supplies (goods and services) provided by customer groups under formal agreement(s) with the acquisition agency, that are required to be incorporated in the delivered materiel system. Department of Defence, *The Defence Capability Development Handbook (Interim),* April 2010, p. 148.

Agreements between CDG and DMO to include the Capability Managers and their role of coordinating and reporting capability development.[200] Projects scheduled to close by the end of 2011 are exempt from the redrafts. In light of their new role, the Capability Managers, including the Chief of Navy for Navy projects, are now signatories to the revised Materiel Acquisition Agreements.

3.44 In July 2010, the ANAO examined the Materiel Acquisition Agreements covering 19 projects included in the audit,[201] and found 18 of these agreements were yet to include the Capability Manager.[202]

3.45 Defence advised the ANAO in February 2011 that Chief of CDG instructions require all Materiel Acquisition Agreements to be updated by the end of 2011, except those projects closing by the end of 2011. Defence further advised that of the listed projects 13 are currently updating their Materiel Acquisition Agreements or had agreements awaiting signature,[203] and five projects will not be updating their Materiel Acquisition Agreements because they are closed, are scheduled to close shortly (2011) or are in the process of closing.[204]

3.46 The ANAO observed that the revised Materiel Acquisition Agreements for JP 2070 Phase 2 and 3, the Lightweight Torpedo Replacement project, were based on the post-February 2010 requirements. These agreements specified Navy's criteria for accepting materiel offered by DMO on the basis that the materiel offered to Navy is fit for service and only poses acceptable risk to personnel, public safety, and the environment. This acceptance is to be supported by evidence that includes:

- a complete Certification of all deliverables;
- a list of known deficiencies;
- an approved Safety Case;

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200 Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review*, May 2009, pp. 9, 26, 27.

201 JP 2027 is covered by a Materiel Sustainment Agreement, as the acquisition phase of this project ended in 2003.

202 JP 2070 Ph 2&3 had Materiel Acquisition Agreements conforming with the new requirements.

203 SEA 1348 Ph 3, SEA 1390 Ph 2.1, SEA 1390 Ph 4B, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1442 Ph 3, SEA 1444 Ph 1, SEA 1449 Ph 2A, SEA 4000 Ph 3, JP 2043 Ph 3A, JP 2048 Ph 4A/B, AIR 87 Ph 2 and AIR 9000 Ph 2.

204 SEA 1102 Ph 3A, SEA 1401 Ph 2-Survey Motor Boats, SEA 1405 Ph 1 and 2, SEA 1654 Ph 2A and JP 2008 Ph 3E.

- an Integrated Logistics Support Plan for the capability at its Final Operational Capability level of maturity; and
- a certified Mission System performance in accordance with the approved Function and Performance Specifications.[205]

3.47 The revised Materiel Acquisition Agreements for JP 2027 Phase 2 and 3, also specify DMO's requirements of the Chief of Navy as the Capability Manager. These include providing professional advice on:

- operational requirements and capability issues, including advice on deficiencies and on the acceptance of capability. That advice is to be provided in a timely manner by CDG, the Capability Manager representative and Defence Science and Technology Organisation (DSTO);
- capability certification from RANTEAA, Navy regulators and other Navy organisations; and
- Objective Evidence requirements to determine and certify compliance with requirements. This is to be provided by RANTEAA, Navy regulators and other Navy organisations.

3.48 The new Materiel Acquisition Agreement provisions provide important improvements over the former Materiel Acquisition Agreements, by ensuring customer and supplier responsibilities are set out by way of defined requirements and agreed procedures for determining compliance with the requirements. They also have important implications for Navy's capability management arrangements, discussed in Chapter 7, in terms of Navy's ability to:

- satisfy DMO's requests for professional advice; and
- assess DMO's compliance with the Navy's professional advice and the additional requirements of DMO contained in the new Materiel Acquisition Agreements.

3.49 There remains scope for improvements in cost and schedule reporting, and explicitly stated expectations of what project management services DMO

[205] Materiel Acquisition Agreement, Department of Defence (Customer), Defence Materiel Organisation (Supplier), *For the provision of supplies and services in respect of the Post 2nd Pass stage of ACAT II Project JP2070 Phase 3 New ADF Lightweight Torpedo,* Version 1.1, 16 April 2010. In February 2011, Defence advised the ANAO this it is a mandatory requirement to include references to Navy's Established Technical Regulation and Safety Regulation in Materiel Acquisition Agreements.

is to deliver, in addition to the materiel. Currently, the Materiel Acquisition Agreements lack a requirement for cost and schedule variance metrics that would provide the Capability Manager early indication of cost and schedule variance issues and the effectiveness of management initiatives to resolve such issues. This is discussed further in paragraphs 4.21 to 4.34.

3.50 The Materiel Acquisition Agreements could also be improved by stating that DMO is to deliver to the Capability Manager at System Acceptance:

- approved Configuration Management Information Systems and technical documentation, which describe the functional and physical configuration of the system (the subject of System Acceptance); and
- and the verification and validation performed on the system together with the results obtained. The Configuration Management Information Systems and their technical content are important for Navy ship Commanding Officers and for the conduct of Materiel Condition Assessments by each Navy ship's Officers and crew (see paragraphs 6.23 to 6.34).

Certification

3.51 Certification is the act of issuing a certificate that provides assurance that a product, service or organisation complies with a stated specification standard or other requirements. The ADF philosophy of technical regulation is that organisations responsible for delivering supplies or services certify that the materiel for which they are responsible, complies with specified standards and regulatory requirements, and is technically fit for service in the intended role. This is articulated in Defence Instructions.[206] The certification of compliance with Navy Regulators' requirements provides the foundation for the Chief of Navy's consideration of Initial Operational Release and

[206] Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, Definition of Terms. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 2 and Definition of Terms.

Operational Release of new or upgraded naval materiel.[207] Navy regulations applicable to CDG and DMO's roles include:

- ensuring that, prior to Second Pass approval by government, each project's Capability Definition Documents have been certified as complying with the Navy Regulators' requirements;[208]
- ensuring that each project's Certification Plan is approved by the DMO Project Director, endorsed by Navy's Regulatory Authorities and authorised by the Director General Navy Certification and Safety, at the 'earliest stages of an acquisition/procurement';[209] and
- managing ongoing compliance with approved Certification Plans.[210]

3.52 Head Navy Engineering (HNE) is the Navy's Technical Regulatory Authority and, within Navy's regulatory system established by Navy's Director General Navy Certification and Safety, is:

- responsible for the certification of the technical integrity of ADF maritime materiel; and
- accountable for ensuring that requirements are defined, and that responsible authorities are competent to discharge their responsibilities, are authorised to do so, and have appropriate management systems in place.[211]

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[207] Department of Defence, Defence Instructions (Navy) ADMIN 37-16, *Navy Regulatory System,* July 2008, p. 3. Navy recognises the inordinate costs of over-regulation and so the degree of regulation to be applied to Naval capability is to be based on formal risk management principles, and should wherever possible, be developed with an awareness and recognition of civil regulatory standards and regimes. The acceptable levels of residual risk will vary according to the context associated with that capability, including its physical and operational environments, and to changes in standards and expectations over time. Regulators are to identify their regulatory requirements, and tailor these to the risk inherent in each capability. Department of Defence, Defence Instructions (Navy) ADMIN 37-16, *Navy Regulatory System,* July 2008, pp. 1, 2.

[208] Department of Defence, Defence Instructions (Navy) ADMIN 37-16, *Navy Regulatory System,* July 2008, pp. 3, 4. Royal Australian Navy, ABR 6492 *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 1, Sect. 1, Annex B of Chapter 4.

[209] Royal Australian Navy, ABR 6492 *Navy Technical Regulations Manual (NTRM),* July 2003, Vol.1 Sect. 1 Chapter 6, pp. 2, 6A-1.

[210] ibid., Vol.1 Sect. 1 Annex A of Chapter 6.

[211] Royal Australian Navy, ABR 6492 *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 1 Sect. 1 Chapter 6, p. 1. Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, paragraph 18. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, paragraph 19.

Project Certification Plans

3.53 Project Certification Plans are to describe the process for certifying that Navy materiel has been designed, constructed and/or maintained to the agreed Certification Basis.[212] They also specify the certificates that are required and the individuals authorised to issue certificates against each regulated requirement.[213] When the certificates are issued, they are compiled by DMO, and the certificates not achieved are listed in each Mission System's TI 338. (See paragraphs 5.22 to 5.24 for an explanation of the TI 338.)

3.54 The Certification Basis is comprised of the compiled general function and performance specifications related to Mission Systems, along with design requirements related to safety and seaworthiness. The technical components of the Certification Basis require Technical Regulator endorsement and authorisation by the Director General Navy Certification and Safety.[214]

3.55 Navy regulations require that the Project Certification Plan is approved by the acquisition organisation, endorsed by the Navy Regulators and authorised by the Director General Navy Certification and Safety, prior to the commencement of the verification and validation process.[215] Ideally the Certification Plan would be finalised immediately after Second Pass approval.[216] This would allow for the project's certification and safety management requirements to be confirmed between Navy and the acquisition organisation,[217] budgeted for, and arrangements made for organisations independent of the supplier to verify compliance with Regulator's requirements.[218]

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[212] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 1 Sect. 1 Chapter 4 Annex B.

[213] Department of Defence, Defence Instructions (Navy) ADMIN 37-16, *Navy Regulatory System,* July 2008, p. 4.

[214] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 2 Sect. 2 Chapter 1 Annex A.

[215] Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* January 2009, Part 1, Chapter 10, p. 10.

[216] Department of Defence, Chief Audit Executive, *Performance Audit – Acceptance into Service of Naval Capability, Australian National Audit Office,* OCAE/OUT/2010, July 2010.

[217] Royal Australian Navy, ABR 5454, *The RAN Regulatory Framework and Certification Manual,* Draft January 2009, Part 1, Chapter 11, pp. 4, 5.

[218] Department of Defence, Defence Instructions (Navy) ADMIN 37-16, *Navy Regulatory System,* July 2008, p. 4.

System Safety Program Plans

3.56 Accompanying the Certification Plan is a System Safety Program Plan covering system safety management and the engineering tasks associated with identifying, evaluating and managing safety risks. The System Safety Program is typically a Prime Contractor's responsibility, and its associated System Safety Program Plan describes how the contractor will execute its System Safety Program in accordance with contractual requirements.[219] The System Safety Program Plan should include organisational responsibilities, resources, methods of accomplishment, milestones, depth of effort, and integration with other program engineering and management activities and related systems.[220]

3.57 A key Defence standard for system safety, MIL-STD-882C *System Safety Program Requirements*, requires Prime Contractors to involve representative users and ADF regulators in System Safety Groups.[221] The standard also requires the System Safety Program to be integrated with the Test and Evaluation program so that system safety influences the evolving system's design and Support System.[222]

3.58 Better practice is that the System Safety Program Plan is agreed between Defence and the Prime Contractor and factored into the Conditions of Contract, the Statement of Work, the Operational Concept Document and the Function and Performance Specification. In practice, agreement of the System Safety Program Plan as part of the project's overall safety program requires review and endorsement by a Defence Safety Management Group and relevant stakeholders prior to contract signature.[223] The System Safety Program Plan provides the basis to the Safety Case and Safety Case Report described in Chapter 5 paragraphs 5.14 to 5.21.

3.59 The ANAO observed that of the 20 projects reviewed in this audit, ten projects had developed Project Certification Plans some years after their

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219 Defence Materiel Organisation, Materiel Acquisition and Sustainment Framework, *SAMS Systems Safety Guide,* November 2003, pp. 39-43. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, pp. 73, 89.

220 Military Standard–882C, *System Safety Program Requirements*, January 1993, pp. 8, Task 102-1.

221 Ibid., pp. 8, Task 102-2, Task 105.

222 Military Standard – 882C, *System Safety Program Requirements*, January 1993, pp. 8, Task 302.

223 Defence Materiel Organisation, *Materiel Acquisition and Sustainment Framework, SAMS Systems Safety Guide,* November 2003, p. 42.

approval by government and signature of the prime contracts.[224] With the exception of SEA 1654 HMAS *Sirius,* these projects were established prior to the promulgation of the current Navy technical regulatory system in July 2003.[225] The HMAS *Sirius* certification plan evolved as the ship was modified to incorporate design changes needed to satisfy Navy's operational requirements.

3.60 Seven projects had Certification Plans established within a year or so of project approval.[226] These latter projects were either projects regulated by the Director General Technical Airworthiness (SEA 1405 and AIR 87) or were projects approved after the publication of the Navy's July 2003 Technical Regulations.[227]

3.61 At the time of the audit, two projects, JP 2027 Landing Platform Amphibious (LPA) project, and JP 2070 Lightweight Torpedo project did not have authorised Certification Plans and or an authorised Certification Basis.

3.62 JP 2027 Landing Platform Amphibious (LPA) project was approved in 1994 and the majority of the capability was delivered prior to the introduction of the requirement of a Certification Basis.[228] However, since early 2000 the project has experienced significant difficulty in establishing an approved Certification Plan and Certification Basis.[229] As noted earlier, the relevant DMO System Program Office was managing a seaworthiness remediation program aimed at ensuring the LPA HMAS *Kanimbla* can return to service in 2012, and was decommissioning the other LPA, HMAS *Manoora.*

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[224] SEA 1102 Ph 3A, SEA 1348 Ph 3, SEA 1390 Ph 2.1, SEA 1390 Ph 4B, SEA 1401 Ph 2 – Survey Motor Boats, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1654 Ph 2A, JP 2008 Ph 3E, and JP 2043 Ph 3A.

[225] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 1, Chapter 6 sets the requirements for the Certification of Maritime Materiel.

[226] SEA 1405 Ph 1&2, SEA 1442 Ph 3, SEA 1444 Ph 1, SEA 1448 Ph 2A, SEA 4000 Ph 3, JP2048 Ph 4A/B and AIR 87 Ph 2.

[227] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 1, Chapter 6 sets the requirements for the Certification of Maritime Materiel.

[228] In 1993, after a proposal to acquire a new training, helicopter and support ship for $494 million was not supported by the Government in the context of the 1993–94 budget, Defence examined three classes of US Navy ships to assess their suitability for the roles of transport, deployment and support of an amphibious force and the at-sea training of Navy personnel. Defence decided that the US Navy's Newport Class 'Landing Ship Tank' was the most suitable for Australian needs. Phase I of the project involved Defence purchasing the ships for $61 million and commissioning them as HMA Ships *Manoora* and *Kanimbla*. Phase 2 of the project involved the ships undergoing modifications to enable them to meet their planned roles. ANAO Audit Report No.8, 2000-2001, *Amphibious Transport Ship Project*, Department of Defence, September 2000, p. 21.

[229] 2009/1016871/1 RANTEAA/OUT/2009/136, Operational Release Brief for JP 2027 Amphibious Transport, October 2009, p. 1.

3.63 JP 2070's Certification Plans and Certification Basis had not been completed as at November 2010, despite JP 2070 Phase 2 and JP 2070 Phase 3 being approved by government in December 2001 and December 2003 respectively. This is a significant technical regulation non-compliance issue, in terms of Navy's regulations and ADF Explosive Ordnance regulations.

3.64 Recently established projects such as SEA 4000 Phase 3 Air Warfare Destroyer project and JP 2048 Phase 4A Amphibious Deployment and Sustainment projects show significant improvements in certification planning.

Conclusion

3.65 DMO, CDG and Navy have sought to design management practices based on better-practice in the commercial and naval sectors. These include formally setting out their respective roles and management responsibilities, and adopting systems engineering as the basis for acquiring and supporting Navy capability.

3.66 Changes brought about by the 2008 Defence Procurement and Sustainment Review include the progressive redrafting of the Materiel Acquisition Agreements between CDG and DMO to include the Capability Managers and their recently-defined role of capability development coordination and reporting.[230] The new Materiel Acquisition Agreement provisions more clearly set out responsibility for defining requirements and agreeing procedures for determining compliance with the requirements.

3.67 Since 2003, Defence has made improvements to project management and the application of systems engineering concepts when defining the requirements for projects, resulting in better developed operational concepts, function and performance specifications and test concepts. The improvements flow through to Defence's contracting template, which clarifies accountability for design and for verifying and validating that ADF capability design and operational requirements have been met and applied to five of the post-2003 projects considered in the course of this audit.[231] However, the improvements could not be readily applied retrospectively to the remaining 15 projects in the

[230] Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review*, May 2009, pp. 9, 26, 27.

[231] SEA 1390 Phase 4B, SEA 1448 Phase 2A, SEA 4000 Phase 3, JP 2048 Phase 4A/B and AIR 9000 Phase 2.

ANAO's sample, which experienced difficulty in gaining agreement on requirements and their verification procedures.

3.68 Similarly, recently established projects such as SEA 4000 Phase 3 Air Warfare Destroyer project and JP 2048 Phase 4A Amphibious Deployment and Sustainment projects show significant improvements in certification planning. Certification provides assurance that a product, service or organisation complies with a stated specification standard or other requirements.[232] The ADF's philosophy is that the organisations responsible for delivering supplies or services will certify that the materiel for which they are responsible complies with specified standards and is technically fit for service in the intended role. However, for most of the projects in the ANAO's audit sample, Certification Plans had not been authorised until some years after the project's approval by government and the signing of prime contracts.[233]

3.69 In general, the ANAO observed that DMO project managers face a substantial range of project management policies and processes that have grown in volume over the last decade. Many have evolved in CDG, DMO and Navy in relative isolation from each other and there is considerable potential for Defence to gain increased operational efficiency by rationalising and streamlining its processes for acquiring and accepting into service Mission System and Support Systems. There is difficulty in keeping all instructions up to date: Acquisition Strategies and Acquisition Project Management Plans examined during the audit indicated a need for DMO to update its guidance to project teams to reflect current Defence Instructions and regulations.

3.70 There is little doubt that besides needing effective management structures, Navy capability development requires standardised management processes that enable the smooth handoff of systems engineering work across organisational boundaries. CDG and DMO have achieved progress in this area. However, improving the handoff of work between DMO and Navy is a more challenging task, as it requires sound systems engineering to detect risks and issues that may develop and compound during each project's system definition and acquisition phases. Risks and issues need to be reduced to

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[232] Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, Definition of Terms. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 2 and Definition of Terms.

[233] SEA 1102 Ph 3A, SEA 1348, SEA 1390 Ph 2.1, SEA 1390 Ph 4B, SEA 1401 Ph 2–Survey Motor Boats, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1654 Ph 2A, JP 2008 Ph 3E, and JP 2043 Ph 3A.

manageable levels more effectively than has been demonstrated to date in many projects.

3.71 In progressing this task, Defence could leverage off DMO's engineering policies, procedures and guidance standardisation program to facilitate efforts to achieve the seamless management of capability envisaged in 1998. The ANAO has recommended (Recommendation 1) that in order to improve systems engineering processes and efficiency, Defence compile and promulgate the Systems Engineering guidance applied to all projects and; align the templates for Capability Definition Documents and Acquisition Project Management Plans accordingly.

4. Materiel acceptance and delivery

This chapter discusses DMO's role in test and evaluation, and the configuration audits leading to System Acceptance. It includes DMOs' role of certifying, through the Report of Materiel and Equipment Performance State (known as the TI 338) and Safety Case Reports, that materiel provided to Navy meets technical, operational and safety regulatory requirements.

Introduction

4.1 DMO makes significant contributions to ADF capability through the acquisition and through-life support of ADF Mission Systems and Support Systems.[234] Better practice is that the development of new ADF materiel, or changes to existing materiel, are based on sound project management and systems engineering judgement, exercised in the first instance during the process of defining requirements and then during the development and acceptance test and evaluation.

4.2 DMO was formed on 1 July 2000 by the merger of the then Defence Acquisition Organisation (DAO) and Support Command Australia (SCA).[235] SCA was itself formed in 1997 through the merger of each Services' Materiel Support organisations, which were responsible for much of the ADF's logistics support and analysis, breakdown parts provisioning, and technical regulation of Navy and Army materiel.[236]

4.3 As at July 2010, DMO had a total of 7170 personnel, comprising of 1504 uniform personnel and 5666 Australian Public Service (APS) personnel.[237]

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234 Defence Materiel Organisation, *DMO Acquisition Manual and Sustainment Manual*, 2007, Foreword.

235 Quarantined from the formation of DMO were the Navy and Army Technical Regulatory Authorities, which remained with their respective Services. This enabled them to maintain their independence in providing advice to their Service Chiefs as to the level of regulatory compliance of the acquisition and through-life support of Navy and Army capability. Department of Defence, *Defence Governance, Acquisition and Support*, April 2000, p. 82. The Air Force's Technical Regulatory Authority, headed by the Director General Technical Airworthiness (DGTA), was formed in 1993 as a part of the Air Force. DGTA became the ADF's Technical Airworthiness Authority in 1998, as a result of the initiatives of the Defence Reform Program.

236 Department of Defence, *Defence Governance, Acquisition and Support*, April 2000, pp. 3-5. At the time of DMO's formation, the former SCA and DAO had a combined total of 10,009 personnel. SCA had some 8116 personnel comprised of 3792 uniform personnel and 4324 APS personnel, and DAO had 1893 personnel comprised of 543 uniform personnel and 1350 APS personnel. Department of Defence, *Defence Governance, Acquisition and Support*, April 2000, p. 6.

237 Department of Defence, *Annual Report 2009-10*, Vol. 2 Defence Materiel Organisation, p. 139.

On that basis since DMO was formed in mid 2000, its total number of personnel has decreased by 2839 or 28.4 per cent. This decrease has occurred as a result of the number of uniform personnel reducing by 2831 or 65.3 per cent, while the number of APS remained largely unchanged.

4.4 Table 4.1 provides the personnel numbers for the DMO Maritime Systems Division, which is responsible for managing the maritime projects included in this audit. The figures indicate that this DMO division is experiencing some shortfalls in the approved workforce personnel numbers. However, the 2009 report on the Strategic Review of Review of Naval Engineering indicates DMO has a substantial shortage of qualified Navy engineers. (See Table 7.2).

Table 4.1

Maritime Systems Division personnel numbers, as at 30 June 2010

	Uniform personnel	APS	Contractors	Total workforce
Approved workforce numbers	234	822	17	1073
Workforce actual occupancy	199	758	5	962
Vacancies	35 [8 per cent]	64 [15 per cent]	12 [70 per cent]	111 [11 per cent]

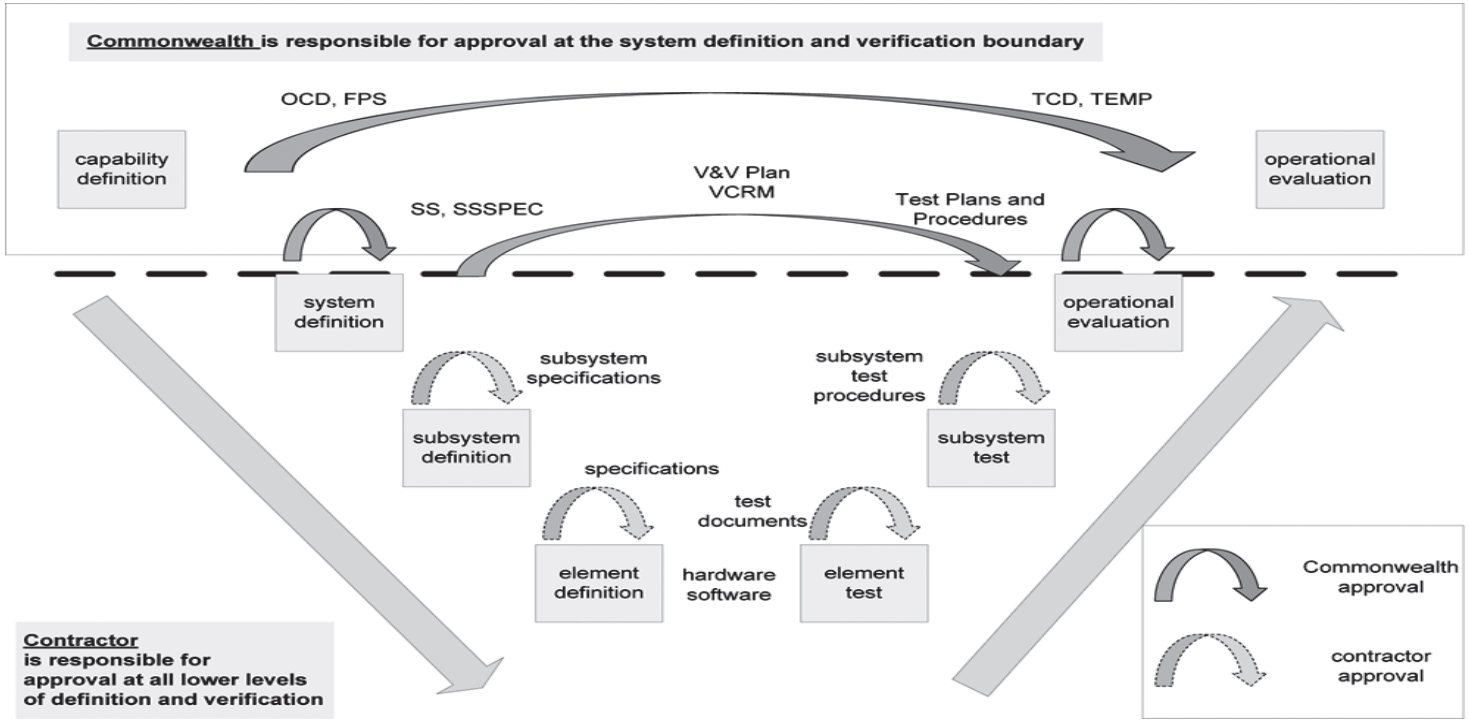
Source: Defence Materiel Organisation.[238]

4.5 The general arrangements for putting better practice into effect are shown in Figure 4.1. It outlines the division of responsibility between DMO and its contractors with respect to defining the materiel to be delivered, and the test and evaluation procedures used to verify and validate that contractors have complied with contractually specified requirements.

[238] Defence advice to the ANAO 23 February 2011, Attachment: *Second Draft Confirmation Paper Operational Release of Naval Capability: Requests for Information (RFIs)*, p. 2.

Figure 4.1

Division of responsibility between Contractors and the DMO



Source: Defence Materiel Organisation, *DMO Project Management Manual 2009*, August 2009, p. 71.

4.6 Under these arrangements, Defence is responsible for the Capability Definition as set out in Operational Concept Document (OCD), the Test Concept Document (TCD) and the Functional Performance Specifications (FPS) (see paragraph 3.9), and the Test and Evaluation Master Plan (TEMP) (see paragraph 4.35).

4.7 The critical points of agreement between DMO and contractors include establishing the Verification and Validation Plan (V&V Plan), and achieving approved Test Plans and Test Procedures, which define the test and evaluation program to be conducted by the contractor under the contract to validate compliance with contracted specifications. The Verification and Validation processes include the maintenance of an up-to-date approved Verification Cross Reference Matrix (VCRM) that references the results of all tests and evaluations used to verify and validate compliance with the contracted specification.

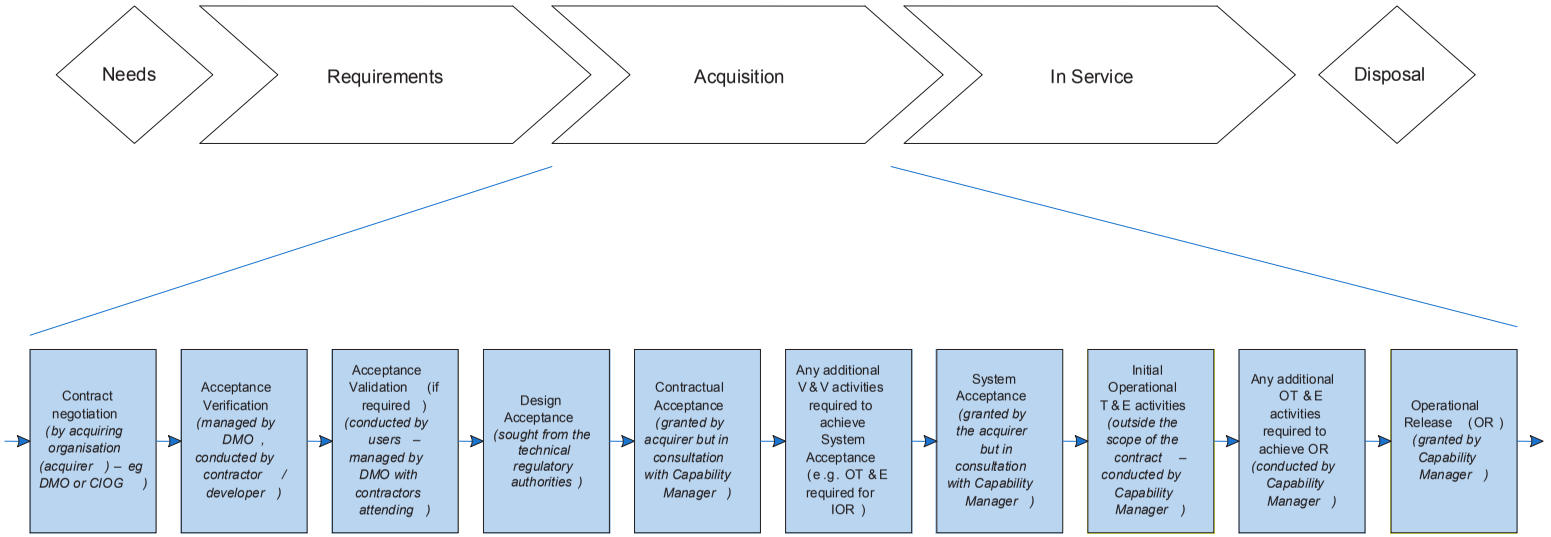
4.8 DMO remains responsible for monitoring the development of the materiel to ensure that it conforms with the Capability Definition. Navy assists DMO with the validation aspects of DMO's approval of contractor Test Reports. These reports are to provide the test and evaluation evidence that verify and validate that the new or upgraded capability design and operational requirements have been met. For instance, Navy assists DMO by conducting weapons trials and sensor system trials.

4.9 Figure 4.2 sets out the key activities and milestones in greater detail, outlining the series of System Acceptance and operational test and evaluation activities and the responsible managers, commencing with requirements verification managed by the DMO, to Operational Release by Capability Managers, such as the Chief of Navy for Navy capability. System Acceptance is the acknowledgment by the DMO project authority that an acquired system complies with contractual and Materiel Acquisition Agreement requirements and the system is ready to be transitioned to operational service.[239] System Acceptance involves development test and evaluation of equipment and subsystems, acceptance test and evaluation of integrated systems and, if requested by the Capability Manager, some operational evaluation of completed capability.

[239] Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. 6.

Figure 4.2

Activities and responsibilities during the system acquisition phase.



Source: Defence Materiel Organisation, *Defence Verification and Validation Manual*, November 2008, p. 72.

4.10 Against that background, the ANAO examined the following key features of the materiel acceptance and delivery process:

- engineering process risk identification and mitigation;
- materiel acquisition status monitoring and reporting;
- test and evaluation and subsequently how it informs verification and validation; and
- acceptance testing and Issue Papers.

4.11 The ANAO also reviewed the closely related issues of configuration management, off-the-shelf acquisitions and System Acceptance from contractors by DMO.

Engineering process risk identification and mitigation

4.12 DMO needs to manage the risks associated with its systems engineering management processes, with a view of identifying risks to cost and schedule achievement in each of its projects, and providing mitigation strategies to reduce the level of risk. The rationale for focusing on engineering management process risk is that cost and schedule overruns are generally preceded by technical problems which, in turn, are preceded by engineering management process problems. To that end, the Technical Risk Identification and Mitigation System (TRIMS) software application program was developed for the US Navy. TRIMS solicits and compiles responses to a set of questions concerned with engineering management process content. The questions are based on lessons learnt on US Navy projects over many years.[240]

4.13 In its February 2004 audit report on the DMO's Wedgetail Airborne Early Warning and Control (AEW&C) project, the ANAO recommended that Defence include in its review of project risk management policy the use of TRIMS in future capital equipment acquisition projects, including those projects progressing toward contract signature.

4.14 The ANAO also recommended that Defence consider acquiring another risk management system (that would complement TRIMS), which was capable

[240] TRIMS was developed by the US Navy's Best Manufacturing Practice Center of Excellence (BMPCOE).

of ensuring project risk and issues were adequately linked to contingency fund management. Defence agreed to both recommendations.[241]

4.15 After successfully testing and evaluating a commercial off-the-shelf risk management system, DMO distributed it to its System Program Offices. DMO also advised its Systems Program Offices in its 2004 Project Risk Management Manual, that:

> Technical Risk Identification and Mitigation System (TRIMS) is the preferred tool for identifying and analysing risk in the ADO [Australian Defence Organisation] when a Product Breakdown Structure (PBS) for the Mission System is available. TRIMS is a knowledge-based, process-oriented tool that helps with the identification, quantification, and tracking of risks in a project, and then with the reduction or mitigation of those risks to acceptable levels.
>
> … Essentially, TRIMS is a large series of checklist questions (≈ 500), which are structured around process areas, such as systems engineering, software design and testability. It is expected that TRIMS will be widely available for use on the DRN [Defence Restricted Network] early in 2004.[242]

4.16 DMO's 2004 risk management manual specified that the use of TRIMS was mandatory for ACAT I and ACAT II projects only, optional for ACAT III projects, and not required for ACAT IV projects.[243]

ACAT I projects are major capital equipment acquisitions that are normally the ADF's most strategically significant. They are characterised by extensive project and schedule management complexity and very high levels of technical difficulty, operating, support and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 1.

ACAT II projects are major capital equipment acquisitions that are strategically significant to the ADF. They are characterised by significant project and schedule management complexity and high levels of technical difficulty, operating, support arrangements and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 2.

ACAT III projects are major or minor capital equipment acquisitions that have a moderate strategic significance to the ADF. They are characterised by the application of traditional project and schedule management techniques and moderate levels of technical difficulty, operating, support arrangements and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 3.

ACAT IV projects are major or minor capital equipment acquisitions that have a lower level of strategic significance to the ADF. They are characterised by traditional project and schedule management requirements and lower levels of technical difficulty, operating, support arrangements and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 4.

Source: ANAO Report No.9, 2008-09 *Defence Materiel Organisation Major Projects Report 2007-08*, November 2008, Appendix 1.

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241 ANAO Audit Report No.32, 2003-04, '*Wedgetail' Airborne Early Warning and Control Aircraft: Project Management* Department of Defence, February 2004, pp. 117-123.

242 Department of Defence, Defence Materiel Organisation, *Project Risk Management Manual Managing Risks within Defence Projects*, June 2004, p. 137.

243 ibid., pp. 62, 98.

4.17 However, DMO's 2010 risk management manual makes no mention of TRIMS. Instead, under the heading *Technical and specialist risks*, it advises that:

> Technical risks are usually identified within a Technical Risk Assessment (TRA) undertaken by the Defence Science and Technology Organisation (DSTO). Specialist risk management processes have also been established for security, the environment and safety. This Manual applies to project risks that have a technical origin, but not to risks that affect the technical integrity of materiel. Risks to technical integrity must be assessed and managed in accordance with the applicable technical regulatory requirements, as published by the relevant technical authorities. [244]

4.18 The ANAO sought advice from Navy's Director Technical Regulation, on the Navy Technical Regulatory System requirements for a risk management system. The advice obtained is that:

> …Technical Risk Management is a high risk process area that is regulated under the NTRS [Navy Technical Regulatory System]. The NTRS requires that only HNE [Head Navy Engineering] authorised organisations design, construct and maintain maritime platforms and these are known as Authorised Engineering Organisations (AEOs). Part of the authorisation process is that they have an appropriate risk management system (RMS) in place which is commensurate with the engineering business in which they are engaged. The RMS is to be articulated in a Risk Management Plan, a subordinate plan to the Engineering Plan which articulates the AEO's Engineering Management System [EMS]. The EMP and hence the EMS (which includes the AEOs RMS) is assessed as suitable by DTR-N as part of the HNE AEO authorisation process.[245]

4.19 The ANAO notes that, of the 20 projects in the audit sample, two projects have been assigned to ACAT I[246] and nine projects have been assigned to ACAT II.[247] DMO's 2004 Project Risk Management Manual specified the mandatory application of TRIMS for all such projects. DMO advised the ANAO in April 2011 that none of the projects included in this audit (all of which were underway during the period in which the 2004 Project Risk

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[244] Defence Materiel Organisation, DMO *Project Risk Management Manual (PRMM) 2010*, DMM (PROJ) 11-0-002 Version 2.2, p. 7.

[245] Defence advice to the ANAO 2 March 2011.

[246] SEA 4000 Ph 3 and JP 2048 Ph 4 A/B.

[247] SEA 1390 Ph 2.1, SEA 1442 Ph 3, SEA 1448 Ph 2A, SEA 1654 Ph 2A, JP 2008 Ph 3E, JP 2043 Ph 3A, JP 2070 Ph 2&3, AIR 87 Ph 2, and AIR 9000 Ph 2.

Management Manual requirement's applied) have implemented TRIMS.[248] It is not clear why the requirements of the 2004 Project Risk Management Manual were not applied or the rationale underpinning DMO's decision to remove the mandatory requirement for TRIMS from its 2010 Project Risk Management Manual.

4.20 While the DMO elected not to apply TRIMS to the ACAT I and ACAT II projects in the ANAO's sample, the agency has applied a commercial off-the-shelf risk management software program designed to assist cost and schedule risk analysis and the setting of contingency budgets. However, not having been specifically designed for retiring engineering process risk, this software lacks the engineering management system risk identification and mitigation features contained in TRIMS. Accordingly, the ANAO considers that there remains benefit in pairing such a risk management approach with a proven system of identification and mitigation of risk inherent in a project's Engineering Management System.

Materiel acquisition cost and schedule management

4.21 The primary goal of all Defence projects is to achieve their specified function and performance requirements on time and within budget. This requires each materiel acquisition project to be carefully planned and its progress monitored to ensure early departures from agreed schedules are detected and corrected. This has particular importance for the Capability Managers' overall responsibility for monitoring and coordinating all activities required to introduce the full level of operational capability into service according to schedules agreed to by government.[249]

4.22 In its 1986 Review of Defence Project Management the Joint Committee of Public Accounts (JCPA), recommended that:

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[248] Defence advice to the ANAO 4 April 2011.

[249] The Defence Procurement and Sustainment Review, recommendations 3.2, 3.3 and 3.4 state:

- Recommendation 3.2: As a fundamental principle, oversight and coordination of all elements necessary for the introduction of a capability should be exercised by the relevant Capability Manager;
- Recommendation 3.3: Defence should implement a framework, through the Capability Managers, to coordinate all the inputs to developing military capability; and
- Recommendation 3.4: Capability Managers should report regularly to Government on the status of the capability development initiatives for which they are accountable.

Department of Defence, *The Response to The Report of the Defence Procurement and Sustainment Review The Mortimer Review,* May 2009, pp. 25-27.

- A Cost Schedule Control System (CS^2) development program be introduced to assist Australian Defence contractors to upgrade their management information systems;[250]
- CS^2 must become the basis for cost and schedule reporting by contractors for all major projects; and
- Progress payments be geared to the submission of satisfactory CS^2 reports.[251]

4.23 In 2005, the ANAO reported that DMO's predecessor, the Defence Acquisition Organisation (DAO), had since 1995, sought to develop an automated Project Reporting and Monitoring System (ProMIS) to monitor and report each of its major projects' cost and schedule performance trends.[252] It was planned to have ProMIS in full operation by late 1998.[253]

4.24 The development of ProMIS continued after DAO became DMO in July 2000. In May 2001, ProMIS had not been implemented on schedule, and DMO was considering developing ProMIS further or using alternative systems.[254] In September 2002, DMO commenced developing a ProMIS replacement, which it called the Improved Project Scheduling and Status Reporting (IPSSR) program.[255] DMO intended to implement IPSSR in all major equipment projects by 2006,[256] to instigate cultural change in the way DMO projects were being managed, particularly with regard to project planning and scheduling. DMO sought to:

- achieve, within each DMO project, a properly maintained and monitored cost and schedule system based on Earned Value

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[250] CS^2 is the acronym for Cost/Schedule Control Systems Criteria, now known as the Earned Value Management System (EVMS).

[251] Joint Committee of Public Accounts Report 243, *Review of Defence Project Management*, 1986, Vol.1, pp. 73-76, 115,116.

[252] ANAO Audit Report No.45 2004–05, *Management of Selected Defence System Program Offices,* May 2005, pp. 14, 39-41.

[253] ANAO Audit Report No.24, 2001-2002, *Status Reporting of Defence Acquisition Projects,* Department of Defence, December 2001, p. 28.

[254] ibid.

[255] Department of Defence, Defence Materiel Organisation, *Improving Project Scheduling and Status Reporting for Acquisition Projects in the DMO: An Overview of IPSSR*, Edition 1, September 2003, p. 2.

[256] Defence Materiel Organisation, Maritime Systems Division, *Improved Project Scheduling and Status Reporting (IPSSR) Implementation Plan, Maritime Systems Division (MSD)*, April 2004, p. 12.

Management techniques. The system was to cover the project's entire scope, not just the work allocated to contractors; and

- provide monthly reports on each project's cost and schedule performance, including the forecast of cost and schedule at the project's completion.[257]

Earned Value Management (EVM) is an established commercial methodology aimed at encouraging better planning by suppliers and fostering joint ownership of contract performance by purchasers and suppliers. EVM is intended to achieve that outcome by providing performance data that:

- illustrates performance against a detailed plan of the entire contractual scope of work;
- reflects an objective measure of contract progress;
- aids in forecasting future cost and schedule outcomes; and
- assists informed and timely decision-making by providing an early indication of possible problem areas.

Source: Department of Defence, Defence Procurement Policy Manual, Version 5.0, June 2004, 3.4.

Earned Value Management Systems typically use a combination of progress measurement techniques to arrive at an objective measurement of progress. For example, DMO's Wedgetail AEW&C project's Earned Value Management System had some 9330 individual work and planning packages scheduled for completion by 2010. Progress on each work and planning package was typically measured using an earned value measurement technique selected from the following eight alternative techniques:

Measured earned value:

1. work package milestones;
2. quantifiable per cent complete;
3. assessed per cent complete;
4. usage-driven assessment;
5. rolling-wave assessment; and/or
6. labour standards.

Apportioned earned value:

7. scope for which planning and earned value measurement is directly related, and in proportion to, other measured effort control accounts/work packages.

Level of effort:

8. scope of a general or supportive nature that is impractical to measure; therefore, earned value is set to the budget value with the passage of time.

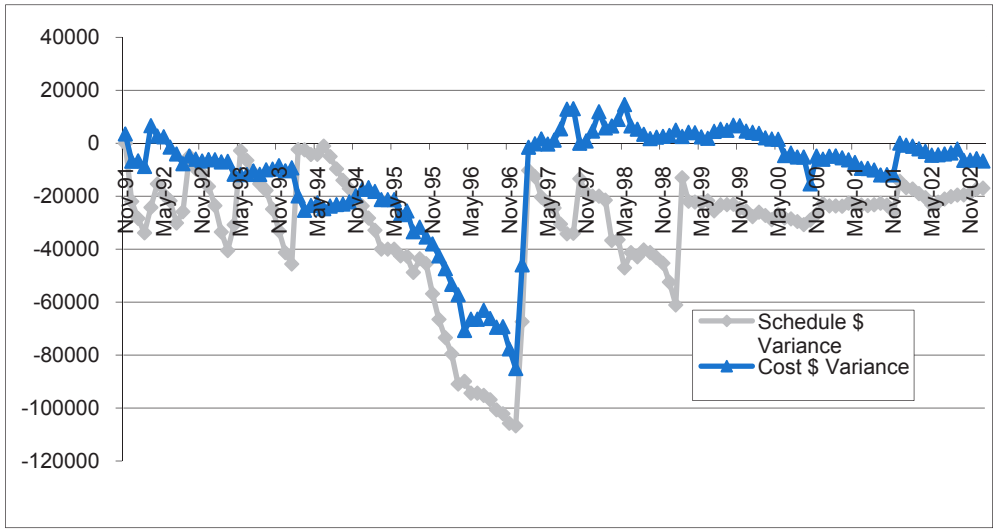
Source: ANAO Audit Report No.32, 2003-04, 'Wedgetail' Airborne Early Warning and Control Aircraft: Project Management Department of Defence, February 2004, p. 71.

[257] ANAO Audit Report No.45, 2004–05, *Management of Selected Defence System Program Offices,* May 2005*,* pp. 39-41.

4.25 The following figure provides an example of the use of an Earned Value Management system's ability to measure monthly cost and schedule variations in a complex system engineering project (the Jindalee Over the Horizon Radar (JORN) project), including the result of management initiatives to arrest cost overruns and schedule slippage.

Figure 4.3

JORN project cost and schedule variance trends



Source: Defence Materiel Organisation, 2005.

4.26 The schedule variance line in Figure 4.3 tracks the difference between the monthly cumulative planned or scheduled value of work, and the value of work actually completed. It reveals that between November 1994 and February 1997, for each month an average of $4 million of work scheduled was not completed. The chart shows management interventions to arrest cost and scheduled overruns were more successful from the beginning of 1999.

4.27 Table 4.2 lists the Earned Value Management status of the projects examined in the audit.

Table 4.2

Earned Value Management applied to each project as at April 2011

Project Number	Project Name	Contractor EVM Reports	Comments
SEA 1102 Phase 3A	Laser Airborne Depth Sounder	No	Not applicable, as the project's cost was below the $20 million threshold.
SEA 1348 Phase 3A	ANZAC Class Ships' Harpoon Missile Capability	Yes	
SEA 1390 Phase 2.1	FFG Upgrade	Yes	
SEA 1390 Phase 4B	FFG upgrade Standard Missile Replacement	No	Foreign Military Sales Case.
SEA 1401	Hydrographic Ships Project	Yes	
SEA 1405 Phase 1&2	Seahawk Helicopter FLIR-EWSP-ESM Capability	Yes (until 2004)	Earned Value Management removed from contract in 2004.
SEA 1429 Phase 2	New Heavyweight Torpedo	No	Memorandum of Understanding with the US Government.
SEA 1439 Phase 4A	Collins Class Submarine Replacement Combat System	No	Bulk of the work is through a Foreign Military Sales Case.
SEA 1442	Maritime Tactical Wide Area Network (MTWAN)	Yes	
SEA 1444 Phase 1	Australian Patrol Boat Replacement (APBR)	No	Received waiver on grounds that contract was sufficiently low risk and price would be lower without Earned Value Management.
SEA 1448 Phase 2A	ANZAC Class Anti-Ship Missile Defence	Yes	
SEA 1654	Maritime Operations Support Capability - HMAS *Sirius*	No	Purchased existing commercial tanker. Contract for modification was $63 million but low risk.

Project Number	Project Name	Contractor EVM Reports	Comments
SEA 4000	Air Warfare Destroyer (AWD)	Yes	
JP 2027	Landing Platform Amphibious	No	LPA's were purchased in 'as is' condition from US.
JP 2008 Phase 3E	Advanced Satcom Terrestrial Infrastructure System	No	Project states that Earned Value Management was not a DMO requirement at the time of project approval (Dec 99). This is incorrect. The requirements for EVM application were promulgated in DEFGRAM 315/1999. This confusion probably reflects the fact we are 12 years down the road and none of the original staff are around to comment.
JP 2043	High Frequency Modernisation	Yes	1997 Contract with Boeing contained Earned Value Management reporting and Payment by Earned Value (PBEV) clauses. PBEV was removed from the contract in 2004 following a rebaseline due to technical problems.
JP 2048 Phase 4A/B	Amphibious Deployment and Sustainment (LHD)	Yes	
JP 2070 Phase 2/3	Lightweight Torpedo	No	Earned Value Management was not applied to the Alliance contract arrangement.
AIR 87 Phase 2	Armed Reconnaissance Helicopter	Yes (until 2008)	Earned Value Management removed from contract in April 2008 following resolution of contractual dispute.
AIR 9000 Phase 2	Multi Role Helicopter	Yes	

Source: Defence Materiel Organisation.

4.28 Table 4.2 shows DMO has not implemented Earned Value Management on equipment procured through US Government Foreign Military Sales (FMS). This is because Defence funds the US Government to apply Earned Value Management when that is necessary for the particular equipment being sold.[258]

4.29 During the course of the audit, the ANAO sought to assess DMO's ability to accurately assess schedule performance in relation to the 20 projects considered. The ANAO, in seeking to make this assessment, first reviewed the project status reports that were provided to DMO's senior executives and to government. However, these project status reports lacked cost and schedule variance data of the kind provided by an Earned Value Management System that complies with a relevant standard.[259] Accordingly, in May 2010, the ANAO requested DMO to provide charts of each project's prime contractor cost and schedule variance, for each of the projects included in the audit. DMO provided Table 4.2, and only one cost and schedule variance chart and that was from the SEA 4000 Phase 3 Air Warfare Destroyer project.

4.30 Accompanying Table 4.2 was the following statement from DMO:

> Post 2006, the DMO has worked to improve the maturity of the schedules and reporting system that were put in place under IPSSR [the Improved Project Scheduling and Status Reporting program]. The focus has been on people, policy and tools. With regards to people, the Standardisation Office implemented a Project Schedule Analysts in Training (PSAiT) program in 2007. The PSAiT program is designed to develop a DMO talent pool of schedulers with scheduling, planning, analysis and earned value management skills. The nine month fast track development program aims to produce trainees with comparable skills, knowledge and exposure at the end of the program to a 2-3 year experienced scheduler.
>
> The planning and scheduling policy and procedures developed under IPSSR have been reviewed and developed since 2006. They are documented in DMH

[258] The US Department of Defense, and the firms on contract to Defense, use Earned Value Management as the basis for measuring, cost, technical and schedule performance of complex programs or projects. It combines both government management requirements and industry best practices to ensure the total integration of cost, schedule, and work scope aspects of contracts. Defense Acquisition University, *Defense Acquisition Guidebook,* May 2010, p. 40.

[259] Standards Australia, Australian Standard 4817-2006, *Project performance measurement using Earned Value,* January 2006. This replaces a 2003 version of the same standard and also replaced the Australian Defence Standard DEF (AUST) 5655, *Australian Cost/Schedule Control Systems Criteria; Standard*, October 1992. The international standard is ANSI/EIA-748-A-1998, *Earned Value Management System*.

(PROJ) 11-0-001 DMO Scheduling Handbook, DMM (PROJ) 11-0-001 DMO Project Management Manual (PMM) and a number of Defence Materiel Standard Procedures (DMSP). Both the PMM and the scheduling DMSPs are the subject of a current review and update process, managed by the Directorate of Project Management in DMO's Standardisation Office.[260]

4.31 The progress measurement, reporting and payment strategies adopted by DMO increasingly over the last decade, are no longer based on CS^2 (now known as EVMS), to the extent recommended by the Joint Committee of Public Accounts in 1986.[261] Rather DMO provides progress measurements and payments based on a mix of engineering and production metrics, software metrics, cardinal milestones, and a suite of project performance metrics based on Earned Value Management-like principles. In June 2011, DMO advised that ANAO that:

> ...the DMO standard ASDEFCON templates are designed to allow for this in the delivery of a management plan, noting that there is acknowledgement that the measures will change depending on the contract life-cycle. For example, in the test phase the number of problem reports and their rate of closure would be more useful than measures used early in the contract.
>
> EVM on its own will not improve acceptance into service. Other tools such as clear requirements and traceability of requirements are often more important than EVM.[262]

4.32 In May 2011, DMO advised the ANAO that DMO's Guide to Earned Value Payments indicates that:

- milestone payments provide DMO Project Managers with better leverage over Contractors;
- the review of monthly earned value payment claims from Contractors is difficult to resource (monthly claims can involve progress against hundreds of Work Packages); and
- Payment by Earned Value provides temptation for Contractors to front load baselines or perform out of sequence work in order to maintain cash flow.[263]

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[260] Defence advice to the ANAO 15 April 2011.

[261] Joint Committee of Public Accounts, Report 243, *Review of Defence Project Management*, Vol. 1 Report, 1986, pp. 73-76, 115,116. See also Defence advice on CS^2 implementation Department of Defence, *Defence Annual Report 1989-90*, pp. 51, 52.

[262] Defence advice to the ANAO, *DMO Additional Information and Proposed Amendments – Revised S.19 Summary*, 8 June 2011.

4.33 The ANAO notes that for the projects considered in the course of this audit, DMO's mix of progress measurement techniques, together with its Improved Project Scheduling and Status Reporting program, has not progressed to the extent that it sufficiently addresses all Earned Value Management System functions, particularly with respect to graphically presenting cost and schedule performance such as that shown in Figure 4.3.[264] Schedule performance information is of particular importance to Navy in terms of scheduling the development of non-materiel elements of capability, including the provision of adequately trained Navy personnel to crew new and upgraded naval assets. This proved particularly problematic in the case of the SEA 1390 Phase 2.1 FFG Upgrade Project, when protracted contract schedule slippages increased the risk that Navy would be unable to provide crews with adequate system and equipment manuals and operator or maintainer training.[265]

4.34 The crewing of the two JP 2048 Amphibious Deployment and Sustainment ships, and the three SEA 4000 Air Warfare Destroyers currently being constructed, will be significantly more demanding than the Navy's crewing of the upgraded FFGs.[266] Consequently, the delivery schedules for these ships will need to be accurately assessed and contingency plans in place to ensure crewing needs are achieved, and the Navy's operational test and evaluation process is able to efficiently and effectively proceed.

Test and evaluation of evolving designs and products

4.35 DMO is responsible for developing Test and Evaluation Master Plans that set out how the test and evaluation strategy used by DMO Project Offices

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263 Department of Defence, DMO, Navy & CDG, *Additional Information and Proposed Amendments*, 24 May 2011, p. 19.

264 Project progress measurement techniques need to be selected with a view to maintaining an accurate and holistic perspective on contractual progress. They need to be applied to not only equipment deliveries, but also to logistics items that relate to equipment reliability, availability and maintainability, including configuration management. A key lesson learned by DMO on the SEA 1390 Ph 2.1 FFG Upgrade project, was that milestones which enable use of the equipment and supplies (such as integrated logistics support and training) should be given similar weight as delivery of the equipment itself. ANAO Report No.17, 2010-11, 2009-10 Major Projects Report Defence Materiel Organisation, November 2010, pp. 263, 264

265 ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, pp. 76-78.

266 ANAO Audit Report No.11, 2007-08, Management of the FFG Capability Upgrade Project, Department of Defence, Defence Materiel Organisation, October 2007, pp. 77, 78.

and Navy will verify and validate Mission System and Support System compliance against defined requirements. These master plans are to enable System Acceptance to be based on progressive technical reviews and tests and evaluations, performed by suitably qualified organisations or personnel using appropriate acceptance criteria. Given the importance of these plans, Navy policy requires them to be endorsed by the Director of the RAN's Test, Evaluation and Acceptance Authority (DRANTEAA).[267]

4.36 The ANAO examined the Test and Evaluation Master Plans for the 17 Navy projects included in the audit, that remained in their acquisition phase, and found:

- eight projects had DRANTEAA endorsed Test and Evaluation Master Plans;[268]
- eight projects did not have an approved Test and Evaluation Master Plan as they had progressed well beyond that requirement;[269] and
- one project, JP 2070 Lightweight Torpedo project, required a Test and Evaluation Master Plan, and this was being developed at the time of the audit.

4.37 The two Army projects included in the audit, AIR 87 and AIR 9000, have Test and Evaluation Master Plans, endorsed by the DMO Aeronautical Systems Division's Chief Engineer (Acquisition), and the MRH Program Director respectively. At the time of the audit the AIR 87 Tiger Helicopters had commenced limited First of Class Flight Trials involving operations from Navy platforms.[270] These trials related to only deck handling alongside and at sea.

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[267] Royal Australian Navy, ABR 6205, *The Naval Operational Test and Evaluation Manual (NOTEMAN*), October 2003, Chapter 1. Royal Australian Navy, ABR 6205, *The Naval Operational Test and Evaluation Manual (NOTEMAN*), Edition 4 January 2011, Annex A to Chapter 3.

[268] SEA 1102 Ph 3A, SEA 1405 Ph 1 & 2, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1448 Ph 2A, SEA 4000 Ph 3, JP 2043 Ph 3A, and JP 2048 Ph 4A/B.

[269] SEA 1390 Ph 2.1 and 4, SEA 1348 Ph 3, SEA 1401–Survey Motor Boats, SEA 1442 Ph 3, JP 2008 Ph 3E, SEA 1654–HMAS *Sirius*, JP 2027–HMA Ships *Manoora* and *Kanimbla.* SEA 1444–Armidale Class Patrol Boat project.

[270] First of Class Trials are those trials, including First of Class flight trials, designed to:

- measure and record the actual performance envelope of new equipment, systems and units independent of operator performance;
- establish a baseline against which future performance of equipment can be tested; and,
- be part of test and evaluation conducted during the naval test, evaluation and acceptance period.

Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual*, Revision 4, January 2011, Glossary.

The alongside trials had been conducted but were curtailed due to Landing Platform Amphibious (LPA) unserviceability. The Navy's Aircraft Maintenance and Flight Trials Unit (AMAFTU) completed the AIR 9000 MRH-90 First of Class Flight Trials involving an LPA in October 2009. Planned operational test and evaluation is currently delayed by the non availability of an LPA and ongoing aircraft certification issues regarding the aircraft's Inertial Reference System, landing gear certification for embarked operations, and ongoing engine reliability issues.

4.38 At the time of the audit, JP 2070 Lightweight Torpedo project was receiving performance information from the other nations involved with the MU90 lightweight torpedo development program. Consequently, the JP 2070 project's Test and Evaluation Master Plan was being revised as its test and evaluation requirements were becoming more clearly defined.

Progressive verification and validation

4.39 As Defence major systems are often technologically complex, costly, and take many years to deliver, it is Defence policy that the acquisition of these systems proceed on a firm foundation of:

- defined requirements;
- progressive design reviews; and
- tests and evaluations that seek to verify and validate compliance with contracted requirements.

Verification is defined as: confirmation by examination and provision of objective evidence [through test and evaluation procedures] that specified requirements to which a product or service, or aggregation of products and services, is built, coded, assembled and provided have been fulfilled. [ISO9000:2006 *Quality Management System Fundamentals*]. Put simply, verification is a process for proving that product designs and development comply with specified function and performance requirements. See glossary of terms, p. 231.

Validation is defined as: proof through evaluation of objective evidence that the specified intended end use of a product or system is accomplished in an intended environment. Put simply, validation is used to determine whether or a not a system, product, or service is operationally effective and suitable.

4.40 DMO Project Office personnel are required to confirm contractual compliance of design requirements through documented traceability of requirements during the design process, and documented verification of those requirements during the construction process. This may involve project

personnel attending contractor-conducted System Requirements Reviews, System Definition Reviews,[271] Preliminary Design Reviews and Detailed Design Reviews.[272] The intention is to confirm that contractual design requirements, as set out in acquisition contracts' statements of work, have been factored into the design process. Once designs are complete, test and evaluation of final products commences with the view of verifying and validating that all Mission System and Support System design operational requirements have been met.

4.41 Project records should be maintained to confirm that the detailed Mission System and Support System requirements have been derived from, and can be traced to, the function and performance requirements established by the Operational Concept Document and the Function and Performance Specifications. They also should confirm, through agreed systematic and progressive verification and validation, that design and operational requirements have been met. The specific technical elements which need to be verified and validated to achieve the Operational Release of a new or upgraded capability are outlined in the Test Concept Document.[273]

4.42 Progressive verification and validation effort during a project is directed to ensuring that contractors maintain an appropriate degree of oversight and control over the evolving system's design and production, so that risks and issues may be resolved before the system is presented by the contractors for System Acceptance by DMO. The aim is to detect and mitigate risks and adverse issues that may result in costly and time consuming redesigns, production reworks and the subsequent need for regressive test and evaluation later in the system development process.

4.43 The importance of this risk reduction strategy is illustrated in Figure 4.4. This figure shows that it may be extremely costly to fix requirements or design defects found late in a project's design and test phase. This underscores the critical importance of systems engineering processes that incorporate system definition and design reviews and progressive verification

[271] Defence Materiel Organisation, *DMO Acquisition Manual and Sustainment Manual,* 2007, pp. 71, 75. See also Defence Material Organisation, *ASDEFCON Checklist* SSR V1.2 and SDR V1.2.

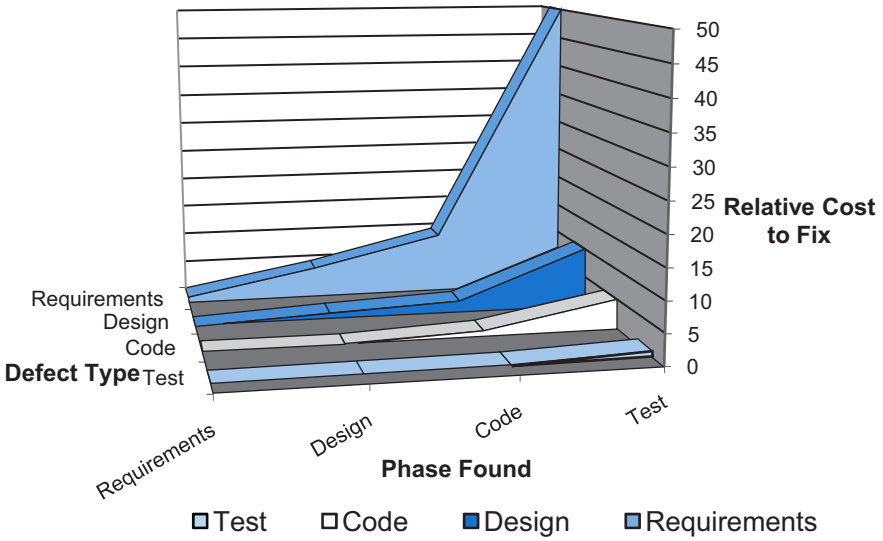
[272] See Appendix 1–Glossary of Terms, which lists these design reviews, and subsequent test and evaluation, in the order in which they occur.

[273] Department of Defence, Defence Instructions (General) OPS 45-2*, Capability Acceptance into Operational Service*, February 2008, p. 2.

and validation of a system's compliance with specified requirements. The intent should be to detect and correct requirements and design defects as early as possible, while there remains sufficient financial and schedule resources to correct the defects. Figure 4.4 also underscores the importance of a project cost and schedule variance monitoring system capable of quickly detecting delays in interpreting requirements and in achieving designs that comply with their specifications.

Figure 4.4

Relative cost to fix defects found at each system development phase



Source: Adapted from J.B. Dabney and G. Barber, Titan Corporation, Direct Return on Investment of Software Independent Verification and Validation: Methodology and Initial Case Studies, June 2003.

4.44 A significant concern of any project is the risk of not conducting the verification and validation procedures capable of timely detection of requirements and design defects.[274] An integral part of the project requirements definition process is the System Definition Review that includes a process to

[274] At, or around System Definition Review (SDR), the Verification Cross Reference Matrix (VCRM) is agreed with the contractor and the verification methods are contractually binding and require a Contract Change Proposal for change. The contractor completes the VCRM progressively as the V&V program progresses. The project office must ensure that the VCRM states the appropriate verification method to be used for all requirements and must ensure that it is updated to accurately reflect the current status of system verification. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. 36.

gain agreement between CDG, DMO and Navy on the verification and validation procedures considered.

4.45 As mentioned in Chapter 2, since 2002, Defence has sought to strengthen the alignment between DMO's major system development processes, and the Terms and Conditions and Statement of Work set out in defence system acquisition contracts.[275] This alignment is intended to achieve efficient and effective integration of all engineering disciplines involved in the execution of a systems acquisition contract, including the setting out of the respective accountabilities of the parties, as outlined in Figure 4.5.

Figure 4.5

ASDEFCON (SM) Concept of Clear Accountability in Design

The Clear Accountability in Design (CAID) strategy seeks to balance cost, schedule, and performance risks while keeping Defence project team resource needs to a minimum. The approach taken is based on two key elements:

(a) Defence controls the contracted requirements at the Function and Performance Specification and Mission and Support System Specifications levels, in order to manage the risks associated with ensuring requirements completion through exercising approval rights over the Prime Contractor's requirements Verification Cross Reference Matrix and test and evaluation programmes; and

(b) the Prime Contractor controls lower level requirements and the design in order to implement cost, schedule, performance, and risk-based business decisions. This is unless Defence has a specific need to control them.

Source: ANAO's analysis of the Defence Materiel Organisation, *ASDEFCON (SM) Handbook*, Volume 2, *Draft Statement of Work*, March 2002, Section 10.4

4.46 The Clear Accountability in Design (CAID) strategy provides Defence with much improved safeguards over the requirements verification process. It provides DMO Project Directors with authority to approve or reject the content of contractor acceptance test plans, procedures or test reports. This reduces the risk of DMO project's being unable to meet their responsibility of ensuring products offered for acceptance have been adequately tested and evaluated against the contractual requirements.

4.47 Nine of the projects included in the audit were established before March 2002, under the Defence Purchasing 101 (DEFPUR 101) suite of

[275] Electronic Industries Association, EIA-632 - *Processes for Engineering a System*, January 1999; and ASDEFCON (SM). In March 2002, Defence published ASDEFCON (SM) to assist drafters in preparing Requests for Tender for acquisition projects. ASDFECON provides extensive advice and instructions concerning acquisition contract drafting, and details mandatory entry and exit criteria for system design reviews, test and evaluation processes and contractual acceptance. ASDEFCON's publication was sponsored by the DMO. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004.

contracting templates.[276] Accordingly, the acquisition contracts for these projects to varying degrees lacked the systems engineering safeguards provided by the post March 2002 Australian Standard Defence Contracting (Strategic Materiel) (ASDEFCON (SM)) contracting templates.[277] These latter templates contain the 'Clear Accountability in Design' strategy (outlined in Figure 4.5) not found in DEFPUR 101.

Managing compliance with requirements

4.48 The key document for managing compliance with contract requirements is the Verification Cross Reference Matrix. Systems engineering standards and DMO system acquisition contracts, involving the design and development of Mission Systems, require contractors to produce a Verification Cross Reference Matrix that cross references the contracted requirements with the procedures by which compliance with those requirements are to be, or have been, verified.[278]

4.49 DMO's systems engineering standard requires the recording of verification results in accordance with acquirer-supplier agreements, verification plan instructions or product directives or procedures.[279] Verification Cross Reference Matrices, complete with verification results, are relied upon during the materiel certification process to provide objective evidence that contractors have complied with contractual specifications, standards and requirements.[280]

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[276] SEA 1348 Ph 3, SEA 1390 Ph 2.1, SEA 1401 Ph 2 – Survey Motor Boats, SEA 1405 Ph 1&2, SEA 1429 Ph 2, SEA 1444 Ph 1, JP 2027 Ph 1&2, JP 2043 Ph 3A and AIR 87 Ph 2. DEFPUR 101 Version 46 1999, focused mainly on guidance on conditions of tender and conditions of contract, and provided only a two page guideline on what a Statement of Work may include.

[277] ANAO Audit Report No. 45, 2004-05, *Management of the Selected Defence System Program Offices,* Department of Defence, May 2005, pp. 72, 73. ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, pp. 13-16, 58, 59.

[278] The Verification Cross Reference Matrix (VCRM) should provide complete traceability between each Function and Performance Specification and Operational Concept Document requirement, and derived requirement, and each corresponding test item, test procedure, and test report. Defence Materiel Organisation, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Part 3 Draft Statement of Work, Sect. 7.1.3. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004.

[279] Electronic Industries Association, EIA-632 - *Processes for Engineering a System*, January 1999, pp. 102-104.

[280] Defence Materiel Organisation, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Part 3 Draft Statement of Work, Sect. 7.1.3. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004.

4.50 DMO Project Office personnel are required to review and, if it is acceptable, approve the Verification Cross Reference Matrix, along with the underlying Acceptance Test Plans, Acceptance Test Procedures, and the eventual Acceptance Test Reports that yield the verification results. Project personnel are also required to witness acceptance tests conducted by the contractors.[281]

4.51 Progressive verification is to be managed through the use of Dynamic Object Orientated Requirements System (DOORS®) verification management software,[282] mandated by the DMO as the requirements-management and design traceability tool to be used for managing requirements for its complex strategic materiel projects.

4.52 The ANAO found that of the 20 projects included in the audit:

- 11 had an approved Verification Cross Reference Matrix;[283]
- nine DMO Project Offices maintained records of the requirements verification status, and provided the ANAO with relevant verification statistics;[284] and
- eight projects did not have an approved Verification Cross Reference Matrix nor were they able to provide the ANAO with statistics on the number of requirements verified as complying with contracted specifications.[285]

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281 Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, p. 74.

282 The use of DOORS® is mandated in the DMO as the requirements-management tool to be used for managing requirements for all ASDEFCON Strategic Materiel and Complex Materiel Vol. 2 projects.

Although not mandated for Complex Materiel Vol. 1 ASDEFCON templates (i.e. small Minor projects), DMO recommends that DOORS® be used for these as well. Attempts to use applications such as Microsoft Word® or Excel® are not encouraged by DMO, since these applications do not enforce the rigour necessary for requirements management, nor do they make it easy to establish and maintain traceability. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, p. 27. Defence Materiel Organisation, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Vol. 2, 4-30. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004.

283 SEA 1102 Ph 3A, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1442 Ph 3, SEA 1448 Ph 2A, SEA 1654 Ph 2S, SEA 4000 Ph 3, JP 2043 Ph 3A, JP2048 Ph 4A/B, AIR 87 Ph 2 and AIR 9000 Ph 2.

284 SEA 1390 Ph 2.1, SEA 1429 Ph 2, SEA 1439 Ph 4A, SEA 1442 Ph 3, SEA 1448 Ph 2A, SEA 1654 Ph 2A, JP 2043 Ph 3A, AIR 87 Ph 2 and AIR 9000 Ph 2.

285 SEA 1348 Ph 3, SEA 1390 Ph 4B, SEA 1401 Ph 2 – Survey Motor Boats, SEA 1405 Ph 1&2, SEA 1444 Ph 1, JP 2008 Ph 3E, JP 2027 – LPA, and JP 2070 Ph 2&3.

4.53 At the time of the ANAO's visit to each project as part of the audit, there were no DMO project personnel available able to assist with corroborating requirements verification procedures and compliance statistics, using direct references to current data residing in approved DOORS® databases. This is an indication that there were insufficient personnel in DMO trained and experienced in the use of Verification Cross Reference Matrix management using DOORS®, which is mandated by DMO for use in all ACAT I and ACAT II projects.[286] The ANAO found some projects to be using other various ad-hoc requirements management systems based on spreadsheets and databases developed by project personnel.[287]

4.54 Records of the management of requirements have particular importance within the ADF's technical regulatory system, which specifies that data applied to and derived from such technical activities must be authoritative, accurate, appropriate and complete. Such data must always be accessible, though it need not be retained in-house.[288]

4.55 DMO advised the ANAO in February 2011, that:

> There is no central repository that collects DOORS® training competencies within DMO. This is due to all extant DOORS® training being provided by external providers. This situation is being addressed via the newly DMO developed Requirements Management course which gives both theoretical and practical usage of the DOORS® tool. This requirements course is due to be rolled out early 2011.
>
> Currently there are 1848 users of DOORS®.
>
> Currently there is no assurance activity associated with the use of DOORS®, however it is being considered to become a metric within DMO. This metric would be utilised to influence the update of the

[286] Although not mandated for ACAT III and ACAT IV projects, DMO recommends that DOORS® be used for these projects as well. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, p. 27.

[287] This practice is not encouraged by DMO's senior management, since it does not enforce the rigour necessary for requirements management, nor does it make it easy to establish and maintain traceability between the requirements specified in the function and performance specifications, and their derived requirements allocated to systems specifications and Support Systems specifications. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008. p. 27.

[288] Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, p. 4. Department of Defence, Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 3.

Requirements Management Policy in particular the assessment for the requirement for the mandatory use of DOORS® for ACAT I and II projects.[289]

Recommendation No.2

4.56 The ANAO recommends that Defence improves its requirements management processes, by ensuring that:

(a) only approved requirements management systems are used by Defence personnel; and

(b) Defence personnel accessing those systems are adequately trained in their use.

Defence response

4.57 Defence agreed to the recommendation and stated as follows:

a) There is a current Defence Materiel Instruction titled "Requirements Engineering" which outlines best-practice policy and guidance on the full spectrum of Requirements Engineering. Currently this only has authority within the DMO; however, Defence will ensure that it is effective across the Defence Organisation.[290]

b) In 2010, the DMO developed and piloted a Requirements Management course. Future courses will be scheduled via the DMO Institute training schedule and will be made available to all Defence personnel who need training on approved Requirements Management systems.

[289] Defence advice to the ANAO 23 February 2011, Attachment: Second Draft Confirmation Paper Operational Release of Naval Capability: Requests for Information (RFIs), pp. 2, 3.

[290] The ANAO notes that the DMO Requirements Engineering instruction (Defence Materiel Instruction (ENG) 12-03-001, *Requirements Engineering*, February 2011), requires amendment to include the System Definition Review process (paragraphs 27, 4.44, 4.61, 4.107, 7.52). It needs to also include Defence's agreement to Recommendation 8 (paragraphs 7.54 and 7.55), which requires both the acceptance verification and validation program and the operational test and evaluation program to be formally endorsed by CDG, DMO and Navy prior to materiel contract signature, and then be managed within an authorised Configuration Management process.

Acceptance Testing and Issue Papers

4.58 As a system undergoes its design and development phase, development test and evaluation activities aim to provide progressive verification and validation that the evolving design meets its specified design and operational requirements. This phase is concerned chiefly with verifying the achievement of engineering design goals, through development test and evaluation, and validating the operational effectiveness of the new or upgraded capability through operational test and evaluation.

4.59 Although there are often separate development and operational test and evaluation events, they need not necessarily occur sequentially. They may be combined or held concurrently and this is encouraged when appropriate to save time and costs.[291]

4.60 It is DMO policy that Capability Manager Representatives are invited to attend acceptance tests, to provide input on the performance of the system against contractual requirements, and to provide operator advice.[292] As many functional performance requirements may be verified and validated during acceptance test and evaluation by inspections and demonstrations, the attendance of Capability Manager Representatives can allow simultaneous development test and evaluation and operational test and evaluation.

4.61 ANAO's examination of Defence records indicate that this degree of integration is not consistently occurring, with the knock-on effect of delaying Navy's completion of operational test and evaluation and regulatory reviews. For example in December 2009, Navy regulators remained concerned about the veracity of FFG Upgrade certificates presented by DMO to Navy, even though the first upgraded FFG commenced sea trials in 2005.[293] These concerns may have been alleviated if there had been better integration of DMO and Navy test and evaluation teams and regulatory review teams during the project's verification and validation phase. In particular, it is highly desirable that DMO and Navy use the System Definition Review process to agree on verification

[291] US Department of Defense, Defense Acquisition University, *Test and Evaluation Management Guide (4th edition)*, The Defense Acquisition University Press, Virginia, 2001, p. 2.1.

[292] Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, p. 74.

[293] Defence Materiel Organisation, *Report of the Materiel and Equipment Performance State (TI-338) of HMAS Sydney FFG-03 FFG Upgrade Project Sea 1390 Initial Operational Release Phase 3*, 9 November 2009. [Classified Report].

and validation procedures prior to DMO commencing its verification and validation program. This would enable verification results to be better understood and utilised by Navy during operational test and evaluation, and regulatory review.

4.62 Where testing and evaluation relates to, or reveals, issues regarding seaworthiness, Navy would benefit from an Issue Paper process that would record, in a single document, all information relating to a particular seaworthiness issue. The ANAO was unable to locate within Navy's technical or safety regulation manuals a policy or process dealing with such technical or safety issues in this manner.[294]

4.63 By contrast, the ADF's Technical Airworthiness Management Manual requires airworthiness regulators or DMO project offices to raise Issue Papers, to ensure visibility of all airworthiness issues judged to be significant enough to require the recording of their resolution. Under these arrangements, DMO project offices are required to maintain an Issue Papers register and to ensure that, as with all design requirements that form the Certification Basis, significant issues are resolved before a Type Certification recommendation is made. Issue Papers which are not resolved, but which do not preclude a Type Certification Recommendation, are to remain open and be presented to the Airworthiness Board.[295] This iterative process commences when issues are first discovered.

4.64 However, this does not occur in Navy projects. Instead, safety and seaworthiness issues are entered by DMO personnel into hazard logs, Safety Case Reports and TI-338s and provided to Navy regulators often less than six months prior to scheduled Initial Operational Release dates (see paragraphs 5.31 to 5.37).[296]

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[294] Department of Defence, Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Department of Defence, Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual* 2002. Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual* Edition 4, 2007.

[295] Department of Defence, Australian Air Publication (AAP) 7001.053, *Technical Airworthiness Management Manual*, 15 February 2002, Sect. 3 Chapter 12 (AL3), p. 10.

[296] In order to obtain appropriate reviews, and regulatory endorsement that the hazards are so far as possible identified and mitigations appropriate, the Safety Case Report should be presented a minimum of six months prior to Initial Operational Release. Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* January 2009, Part 1, Chapter 11, paragraph 9. Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual*, Revision 4, January 2011, Chapter 5 Annex A, paragraph 22.

4.65 This is less timely and effective than the airworthiness process of raising and monitoring Issue Papers. In February 2011, Defence advised the ANAO that the airworthiness process of Issue Papers has been observed as being effective in aviation projects, and that it could be considered for application to maritime projects. However, as Navy utilises the Safety Case methodology to trace and demonstrate hazard management the Issues Paper process would need to be integrated or at least be complementary to the Safety Case.

4.66 At the time of this audit, Navy commenced establishing Seaworthiness Boards. This is an important initiative to support the Chief of Navy in his duty of care to provide a safe working environment, as well as his other capability management responsibilities. These Boards are based on a process which defines the condition of a ship or submarine and its fitness for sea. Members of the Seaworthiness Board are senior, appropriately experienced and respected individuals who are independent of the chain of command and line management. The Board considers aspects of Operational Seaworthiness, Technical Seaworthiness and Safety to form a judgement on the overall health of the maritime platform. The Board makes no judgement on mission-worthiness, but may recommend operational limitations or other risk reduction strategies to the Chief of Navy should they be warranted. The Seaworthiness Boards also provide an effective feedback mechanisms for managing risk during the Navy capability in-service phase.

4.67 The ANAO examined a range of submissions made to the HMA Ships *Manoora* and *Kanimbla* Seaworthiness Board and found that Navy would benefit from adopting a system similar to the Airworthiness Issue Papers process, particularly in terms of ensuring that all information relating to a particular seaworthiness issue and its resolution is recorded in a single document.

Recommendation No.3

4.68 The ANAO recommends that, in order to improve their efficiency and effectiveness, Defence streamline and integrate its processes for system verification and validation, acceptance into service and regulatory review. This should include ensuring that:

(a) Navy operational test and evaluation teams witness relevant acceptance testing, and in particular validation testing of systems in their intended environment;

(b) DMO provides Navy with access to its requirements management systems, improving Navy's visibility of the status of the naval Materiel Systems under development and acceptance test and evaluation; and

(c) DMO and Navy require Project Engineers, in their capacity as Design Acceptance Representatives, to provide Issue Papers regarding all mission critical and safety critical requirements found to be non-compliant to Head Navy Engineering.

Defence response

4.69 Defence agreed to the recommendation and stated as follows:

a) Navy personnel are actively participating in the relevant acceptance testing which has been emphasised as a key requirement in the updated policy reference ABR 6205 for Naval Operational Test and Evaluation, issued on 27 January 2011. The process improvements in this reference are now being implemented.

b) There are no barriers to the sharing of appropriate information between the DMO and Navy. DMO will ensure that Navy and the other Capability Managers are provided with access to its requirements management systems.

c) Head Navy Engineering (HNE) as the Navy Technical Regulatory Authority is appropriate to review and accept mission safety critical requirements. A Technical Directive shall be issued by HNE to Design Acceptance Representatives to implement this recommendation.

Configuration Management

4.70 DMO is responsible for establishing a configuration management system for all new and upgraded Navy Mission and Support Systems and for maintaining the configuration status during the in-service phase. Configuration Management is fundamental to the management of a Mission System's technical integrity and logistics support. It is the means by which the functional and physical states of equipment are recorded, communicated and controlled.[297] It is Defence policy that all ADF materiel acquisition projects shall include a requirement for precise definition and verification of the

[297] Department of Defence, Defence Instructions (Navy), LOG 47-3, *Regulation of technical integrity of Australian Defence Force maritime materiel*, January 2009, p. 5.

configuration at the point of acceptance.[298] Satisfying this requirement entails a Configuration Management system that:

(a) identifies and documents the physical and functional design characteristics;[299]

(b) controls changes to design characteristics via a documented configuration control process;

(c) records, maintains and reports the design status information for physical items and their associated configuration documentation; and

(d) audits the design (and subsequent changes) to verify compliance to specified functional and physical criteria.[300]

4.71 The Physical and Functional Configuration Audits and System Verification Reviews are intended to verify that Navy capability hardware or software items conform to their specified functional and physical criteria.[301]

4.72 DMO System Program Offices are responsible and accountable for:

(a) the acquisition of configuration data and implementation of follow-on support contracts to support all new or modified materiel;

(b) defining, funding and implementing new or upgraded processes for the management and distribution of configuration data;

(c) maintaining the integrity, currency and quality of configuration data; and

(d) ensuring that acquired configuration data and supporting infrastructure complies with this policy and is compatible with the wider technical data management framework.[302]

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298 Department of Defence, DI(G) LOG 08-4 – *Defence Policy on Configuration Management*, October 2003, p. 1

299 The characteristics are specified in increasing detail from the very general to the very detailed.

300 Department of Defence, DI(G) LOG 08-4 – *Defence Policy on Configuration Management*, October 2003, pp. 1, 2.

301 Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 2 Sect. 2 Chapter 4, p. 7. Department of Defence, Defence Instructions (General) LOG 08-4, *Defence Policy on Configuration Management*, October 2003, p. 3. More complete descriptions of Physical and Functional Configuration Audits, and System Verification Reviews are provided in Appendix 5 of this report.

302 Defence Instructions (General) LOG 08-4, *Defence Policy on Configuration Management*, October 2003, p. 2.

Functional Configuration Audits

4.73 Functional Configuration Audits form part of the System Acceptance process, and are relied upon for verification that each configuration item in the major system has satisfactorily acquitted the functions it is intended to perform.[303]

4.74 In particular, Functional Configuration Audits are conducted for the first production item to be successfully completed, to determine that all requirements established in the specifications, associated test plans, and their related documents have been tested and that the item has passed the tests, or otherwise that corrective action has been initiated. For very large systems, functional configuration audits are usually conducted in incremental stages. A final summary Functional Configuration Audit may also be necessary to ensure that component parts are properly integrated.[304]

Physical Configuration Audits

4.75 Physical Configuration Audits are conducted on the completion of, or concurrently with, Functional Configuration Audits. They examine whether the first production item to be successfully completed physically complies with design and construction drawings and that all support documentation is complete and satisfactory. Physical Configuration Audits also test whether the production item's prescribed acceptance testing requirements are adequate.[305] Once these physical audits are successfully completed, and the production item is included in the Product Baseline, all subsequent engineering of design changes to the item must be processed and approved through a formal engineering change action.[306]

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303 Department of Defence, Defence Instructions (General) LOG 08-4 – *Configuration Management of Systems and Equipment,* April 2007. Defence Materiel Organisation, *DMO Acquisition Manual and Sustainment Manual*, 2007, p. 75. Defence Materiel Organisation, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Part 3, Sect. 6.7. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004. Electronic Industries Association, EIA-632 - *Processes for Engineering a System*, January 1999, Sect. 4.2.3. United States (US) Military Standard (MIL–STD) 973, *Configuration Management,* April 1992, pp. 12-14.

304 Department of Defense, Military Handbook – 61A, *Configuration Management Guidance*, February 2001, Sect. 8.2.2.1. United States (US) Military Standard (MIL–STD) 973, *Configuration Management*, April 1992, pp. 12, 67-84.

305 United States (US) Military Standard (MIL–STD) 973, *Configuration Management,* April 1992, p. 12.

306 Department of Defense, Military Handbook – 61A, *Configuration Management Guidance*, February 2001, Sect. 8.2.2.2. United States (US) Military Standard (MIL–STD) 973, Configuration Management, April 1992, pp. 14, 74-100.

4.76 In addition, configuration changes to the hull or machinery of a naval vessel that is the subject of a Classification Society certification, should also be submitted to the Classification Society for approval, and during execution be inspected by the Classification Society's surveyors to ensure the configuration changes satisfy the requirements of the Classification Society. Navy and DMO's reliance on Classification Societies is discussed in Chapter 5.

4.77 The ANAO found that of the 13 Navy projects considered in the course of this audit that had achieved Naval Initial Operational Release, or Operational Release:

- eight projects provided records concerning completed Functional Configuration Audits;[307] and
- nine projects provided records concerning completed Physical Configuration Audits.[308]

4.78 These results indicate inconsistency in the application of configuration management in DMO, including the need for improved configuration audit record keeping. Past ANAO audits have indicated configuration management to be particularly problematic in Navy projects, and that recovery from configuration audit deficiencies may take years.[309]

4.79 Inadequate records of the configuration status of systems offered by DMO for Initial Operational Release or Operational Release contributes to delays in the regulatory review process. These delays are caused when Navy regulators seek additional information from DMO in order to establish compliance with Navy regulations and, more generally, to assess the level of risk to the accuracy of evidence provided to Navy in support of the technical, operational and safety review process.

4.80 Incomplete or inconsistent configuration audits also place RANTEAA in the position of being uncertain of the extent to which systems presented by DMO for Navy operational test and evaluation have competed their

[307] The five Navy projects that did not provide Functional Configuration Audits records were SEA 1401 Ph 2 – Survey Motor Boats, SEA 1444 Ph 1, SEA 1654 Ph 2A, JP 2008 Ph 3E and JP 2027 Ph 1&2.

[308] The four Navy projects that did not provide Physical Configuration Audit records were: SEA 1102 Ph 3A, SEA 1401 Ph 2 – Survey Motor Boats, SEA 1654 Ph 2A and JP 2027 Ph 1&2.

[309] ANAO Audit Report No. 45, 2004-05, *Management of the Selected Defence System Program Offices,* Department of Defence, May 2005, pp. 77-78. ANAO Audit Report No. 11, 2007-08, *Management of the FFG Capability Upgrade*, Department of Defence, Defence Materiel Organisation, October 2007, pp. 64-66.

development phase. They also place the Commanding Officers of RAN ships in a difficult position, since they are responsible for ensuring that no unauthorised configuration changes to their ship are undertaken.[310] Without a system's functional and physical configuration being completed by DMO at System Acceptance, Commanding Officers would be uncertain of the authorised configuration baseline they are responsible for maintaining (see paragraphs 6.23 to 6.34).

4.81 Defence records indicate that the August 1998 report of the HMAS *Westralia* Board of Inquiry found that the formal RAN configuration change process is circumvented at times, generally by well intentioned personnel, and this can have a severe impact on safety.[311] The Board of Inquiry recommended:

> An urgent review of the configuration management training provided in MEO [Marine Engineering Officer] and CO [Commanding Officer] Desig [Designate] courses together with a review of other pre joining and career courses should be conducted.
>
> A firm reminder of the importance of a disciplined approach to configuration management to the RAN community should be issued and reinforced on a regular basis. The Board notes the direction given by the Maritime Commander [MHQAUST message 210733Z JUL 98] to initiate audits and to manage the safety implications resulting from the unauthorised configuration changes and inappropriate use of procedural workarounds.
>
> A technical review of work packages by a competent professional engineering authority should be introduced as part of the procedure for authorising work.
>
> A review of the RAN configuration management process in the light of the shortcomings revealed to this Inquiry and the recent organisational changes such as Class Logistic Offices and Refit Planning Logistic Support Services (RPLSS) contractors, should be conducted. The review

[310] Defence Instructions (Navy) ADMIN 30-3, *Instructions to the Commanding Officer*, November 2002, p. 9.

[311] Royal Australian Navy, *Report of the Board of Inquiry into the fire in HMAS WESTRALIA on 5 May 1998*, 28 August 1998, Vol. 1, p. 198.

> should include an assessment of the level of engineering expertise available in the RPLSS offices.[312]

4.82 Configuration audits are an integral part of the system development process, and so they should be finalised by DMO prior to the System Acceptance milestone. Also, functional and physical configuration information should be available to Navy during operational test and evaluation, and during the yearly Materiel Condition Assessments of each RAN ship to be conducted by each ship's crew.

4.83 The paramount importance of configuration audits was re-enforced by Defence in advice to the ANAO of a recent Australian Defence Test and Evaluation Office (ADTEO) initiative. Defence informed the ANAO that that if configuration audit documents cannot be produced at Test Readiness Reviews, then the system under test is considered to be not adequately described nor controlled, and so operational test and evaluation by ADTEO will not commence.[313]

4.84 An August 1999 review of configuration management in the RAN, which focused on DAO configuration management practices as well as Navy's, identified over 150 actions needed to improve configuration management with a particular emphasis on policy and procedures, but ranging across training, qualifications and experience, and tools (i.e. information systems).[314] DMO's most recent review of its own and Navy's configuration management practices, which was completed in September 2010, found that:

> It is apparent that in the intervening years, the majority of the actions recommended by [the 1999 review] have not been implemented, or alternatively, organisational restructuring and other influences have resulted in regression.[315]

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312 Royal Australian Navy, *Report of the Board of Inquiry into the fire in HMAS WESTRALIA on 5 May 1998*, 28 August 1998, Vol. 1, p. 198.

313 ADTEO is located within CDG and is the Defence authority for test and evaluation. The ADTEO provides advice and consultancy on test and evaluation issues and is responsible for the development of Test and Evaluation policy and the Defence Trials policy.

314 Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report*, September 2010, Executive Summary. *Review of Configuration Management in the RAN*, August 1999.

315 Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report*, September 2010, Executive Summary.

4.85 This is a significant systems engineering and technical regulation non-compliance issue. In February 2011, Defence advised the ANAO that DMO has recently initiated the following steps to enhance standardisation of Configuration Management throughout DMO:

> creation of a position within the Standardisation Office to ensure consistent configuration control policy and processes are deployed within DMO;
>
> Standardisation Office has taken the ADO [Australian Defence Organisation] enterprise lead for Configuration Management;
>
> Standardisation Office is providing the Chair of the Configuration Management User Requirements Group; and
>
> Standardisation Office is investigating a common toolset to assist in configuration management.

Recommendation No.4

4.86 The ANAO recommends that, in order to reduce technical integrity and logistics risk and to reduce delays in Navy's regulatory reviews, Defence:

(a) reinforces the need to maintain accurate configuration records; and

(b) requires Navy to reject materiel offered for Initial Materiel Release that has been the subject of insufficient Configuration Management.

Defence response

4.87 Defence agreed to the recommendation and stated as follows:

> a) Defence notes that the current configuration management policy requires improvement and, taking account of recent reviews, is developing a suite of engineering policies, including configuration management, that will then be implemented across Defence.
>
> b) Navy has welcomed the introduction of the milestone of Initial Materiel Release, which is the offer of the new capability for acceptance into Naval service for Initial Operational Release. The focus on configuration management at Initial Materiel Release is a logical point to accept or reject materiel.

Military and Commercial Off-the-Shelf equipment

4.88 The Defence Procurement Review 2003 and the Defence Procurement and Sustainment Review 2008 advocated the increased use of off-the-shelf acquisitions to reduce project risk.[316] The Defence White Paper 2009 confirmed the Government's decision that military off-the-shelf (MOTS) and commercial off-the-shelf (COTS) solutions to Defence's capability requirements will be the benchmark going forward.[317]

4.89 Where Defence relies on off-the-shelf acquisitions, the system engineering process may logically begin with the Functional Configuration Audits and Physical Configuration Audits, rather than the system engineering reviews at the requirements reviews stage, which apply to more developmental acquisitions. However, the experience of JP 2070 Lightweight Torpedo Replacement project identifies that claims surrounding the development status of a product offered as off-the-shelf require verification to confirm that the product being offered is actually off-the-shelf. Additionally, where claims about the development status are verified, the method of integration with other platforms or systems also requires close consideration as this may introduce developmental risk to a project.[318]

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[316] Department of Defence, *Defence Procurement Review 2003*, August 2003, p. 15, advised that [acquisition project] …Initial Business Cases should provide a variety of realistic capability, cost, schedule, and risk trade-offs for government to consider. At least one off-the-shelf option must be included. Any option that proposed the 'Australianisation' of capability would need to fully outline the rationale and associated costs and risks.

Defence Materiel Organisation, *GOING TO THE NEXT LEVEL the report of the Defence Procurement and Sustainment Review*, September 2008, pp. 17-19. Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review*, May 2009, p. 22. The Defence Capability Development Handbook 2010, which was released in interim form in March 2010, advises that military or commercial off-the-shelf options should be used as a benchmark for considering acquisition options. The handbook advises that any option that moves beyond the requirements of an off-the-shelf solution must include a rigorous cost–benefit analysis of the additional capability sought so that the full resource risks and other impacts are understood.

[317] The Government has decided that military-off-the-shelf and commercial-off-the-shelf solutions to Defence's capability requirements will be the benchmark against which a rigorous cost-benefit analysis of the military effects and schedule aspects of all proposals will be undertaken. Such an approach is consistent with the Defence Procurement and Sustainment Review. Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030*, Defence White Paper 2009, May 2009, p. 127.

[318] ANAO Audit Report No.37, 2009-10, *Lightweight Torpedo Replacement Project*, Department of Defence, May 2010, pp. 18, 30-31, 51, 109-115, 190. In May 2011 Defence advised the ANAO that:

Footnote continued on the next page…

4.90 The Defence White Paper 2009 advised that the Government needs to make informed decisions about the appropriate mix of cost, risk and capability.[319] The ANAO found that the Government was not well informed of the status of the JP 2070 preferred solution, before and after the acquisition contracts were signed.

4.91 As at March 2011, tests carried out at sea have not verified that the JP 2070 lightweight torpedos acquired by DMO are capable of performing to their specifications. Consequently, the successful completion of JP 2070 remains at risk.

System Acceptance

4.92 Defence capability acceptance policy specifies that acceptance planning should identify key milestones and events that are to be completed in order to allow a coordinated delivery of capability. Each milestone is to have an agreed set of completion or success criteria accepted by the Capability Managers. These are to be reflected in Project Management Plans, Business Cases and Materiel Acquisition Agreements.[320]

4.93 The following primary milestones relate to major systems acquired by the DMO:

Unlike the FFG Upgrade project, the Lightweight Torpedo Replacement project torpedo is a more mature capability and is not unique to Australia. It is in service with a number of foreign navies. The Acceptance Test and Evaluation validation and verification approach relied on the extensive work done by these other nations, including France and Italy, against the specification for the torpedo. This work reduced the project's Acceptance Test and Evaluation program to a minimal number of torpedo firings primarily aimed at validating and verifying other elements of the capability, such as ship integration. The project has accepted the torpedoes delivered in November 2010, ahead of confirming full compliance against the specifications. Supplies Acceptance Certificates used by the project for Acceptance are based on production of those torpedoes against the contract. The contract provides robust protection to the Commonwealth should the torpedoes subsequently prove to be deficient against the specifications. While the project currently does not have an approved Test and Evaluation Master Plan, the project continues to work with Navy to achieve such approval. The project has a regulatory certification plan endorsed and authorised by Navy dated October 2010 for the ANZAC Class with the FFG Class plan under final review.

Department of Defence, DMO, Navy & CDG, *Additional Information and Proposed Amendments*, 24 May 2011, pp. 7, 8.

[319] Department of Defence, *Defending Australia in the Asia Pacific Century: Force 2030*, Defence White Paper 2009, May 2009, p. 127.

[320] Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. 2. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, p. 10.

- **System Acceptance**—the acknowledgment by the DMO Project Authority that an acquired system complies with contractual and Materiel Acquisition Agreement requirements, and that the system is ready to be transitioned to the in-Service Phase. The key objective of the System Acceptance process is to ensure that the Capability Manager's minimum requirements for Initial Operational Release are met at System Acceptance;[321] and
- **Contractual Delivery**—the movement of the materiel from the contractor to the acquirer's possession.[322]

Criteria for System Acceptance by the DMO

4.94 The Defence Instruction for acceptance into service specifies that System Acceptance is the acknowledgment by the DMO Project Authority (typically the DMO Project Manager or Project Director), that an acquired materiel system complies with contractual and single-Service requirements, and is ready to be transitioned to the in-Service Phase.[323]

4.95 DMO's System Acceptance criteria set out in the DMO Verification and Validation Manual include:

- Design Acceptance, based on verification of compliance with Technical Regulatory Authority requirements (this requires an endorsed Safety Case or Safety Assessment, and the successful completion of Functional Configuration Audit and Physical Configuration Audit of the first production item to be successfully completed), along with verification of the technical integrity of the system design;[324]
- demonstration of fitness for service in the form of satisfactory completion of an Operational Evaluation (or similar), validating that

[321] Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. 6.

[322] ibid.

[323] ibid., p. A-2.

[324] Technical integrity is an items fitness for service, safety and compliance with regulations for environmental protection. Department of Defence, Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010.

the system meets the users' needs (if this is required by the Capability Manager);[325]

- completion of all verification and validation activities identified in the Verification and Validation Plan (including Acceptance Testing) and reported in a completed Verification Cross Reference Matrix;
- verification of compliance with all of the contractual requirements (including system safety requirements);
- approval from the relevant regulators (e.g. technical regulators, operational regulators and safety regulators) of the capability; and
- a completed Functional Configuration Audit to verify that the system complies with requirements.[326]

4.96 Defence's strategic materiel contract template (ASDEFCON (Strategic Materiel)) for the acquisition of ACAT I and ACAT II Mission and Support Systems, advises that, within the scope of acceptance validation, contractors should be obliged to demonstrate to Defence that the Mission System will function and perform as specified when operated in accordance with the Operational Concept Document. In other words, the contractor should demonstrate the system's fitness for service in the actual operating environment, including when interfacing with extant in-service capabilities and systems.[327] ASDEFCON (Strategic Materiel) has a DMO-checklist for System Acceptance Audits (SAA). Appendix 4 of this audit report, provides an extract of that checklist, which shows the System Acceptance Audit objectives.

4.97 In practice the System Acceptance process requires DMO to validate systems through operational test and evaluation conducted in a realistic operational environment, when operated by its intended users. For Navy systems, validation often requires periods at sea in a Defence practice area

[325] Operational Evaluation (OPEVAL)–A trial conducted by competent T&E agencies to provide an early, but limited, operational assessment to add confidence to a production or procurement decision. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. B6.

[326] Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. 77. See also, *Exposure Release Draft V&V Manual November 2003–January 2004*, November 2003, pp. 33-37. This 108 page exposure draft provided a firm knowledge base for the planning and conduct of Mission System and Support System verification and validation that was aligned to Defence's contract template ASDEFCON (Strategic Materiel).

[327] Department of Defence, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Part 3, 7.2.3, and Supplementary information, Sect. 13. Verification and Validation. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004.

with members of the Defence force conducting exercises including the firing of weapons. Consequently, DMO requires Navy conducted operational test and evaluation in order to complete system validation ahead of System Acceptance.

4.98 In February 2011 Defence advised the ANAO that:

> …the use of the validation demonstration clauses within ASDEFCON (Strategic Materiel) is dependent upon delivery sequence of the platforms and may be tailored project by project. Notwithstanding this, the contractor is still only required to ensure compliance against the system specification rather than the OCD and FPS. However, if a failure occurs during the validation demonstrations, an analysis could be conducted to resolve the origins, eg a defect (against the specification), poor requirements definition or an external failure.
>
> Most frequently these tests are done by Navy as the contractor can not go to sea to fire weapons. A better assessment would be whether all tests identified in the Test and Evaluation Master Plan have been completed.[328]

4.99 DMO also advised that:

> …The System Acceptance criteria quoted from the V&V Manual includes criteria such: Design Acceptance, VCRMs [Verification Cross Reference Matrices], Regulatory sign-off, FCAs [Functional Configuration Audits] and the use of the SAA [System Acceptance Audit] checklist. Of note there is neither specific format nor a formalised acceptability threshold to report on System Acceptance. Instead a culmination of individual products and data which informs outputs such as the SG1 and the TI338 are produced which highlights the conformance, non-conformance and risks.[329]

4.100 The System Acceptance process is reliant on:

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[328] Department of Defence, AFCD/CAE/OUT/201/48, *Performance Audit – Acceptance into Acceptance into Service of Naval Capability*, 11 February 2011. Consolidated Defence Response, p. 13.

[329] Defence advice to the ANAO 23 February 2011, Attachment: Second Draft Confirmation Paper Operational Release of Naval Capability: Requests for Information (RFIs), p. 3.

The Supplies Acceptance Certificate (Form SG1) provides for an authorised representative of the supplier to certify that the supplies conform in all respects to the conditions and requirements of the contract. Provision is also made for the supplier to record details of any non-compliance with the terms and conditions of the contract. Any non-compliance with contractual requirements must be approved by, or on behalf of, the Commonwealth Representative prior to acceptance. The details of any non-compliance must be recorded on the Supplies Acceptance Certificate, or an Annex to the Supplies Acceptance Certificate. When an Annex is used, this is to be referred to in the body of the Supplies Acceptance Certificate. Department of Defence, *The Defence Procurement Policy Manual*, June 2004, Annex 6D-1.

- Test and Evaluation Master Plans that broadly identify tests to be conducted prior to System Acceptance. As mentioned earlier this plan requires the approval of RANTEAA;
- Verification Cross Reference Matrices that cross reference contracted requirements with the procedures by which compliance with those requirements are to be, or have been, verified.[330] These matrices need to be approved by DMO and agreed to by Navy prior to the conduct of the final System Definition Review; and
- the culmination of these individual products and data to provide the basis for a Supplies Acceptance Certificate (Form SG1) and the TI 338.

4.101 The ANAO examined the System Acceptance records provided by DMO on the 13 Navy projects considered in the course of this audit that had achieved Initial Operational Release or Operational Release. The records provided in relation to 11 of these projects were not consistent with DMO's System Acceptance criteria as set out in the DMO Verification and Validation Manual, or as set out in the DMO System Acceptance Audit checklist.

4.102 Two projects provided records indicating achievement of DMO's System Acceptance criteria as set out in the Verification and Validation Manual. These were SEA 1429 Ph 2 Replacement Heavyweight Torpedo project and SEA 1439 Ph 4A Collins Replacement Combat System project. These are essentially military off-the-shelf (MOTS) acquisitions, the product of an armaments cooperation program between the US Navy and the Royal Australian Navy. This arrangement provides the RAN with extensive engineering development and logistics support, including the demonstration of safety and fitness for service in US Navy submarine service, assistance in establishing a US Navy Certified Authorised Intermediate Maintenance Authority at HMAS *Stirling* for the torpedos and alignment with the US Navy logistics support for the combat system.[331]

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[330] VCRMs should provide complete traceability between each FPS and OCD requirement and derived requirement and each corresponding test item, test procedure, and test report. Defence Materiel Organisation, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Part 3 Draft Statement of Work, Sect. 7.1.3. Since 2002, DMO has produced other versions of ASDEFCON (SM), with the latest ASDEFCON (SM) Handbook being published in 2004.

[331] Combined with that is the project's ability to test the combat system and torpedo system integration in a controlled environment at the Collins Submarine Combat System Support Facility at HMAS Stirling, and at the Torpedo Analysis Facility at DSTO Salisbury South Australia. The project also has the ability to provide operations and maintenance personnel with prerequisite training in the upgraded systems, prior to taking up their submarine duties.

4.103 The 11 remaining projects provided Reports of the Materiel and Equipment Performance State (TI 338) (discussed in Chapter 5),[332] and correspondence between DMO and the prime contractors on System Acceptance milestone completion. All these documents fell short of what would be expected from a Systems Acceptance Audit by DMO, conducted in accordance with the audit criteria identified in Appendix 4.

4.104 Eight of the 13 Navy projects considered in the course of this audit, which had achieved Initial Operational Release or Operational Release, had records of formal supplies acceptance in the form of a Supplies Acceptance Certificate (Form SG1). Defence procurement policy requires the use of Supplies Acceptance Certificates for the purpose of formal acceptance of supplies. Contractors must first detail any non-compliance with the terms and conditions of the contract, and before accepting the supplies the officer performing acceptance is to take all reasonable steps, appropriate to the nature of the supplies, to determine that the supplies fully conform to the requirements of the contract. This includes, but is not limited to, the sighting of objective evidence that all technical, functional and performance requirements have been met.[333] In the case of naval projects, it is not unusual for non-compliance to be assessed for significance and, if appropriate, left for correction during post-delivery maintenance that can occur within Navy's operational test and evaluation period.

4.105 Of the 20 projects in the ANAO's sample, four projects issued Supplies Acceptance Certificates prior to Navy granting Initial Operational Release.[334] In this circumstance, it is not clear how the signing officers for these projects could certify that the supplies fully complied with contractual requirements, when these projects had not achieved Initial Operational Release and so had not commenced Navy operational test and evaluation that would validate that operational requirements had been met. However, as the acceptance certificate process allows for non-compliance to be corrected at some future time, formal acceptance of supplies may be agreed to by DMO ahead of System Acceptance criteria being achieved.

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[332] In January 2011, the title of the TI 338 reports was changed to: *The Report on the Limitations and State of the Mission and Support System.* AFCD/CAE/OUT/2010/48 Performance Audit - Acceptance into Service Of Naval Capability, 11 February 2011.

[333] Department of Defence, *The Defence Procurement Policy Manual,* June 2004, p. 600 (Annex 6D-1).

[334] SEA 1390 Ph 2.1, SEA 1442 Ph 3, JP 2008 Ph 3E and JP 2070 Ph 2&3.

4.106 In February 2011, Defence advised the ANAO that:

> Complying with contractual requirements is different to complying with operational requirements. There could be a mismatch harking back to translation of the COD [Concept of Operation Document] into the FPS [Function and Performance Specification] and TCD [Test Concept Document], or traded during contract negotiations (including approvals of CCPs [Contract Change Proposals] and ECPs [Engineering Change Proposals] post prime contract signature). Therefore, a contractually compliant system may indeed not be technically or operationally compliant. Measures should be in place to eliminate this circumstance. But the Commonwealth has no right to "deny" System Acceptance if all contractual requirements are met.[335]

4.107 The ANAO considers that any mismatch between complying with contractual requirements and complying with operational requirements should be preventable following sound systems engineering processes, including System Definition Reviews. System Definition Reviews are conducted to ensure contractual requirements, and their verification and validation procedures, are agreed between the parties and are contractually binding.[336] It is noteworthy that of the 20 projects included in the audit, 12 were unable to provide records concerning completed System Definition Reviews.

4.108 Against this background, DMO should place increased rigour on ensuring System Acceptance Certificates are signed only when all System Acceptance criteria are met, or when the acceptability of System Acceptance criteria shortfalls is endorsed by the Capability Manager.

Recommendation No.5

4.109 The ANAO recommends that DMO ensure that the delegate authorised to approve Systems Acceptance is an executive with seniority commensurate with the importance of the project, who is external to the Systems Program Office, and who is designated in the Project Certification Plan.

Defence response

4.110 Defence agreed to the recommendation and stated as follows:

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[335] Department of Defence, AFCD/CAE/OUT/201/48, *Performance Audit – Acceptance into Acceptance into Service of Naval Capability*, 11 February 2011. Consolidated Defence Response, p. 15.

[336] Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. 36. A more complete description of the Systems Definition Review is provided in Appendix 5 of this report.

Defence agrees to the recommendation and will develop guidance regarding appropriate authorities, by position, within the DMO who would be delegated by the CEO DMO to approve Systems Acceptance. The over-riding principle is that there must be a separation of duties between the Project Charter owner and the Systems Acceptance approving authority.

Conclusion

4.111 Capability Managers are responsible for monitoring and coordinating all activities required to introduce the full level of operational capability into service according to schedules agreed to by government. However, project status reports to DMO senior executives and to government examined by the ANAO during this audit lacked cost and schedule variance data capable of revealing early departure from schedule and the effectiveness of schedule recovery interventions.

4.112 DMO was able to provide the ANAO with Earned Value Management project cost and schedule variances charts for only one of the 13 projects included in the audit, which had earned value reporting from contractors. The ANAO notes that for the projects considered in the course of this audit, DMO's mix of progress measurement techniques, together with its Improved Project Scheduling and Status Reporting program, has not progressed to the extent that it fully replaces all Earned Value Management System functions–particularly with respect to graphically presenting cost and schedule performance. Schedule performance information is of particular importance to Navy in terms of scheduling the development of non-materiel elements of capability, including the provision of adequately trained Navy personnel to crew new and upgraded naval assets. Overall, DMO has not made best use of Earned Value Management and its Improved Project Scheduling and Status Reporting program to ensure that its senior executives and government are fully apprised of project cost and schedule variations and to support effective senior management interventions to address the variations.

4.113 For Naval capability projects, unmanaged technical risks are frequent contributors to cost and schedule overruns. In 2004, DMO mandated the use of an optimised technical risk management system (TRIMS-Technical Risk Identification and Mitigation System) for all complex major DMO projects. However, DMO has discontinued the use of TRIMS, relying instead on its standard Risk Management System, which is optimised for cost and schedule risk management and contingency fund management, rather than technical risk. In the absence of a system such as TRIMS, DMO is not well-placed to

identify and mitigate the engineering management risks for each major project in a timely and comprehensive way.

4.114 It may be extremely costly to fix requirements or technical design defects found late in a project's design and test phase.[337] Consequently, systems engineering processes that incorporate system definition and design reviews and progressive verification and validation of a system's compliance with specified requirements are critically important. An integral part of the project requirements definition process is the System Definition Review process, which includes gaining agreement between CDG, DMO and Navy on the verification and validation procedures each of these stakeholders agrees as being necessary. However, such System Definition Reviews do not consistently occur.

4.115 Requirements management, including verification and validation, is an ongoing systems engineering responsibility over the life of a project. However, at the time of the ANAO's visit to each project during this audit, there were no DMO project personnel available able to assist with corroborating requirements verification procedures and compliance statistics, using direct references to current data residing in approved requirements management systems.[338] This is an indication that there were insufficient personnel in DMO trained and experienced in the use of the requirements management system approved and mandated by DMO.

4.116 The ANAO has recommended (Recommendation 2) that DMO takes steps to ensure that project offices use only approved requirements management systems and that its personnel are adequately trained in their use. Improvements in requirements management would benefit DMO in its contract management role. Improvements would also assist Navy's technical and safety regulators to gain sufficient, appropriate evidence to assess and manage the residual risk that the Chief of Navy accepts when releasing new or upgraded capability into service.

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[337] At, or around System Definition Review (SDR), the Verification Cross Reference Matrix (VCRM) is agreed with the contractor and the verification methods are contractually binding and require a Contract Change Proposal for change. The contractor completes the VCRM progressively as the V&V program progresses. The project office must ensure that the VCRM states the appropriate verification method to be used for all requirements and must ensure that it is updated to accurately reflect the current status of system verification. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, pp. 36, 62.

[338] Although two projects had personnel able to access detailed requirements verification records residing in spreadsheets derived from DOORS®.

4.117 As a system undergoes design and development, progressive verification and validation moves gradually through the development test and evaluation phases. These are concerned chiefly with verifying the achievement of engineering design goals through acceptance test and evaluation and though operational test and evaluation. The latter is concerned chiefly with validating the operational effectiveness of the new or upgraded capability.

4.118 DMO and Navy would benefit from working more closely during acceptance test and evaluation. A more integrated approach would enable Navy's operational test and evaluation personnel to assist DMO to identify the early emergence of issues that may adversely impact on operational release of new or upgraded capability; avert the repetition of operational tests that could more efficiently and effectively be conducted as part of verification and validation acceptance testing; and avoid contractual difficulties resulting from supplies acceptance by DMO prior to Navy completing technical and safety regulatory reviews. The ANAO has recommended (Recommendation 3) that Navy and DMO take steps to streamline and integrate verification and validation and acceptance testing, and regulatory review processes.

4.119 The testing and evaluation of seaworthiness would benefit by Defence adopting an Issues Paper process, recording in a single document all information relating to a particular seaworthiness issue, from the time it is first encountered by DMO until the time it is resolved. This would assist DMO to account for seaworthiness issues, place the onus on the project personnel best placed to manage seaworthiness issues, and ensure timely resolution to the satisfaction of regulatory requirements. This approach would complement Navy's Safety Case processes, which otherwise only alert Navy regulators of seaworthiness issues late in the system development process.

- When capability acquisitions involve military off-the-shelf (MOTS) or commercial off-the-shelf (COTS) equipment that needs no further development or integration into other systems, Defence may choose to rely on the vendor's systems engineering processes. However, even though technical risks are seen to decrease as projects move from developmental systems toward off-the-shelf solutions, in practice this has not entirely been the case.
- The acquisition of off-the-shelf equipment still needs to be accompanied by sufficient and appropriate test and evaluation data suitable for the Services to assess the equipment's fitness for service, and its risk to personnel, public safety, and the environment. In all

cases, it is fundamental that senior responsible officials managing the definition, acquisition and acceptance phases have clear visibility of the key decisions, assumptions and test and evaluation data that led the vendor to categorise the equipment as off-the-shelf.

4.120 Once testing and evaluation requirements are satisfied, it is then essential that the functional and physical states of equipment are recorded, communicated, controlled and maintained.[339] Configuration Management is the fundamental discipline of managing a Mission System's technical integrity and logistics support. However, about a third of the DMO projects in this audit achieved Initial Operational Release and Operational Release without the benefit of complete configuration audit records relating to both system functional and system physical characteristics.

4.121 DMO project teams are responsible for maintaining accurate configuration records in order to ensure that the risks to technical integrity and safety are adequately identified and managed. Reviews of Configuration Management in DMO and Navy conducted in 1999 and 2010, revealed significant non-compliance with adequate levels of configuration management. This is a significant systems engineering and technical regulation issue relating to establishing and maintaining safety and seaworthiness. The ANAO has recommended (Recommendation 4) that DMO improves the configuration management of naval materiel, and requires Navy to reject materiel offered for acceptance into service, that is the subject of insufficient Configuration Management.

4.122 Defence capability acceptance policy specifies that acceptance planning should identify key milestones and events that are to be completed in order to allow a coordinated delivery of capability. Each milestone is to have an agreed set of completion or success criteria accepted by the Capability Managers.

4.123 For the 13 Navy projects considered in the course of this audit that had achieved Initial Operational Release or Operational Release, the System Acceptance records provided by DMO for 12 projects were not consistent with DMO's System Acceptance criteria as set out in the DMO Verification and Validation Manual, or in the DMO System Acceptance Audit checklist. The ANAO has recommended (Recommendation 5) that DMO increase its

[339] Department of Defence, Defence Instructions (Navy), LOG 47-3, *Regulation of technical integrity of Australian Defence Force maritime materiel*, January 2009, p. 5.

accountability profile for the Systems Acceptance process by requiring DMO Senior Executives, as delegates of the Chief Executive Officer, to sign-off on System Acceptance.

5. Navy materiel certification

This chapter examines the processes involved in certifying the safety and fitness for service of systems offered by DMO to Navy.

Introduction

5.1 In June 2002, the then Secretary of Defence and the then Chief of the Defence Force jointly issued an instruction establishing the ADF's Technical Regulatory Framework. The instruction aimed to standardise and integrate, at an overarching policy level, each Service's responsibility to ensure that ADF materiel is fit for service, and only poses acceptable risk to personnel, public safety, and the environment.[340] Management structures, policy and processes for the Technical Regulatory Framework are set out in three sets of manuals, developed by each Service's Technical Regulatory Authority on behalf of their Service Chiefs.

5.2 The Framework sets out materiel certification processes that provide Capability Managers assurance that a product, service or organisation complies with stated specifications, standards or other requirements.[341] The certification of ADF materiel is a continuous process, operating for each phase of a project:

- **Pre-contract** – During pre-contract negotiations, certification requirements (in the form of a Certification Basis,[342] Certification Plans and System Safety Program Plans) are to be agreed for inclusion into acquisition contracts (see paragraphs 3.50 to 3.57). Also during this period the Defence organisations that accept Navy materiel designs and construction, seek from Navy authorisation to perform their tasks through Authorised Engineering Organisation (AEO) certification;

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[340] Defence Instructions (General) LOG 4-5-012, Regulation of technical integrity of Australian Defence Force materiel, September 2010, p. 2.

[341] Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004. Defence Instructions (General) Log 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010.

[342] Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004. Defence Instructions (General) LOG 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010. The Certification Basis is comprised of the compilation of requirements relating to a Mission System's technical integrity. Technical integrity is defined as its fitness for service, safety and compliance with regulations for environmental protection.

- **Production** – During this phase Prime Contractors and DMO are to certify that designs and products comply with contracted and regulatory requirements. Both parties to the contract are to confirm, through verification and validation activities, that end-products fulfil the requirements of their intended use, and to identify any potential risks to technical integrity.[343] Validation activities may involve harbour and sea acceptance trials, and mission trials in the case of First of Class Trials,[344] (see paragraphs 4.35 to 4.55 and Appendix 5);
- **Post System Acceptance** – This phase extends beyond DMO's contractual acceptance of Mission and Support Systems to include the other Fundamental Inputs to Capability, including trained Navy personnel and the incremental transition of remaining materiel (see Table 2.1 and Figure 2.1). During this phase, Navy regulators complete their review of the project's Safety Case Reports and the TI 338, and the supporting objective evidence, in order to assess the level of risk to accuracy inherent in the T1 338s and Safety Cases. The Regulators' endorsements are a necessary component of the submissions to the Chief of Navy seeking Initial Operational Release or Operational Release of new or upgraded Navy capability (see Chapter 6); and
- **In Service** – Periodic re-validation of a ship's certification occurs in accordance with certification renewal programs. Navy also has Materiel Condition Assessment processes focused on functional performance assessments to confirm fitness-for-service, and physical condition assessments to determine whether the risks to mission, the environment, and personnel are within acceptable limits (see Chapter 6).

5.3 Navy's Regulatory System has three regulatory domains:

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[343] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual* (NTRM), July 2003, Vol. 2 Sect. 2 Chapter 4.

[344] First of Class Trials are those trials, including First of Class flight trials, designed to:

- measure and record the actual performance envelope of new equipment, systems and units independent of operator performance;
- establish a baseline against which future performance of equipment can be tested; and,
- be part of test and evaluation conducted during the naval test, evaluation and acceptance period.

Royal Australian Navy, ABR 6205, Naval Operational Test and Evaluation Manual, Revision 4, July 2010, Glossary

- **Operations Regulation,** headed by Commander Australian Fleet (COMAUSFLT), and the Delegate-Commodore Flotillas (COMFLOT);
- **Technical Regulation and Logistic Support Regulation,** headed by the Head Navy Engineering (HNE); and
- **Safety Management System Regulation,** comprising Head Navy People and Reputation (HNPAR), and the Delegate-Director General Navy Certification and Safety (DGNCS).

5.4 The Director of Navy Certification (DNC) assists the regulators to define their respective regulatory documentation and compliance hierarchies, and is responsible for aggregating reports of compliance from the regulators, including their endorsement of Safety Case Reports and the TI 338 issued by DMO to support Initial Operational Release and Operational Release.[345]

5.5 Within this context the ANAO examined the key stages in Navy's certification process relating to each project's:

- Authorised Engineering Organisation arrangements;
- Safety Case and TI 338 reports to Navy Regulators;
- the achievement of Initial Operational Release and Operational Release; and
- Navy's reliance on Ship Classification Societies and associated Flag Authority Arrangements.

[345] Defence Instructions (Navy) ADMIN 37–15 *Assuring the safety, fitness for service and environmental compliance of naval capability*.

Authorised Engineering Organisations

5.6 The Technical Regulatory Framework requires Defence organisations that undertake the design and construction of ADF materiel, or that accept designs and construction, to be authorised to perform their tasks through Authorised Engineering Organisation (AEO) certification. Authorised Engineering Organisations are to ensure all ADF materiel is designed, constructed and maintained to approved standards, by competent and authorised individuals who are acting as members of an approved organisation, and whose work is certified as correct.[346]

5.7 The Navy's Authorised Engineering Organisation certificates are informed by the Navy Technical Regulatory Authorities' assessment of the respective Defence organisation's compliance with Navy's technical regulations.[347] Commercial organisations that undertake design, construction or maintenance of ADF maritime materiel are not required to seek or maintain Authorised Engineering Organisation certification. Instead, DMO's Maritime Systems Division Authorised Engineering Organisations are responsible for ensuring that the firms that provide design, construction and maintenance services are made aware of the Navy's technical regulatory standards, and that the providers comply with these standards.

5.8 This is in significant contrast with the ADF airworthiness regulations, which require all such firms to be Authorised Engineering Organisations in the

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[346] AEO certification provides high confidence that the organisation has:

- technical management systems appropriate to the type of work being performed. These include quality management systems such as ISO 9001, engineering management systems, design support networks, and configuration management systems. The organisation must also have a Senior Design Engineer, responsible to the Senior Executive, for ensuring compliance of the organisation with the regulations, and for assigning Engineering Authority to individuals within the organisation;
- personnel with appropriate authority, training, qualifications, experience, demonstrated competence and integrity to undertake the activities required;
- processes that are documented, controlled and approved for all the organisation's engineering activities. These include procedures and plans to specify and define technical activities, which must be controlled and approved by an appropriately qualified individual, nominated within the quality system; and
- data applied to, and derived from, technical activities that are accessible, authoritative, accurate, appropriate and complete.

Adapted by the ANAO from Australian Defence Force, Australian Air Publication 7001.053, Technical Airworthiness Management Manual, Sect. 3 Chapter 1, and Department of Defence, Defence Instructions (Navy) ADMIN 37-16, *Navy Regulatory System*, July 2008, p. 3.

[347] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM)*, July 2003, Vol. 2 Sect. 6 Chapter 1.

case of aircraft design and construction, and Authorised Maintenance Organisations in the case of aircraft maintenance.

5.9 The ANAO found that as at May 2010, all but one of the 18 DMO System Program Offices that managed projects considered in the course of this audit had AEO status.

5.10 In September 2010, the Landing Platform Amphibious Seaworthiness Board identified deficiencies in some of Amphibious and Afloat Support System Program Office's (AASSPO's) high risk engineering process areas. This lead to Corrective Action Requests covering the following:[348]

- Integrated Logistics Support data system deficiencies,
- maintenance management planning; and
- Configuration Management.

5.11 In December 2010, the Director Technical Regulation – Navy conducted an appraisal of AASSPO's Engineering Management System, and subsequently found inadequacies in the following process areas:[349]

- technical risk management;
- engineering change management/technical data management; and
- maintenance management.

5.12 In February 2011, Head Navy Engineering found ASSPO's Engineering Management System to be inadequate for ensuring the technical integrity of Amphibious and Afloat Support platforms, and subsequently withdrew AASSPO's Engineering Authorisation.[350]

5.13 The significant findings made by the Seaworthiness Board and Director Technical Regulation – Navy indicate the presence of systemic issues that resulted in the unsatisfactory state of AASSPO's Engineering Management System. DMO Authorised Engineering Organisations are responsible for maintaining the technical integrity of Navy's capability, from the Mission System sustainment perspective.[351] This is effectively achieved by ensuring its

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348 File No HNE/OUT/2011/00x, *Removal of AEO Status – AASSPO*, 7 February 2011, p. 1

349 ibid.

350 File No HNE/OUT/2011/00x, *Removal of AEO Status – AASSPO*, 7 February 2011, p. 1

351 Defence Instructions (Navy) LOG 47-3, *Regulation of technical integrity of Australian Defence Force maritime materiel,* January 2009, p. 3

System Program Offices are adequately resourced to achieve that outcome. AASSPO had a history of difficulties in its Engineering Management System, and DMO's Maritime System Division could have better mentored and resourced AASSPO, to assist it to overcome its difficulties in maintaining the LPAs in a seaworthy state.

Safety Cases and TI 338s

5.14 The ADF Regulatory Framework requires evidence that the systems being offered to Navy are fit for service and only pose acceptable risk to personnel, public safety, and the environment.[352] This requirement is factored into each project's Certification Plans and the System Safety Program Plan, which when executed, result in the issue of regulatory compliance certificates that are compiled in TI 338s and Safety Case Reports. (These plans were discussed in paragraphs 3.50 to 3.57.)

5.15 The development and maintenance of Safety Cases and TI 338s are the means by which Navy seeks to demonstrate compliance with the requirements of the *Occupational Health and Safety (Commonwealth Employment) Act 1991*, the *Environmental Protection and Biodiversity Conservation Act 1999*,[353] and other related legislation and international agreements. This legislation requires manufacturers, suppliers and employers to identify, assess, and eliminate or control risk prior to, and during the introduction of new plant, and to factor the principles of ecologically sustainable development into the selection, maintenance and operation of equipment and facilities.

5.16 Safety Cases are developed by DMO System Program Offices and describe how safety has been considered with regard to the workplace, Mission and Support System hardware and software, personnel and management systems. They are to formally demonstrate that due diligence has been given to the occupational health and safety implications of the

[352] The ADF philosophy of technical regulation is that organisations responsible for delivering supplies or services certify that the materiel for which they are responsible complies with specified standards and is technically fit for service in the intended role. This certification is of critical importance to the Service Chiefs, who are accountable for the safety, fitness for service and environmental compliance (collectively referred to as 'technical integrity') of materiel introduced into and operated by the Services. Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force Materiel*, June 2004. Defence Instructions (General) LOG 4-5-012, Regulation of technical integrity of Australian Defence Force materiel, September 2010, p. 2.

[353] Defence Instructions (Navy) ADMIN 37-15, Assuring *the safety, fitness for service and environmental compliance of naval capability*, April 2007, p. 1, Annex B. Royal Australian Navy, ABR 5454, *The RAN Regulatory Framework and Certification Manual,* Draft January 2009, Part 1, Chapter 11.

introduction into service of new capability, and they facilitate the management of hazards throughout the life of the capability through to disposal.[354]

5.17 The TI 338 reports are developed by DMO System Program Offices and provide key risk information to Navy's Commanding Officers and Force Commanders. These provide an account of the materiel state of the Mission and Support Systems, in terms of operational limitations within the parameters approved by government at Second Pass approval, and hazard risk assessments of the remaining risks at the time of materiel release by DMO to Navy.[355]

5.18 To reduce schedule pressure placed on Navy regulators, DMO is to provide Navy's operational, technical and safety regulators with the project's Safety Case Reports six months prior to scheduled Initial Operational Release.[356]

Safety Cases and Safety Case Reports

5.19 The Navy Regulatory System specifies the development and maintenance of Safety Cases, comprising:[357]

- a Safety Case Report which compiles and summarises all of the assumptions, actions (undertaken and planned), results and analysis used to argue that the system is acceptably safe. It records the initial Safety Assessment results and is updated throughout the life of the system;[358]
- a Capability System Description that defines the context for the Safety Case and the boundaries within which the risk management process will be conducted. A thorough understanding of the strengths,

[354] Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual,* Edition 4, 2007, Annex F to Chapter 5.

[355] Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual (NOTEMAN),* Edition 4, 2011, Annex A to Chapter 5.

[356] In order to obtain appropriate reviews, and regulatory endorsement that the hazards are so far as possible identified and mitigations appropriate, the Safety Case Report should be presented a minimum of six months prior to Initial Operational Release. Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* January 2009, Part 1, Chapter 11, paragraph 9. Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual*, Revision 4, January 2011, Chapter 5 Annex A, paragraph 22.

[357] Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual,* April 2006, Chapter 5, Annex F to Chapter 5. Royal Australian Navy, ABR 6303, *Navy Safety Systems Manual* Edition 4, 2007.

[358] Department of Defence, ASDEFCON (Strategic Materiel) Version 1.2, Guidance on the Draft Statement of Work (V1.2), 4-47.

weaknesses, intended employment and threats to the system is required;

- a Formal Safety Assessment that identifies, analyses, evaluates, and treats all the hazards and risks associated with the capability system given its state, mode, function and role.[359] The Formal Safety Assessment assesses whether the capability system is both safe and fit for service as defined by its operational requirements. It will also identify appropriate control measures that will mitigate all risk to 'As Low As Reasonably Practicable' (ALARP);
- a Communications Plan that communicates and transitions the contents of the Safety Case to stakeholders involved with the acquisition, operation, maintenance and management of the system;
- Emergency and Contingency Arrangements for residual hazards and risks. These must include equipment, operating procedures and training as appropriate, and must be carefully examined to ensure maximum effectiveness in the actual environment in which the hazards could be realised; and
- Safety Management System arrangements to ensure the requirements of the Safety Case are met throughout the life of the capability system. It is to include system maintenance, Integrated Logistics Support, Configuration Management and Certification.

5.20 Navy's implementation of its Regulatory System involves the Director Navy Certification conducting a structural review of each project's Safety Case Report produced by DMO, and Navy Regulator Delegate personnel conducting an analysis of each project's Safety Case data. The structural reviews and data analysis are generally scheduled to take four to eight weeks. The culmination of this process is the authorisation of the Safety Case Report by the Director General Navy Certification and Safety. This approval is a key factor in submissions to the Chief of Navy regarding materiel being considered for Initial Operational Release or Operational Release.

5.21 The Safety Case Report can be presented for review by DMO up to six months prior to Initial Operational Release in order to significantly reduce

[359] The Formal Safety Assessment Report is also specified in the Defence preferred standard for safety, Military Standard – 882C, *System Safety Program Requirements*, January 1993, Task 301 – Safety Assessment, Appendix A.

schedule pressure during a project's the regulatory review phase.[360] Once approved, an updated Safety Case may be required, post the completion of DMO's system verification and validation activities. Updates would summarise any new risks and how they have been managed.

TI 338s

5.22 Where capability is offered to Navy for Initial Operational Release and Operational Release, Navy is advised by the DMO Project Manager, via a TI 338, of the state of the Mission System and Support System in terms of:

- certification of the state of regulatory compliance in accordance with certification requirements set out in each project's Certification Plans. The types of certificates depend on the nature of the capability being acquired, and cover safety, technical and operational regulatory domains;
- defects, deficiencies or delivery issues to be rectified during Navy's operational test and evaluation program and prior to Operational Release;
- the outcomes of the Hazard Risk Assessments carried out by the DMO Project Manager that apply to personnel safety, fitness for service, mission capability and environmental risks. The intention is to provide Navy's Regulators with confidence that all foreseeable risks have been identified, assessed, treated, and subsequently accepted at an appropriate level of authority. The Hazard Risk Assessments are provided in TI 338s and in the Safety Case's Formal Safety Assessment outlined above; and
- Mission System performance and operating limitations prepared by the relevant Navy Force Element Group Commander, endorsed by the Fleet Commander and acknowledged by both the Mission System's Commanding Officer and the DMO Project Manager. These limitations are set out so as to ensure the safe operation of the equipment or capability in light of the defects, deficiencies and delivery issues.

[360] In order to obtain appropriate reviews, and regulatory endorsement that the hazards are so far as possible identified and mitigations appropriate, the Safety Case Report should be presented a minimum of six months prior to Initial Operational Release. Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* January 2009, Part 1, Chapter 11, paragraph 9. Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual*, Revision 4, January 2011, Chapter 5 Annex A, paragraph 22.

5.23 The Navy Regulators' role is to validate the accuracy of the inherent risk described in the TI 338. They review the Project Manger's certificates and Hazard Risk Assessments to assess their appropriateness, and determine to either endorse them or to seek additional objective evidence. The regulators are to provide a recommendation on the TI-338 for Initial Operational Release or Operational Release based on their review of the objective evidence within their domains.[361]

5.24 An updated TI 338 Report format was included in the Edition 4 of the Navy Operational Test and Evaluation Manual, which was formally approved by the Deputy Chief of Navy in January 2011. DMO projects are expected to produce TI 338s that conform to this new format from 2011. In this updated format, the DMO advises the Function and Performance Specification limitations, which Navy's Force Commander uses to promulgate Performance and Operational limitations.[362]

5.25 All 13 Navy projects in the ANAO's sample that received Initial Operational Release or Operational Release had TI 338s, and all had been reviewed and endorsed by the regulators prior to the grant of Initial Operational Release and Operational Release of the capability.

5.26 Of the 13 Navy projects that had received Initial Operational Release or Operational Release, all but one had its Safety Case Report approved by Director General Navy Certification and Safety. The exception was SEA 1654 HMAS *Sirius*, which received Initial Operational Release in October 2006. DMO records indicate HMAS *Sirius* has Safety Assessments based on Lloyds Register classification of the ship's build, Lloyds Register Operational Safety Assessments, and Safety Assessments conducted by other firms on items outside the scope of the Lloyds Register classification. At the time of the audit, the DMO project office was further developing the ship's Safety Case in preparation for Operational Release. The most recent Operational Release Safety Compliance Assessment of HMAS *Sirius* was dated 3 June 2010.

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[361] Department of Defence, Defence Instructions (Navy) ADMIN 37-15, *Assuring the safety, fitness for service and environmental compliance of naval capability*, April 2007, p. 4

[362] Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual*, Edition 4, January 2011, Annex A to Chapter 5.

Delays in achieving Initial Operational Release or Operational Release

5.27 DMO informed the ANAO that decisions to grant Initial Operational Release or Operational Release for some new or upgraded capabilities were being deferred by Navy on the basis of defects and inconsistencies that had been identified in project's TI 338s, irrespective of the requirements in the Certification Plan and in the Materiel Acquisition Agreement.[363]

5.28 The ANAO examined DMO's requirements verification records for several Navy projects and noted that it was difficult to categorise technical, operational and safety requirements and to determine their compliance status. It is these records that provide the materiel status information that underpin TI 338s and Safety Case Reports.

5.29 The ANAO examined the TI 338s for all 13 projects in the ANAO's sample which had been granted Initial Operational Release or Operational Release and found evidence of inconsistent references to requirements verification and configuration management (see paragraphs 4.35 to 4.55 and 4.70 to 4.85 respectively). This was a significant issue for several Navy projects, and appeared to have contributed to Navy deferring its decision to grant Initial Operational Release and Operational Release for these projects.

5.30 Navy Regulators require sufficient appropriate information to enable them to gauge the level of risk to the technical integrity of materiel offered by DMO to Navy. When Navy Regulators received information in TI 338s or Safety Cases that was not based on a comprehensive understanding of Navy's regulatory requirements, the regulators were likely to lose confidence in the integrity of data and documents placed before them.

5.31 ANAO's examination of Navy records indicate that, while the time required to undertake a regulatory review will vary depending upon such factors as the level of complexity of the documentation, indicative times for regulatory review and resolving problems are:

(a) Safety Cases – six weeks (including four weeks for regulator review);

(b) TI 338s – three weeks (including two weeks for regulator review); and

[363] Department of Defence, Chief Audit Executive, OCAE/OUT/2010, *Performance Audit – Acceptance into Service of Naval Capability*, June 2010, Annex A, A-4.

(c) Project Certification Plans - four weeks (including three weeks for regulator review).

5.32 This time is required to allow the regulators to exercise independent judgement and to also seek additional information. In order to reduce schedule pressure placed on Navy regulators, Navy prefers that DMO provides Navy's regulators with Safety Case Reports six months prior to scheduled System Acceptance.

5.33 The ANAO examined records on the timeliness and quality of documents provided by DMO for Navy regulatory review. The ANAO found that in 2007, the regulators experienced several instances of very short-notice requests for regulatory review. Additionally, Navy records indicate that the quality of the documents presented for regulatory review was such that they generally required rework before the regulatory review could be undertaken. This reportedly shortened the review time available, and added to the work of reviewing original and amended documents and making enquiries.[364] The timely provision of documents to Navy Regulators remained an issue into 2009.[365]

5.34 Navy Regulators also rely on external subject matter experts to review Project Certification Plans, Safety Case Reports and TI 338s. This reliance on external providers increases the time required for regulatory reviews. Navy advised the ANAO that generally short-notice requests for regulatory review can only be met at the expense of other projects under review.

5.35 The ANAO notes that a time saving technique used by ADF aircraft projects involves streamlining the airworthiness regulatory review process, by assembling within a single Verification Cross Reference Matrix, airworthiness design requirements and evidence of their compliance, separately from the general function and performance requirements and evidence of their

[364] Navy Systems Command, DGNCSA/OUT/2007/093 *Provision of Documentation for Regulatory Endorsement,* 7 November 2007.

[365] On 19 January 2009, the FFG Upgrade Project Authority requested a regulatory review and endorsement for HMAS *Melbourne* to conduct missile firings, after the ship had commenced the transit to the missile firing test range. This request occurred that a time when the relevant Safety Case had neither been endorsed nor authorised. Director Navy Certification, 2008/1096593/1 Brief for DGNCSA *HMAS Melbourne ES Trials and SM1 ESSM FIRING – PMRF Hawaii Feb 09 Safety Assessment Review and Endorsement.* Navy Systems Command, DGNCSA/OUT/2008/144, *Brief for CANASC – FFG UP OR IOR*, 7 November 2008, p. 1.

compliance.[366] This allows both sets of requirements and their compliance evidence, to be managed within a single requirements management system, while at the same time being separated within that system, to allow agencies overseeing the design to readily view the data they need to review.

5.36 Another technique used by ADF aircraft projects is the use of Airworthiness Issue Papers, which provide airworthiness regulators or DMO project offices with visibility of all airworthiness issues judged to be significant enough to require the recording of their resolution. This allows the regulators and DMO project offices to engage in fully identifying and analysing significant airworthiness issues early, so increasing the probability that they will be resolved prior to the scheduled System Acceptance period.

5.37 Both the above streamlining techniques would assist Navy Regulators and DMO project office personnel to better manage issues of significance to Navy Mission System performance and technical, operational and safety management.

Recommendation No.6

5.38 The ANAO recommends that, in order to safeguard the quality of the overall Navy regulatory review process:

(a) Navy adopts streamlined regulatory review processes through improved verification information sharing with acquisition agencies; and

(b) DMO mandates adherence to Navy's regulatory review schedule requirements, as documented as part of future Acquisition Baselines and agreed via the Materiel Acquisition Agreements.

[366] Designs that are classified as airworthiness designs are any designs that impact upon the safety of flight of an aircraft. Department of Defence, Australian Air Publication (AAP) 7001.053, *Technical Airworthiness Management Manual,* 15 February 2002, Sect. 1 Chapter 5, Annex A, 5A-1.

Defence response

5.39 Defence agreed to the recommendation and stated as follows:

a) The Navy has worked closely with the DMO in 2010 to improve policy for the regulatory review process and on 27 January 2011 issued an updated policy reference ABR 6205 for Naval Operational Test and Evaluation, which was endorsed by Head Maritime Systems, DMO, prior to release. The process improvements in this reference are now being implemented.

b) DMO agrees that future Acquisition Baselines should be documented and contained in the Materiel Acquisition Agreements and agreed by the DMO, Navy and CDG (as signatories of the Materiel Acquisition Agreement). This process improvement will assist the DMO and Navy to satisfactorily address the regulatory review schedule.

Navy's reliance on Ship Classification Societies

5.40 Over the last decade, Defence has become increasingly reliant on shipping industry Classification Societies to provide independent verification that each naval vessel complies with design, construction and operation requirements that govern the vessel's particular class.[367] This aligns with commercial shipbuilding building practice whereby, for finance and insurance purposes, shipbuilders contract Classification Societies to independently verify and certify, that ship designs and construction comply with international conventions, rules and regulations.[368] This puts the onus on the shipbuilder to correctly interpret and comply with the conventions, rules and regulations, in order to achieve certification, whilst distancing the ship owner from contention over adherence to technical seaworthiness and operational requirements.[369]

5.41 Defence's greater reliance on Classification Societies has developed from the Defence Commercial Support Program, introduced in 1991 following a review of the report, *The Defence Force and the Community: A Partnership in Australia's Defence*. (known as the Wrigley Report), tabled by the Minister for Defence in 1990.[370] This program included the commercialisation of the then

[367] Navy Brief, DNC/OUT/2010/027 *Classification Status of the Fleet,* April 2010.

[368] The main rules and regulations pertaining to commercial shipping are the International Maritime Organisation safety and environment protection regulations.

[369] Australian Navy Systems Command Minute, 2004/1014061 DNC/OUT/2005, *The Use of Classification Societies within the NRS Framework*, July 2005.

[370] ANAO Audit Report No. 2, 1998-99, *Commercial Support Program,* Department of Defence, July 1998, p. 9.

Naval Dockyards and an increased reliance on contractors to conduct depot-level maintenance and intermediate-level maintenance of naval ships and systems. Concurrent with this has been a reduction in the number and roles of Defence's Navy engineers and technical officers.[371] This in turn has led to reduced opportunities for DMO and Navy personnel to develop and maintain a skilled workforce fully aware of the international rules and regulations related to naval architecture and ship design and construction, and deep-level maintenance.[372] Chapter 7 provides additional coverage of this issue.

5.42 Defence and DMO use the services of the Classification Societies to certify and assure that naval ships comply with recognised ship design and construction rules where that is required in the endorsed Certification Basis. Table 5.1 lists the Classification Societies engaged by DMO at the time of that audit.

Table 5.1

Classification Societies engaged by the Defence Materiel Organisation

Classification Society	Ship Class
Lloyd's Register of Shipping	The two Hydrographic Ships, the four Survey Motor Launches, HMAS *Tobruk*, the six Landing Craft Heavy (LCH), HMAS *Sirius*, and the Sail Training Ship (STS) *Young Endeavour*.
Germanischer Lloyd	The eight Anzac Class Frigates.
Det Norske Veritas	The 14 Armidale Class Patrol Boats and the six Huon Class Mine Hunter Coastal ships.
Bureau Veritas	The Auxiliary Oiler Replenishment (AOR) vessel HMAS *Success*.
American Bureau of Shipping	The two Mine Sweeper Auxiliaries.

Source: Director, Navy Certification and Safety, *Classification Status of The Fleet*, March 2010.

[371] Defence's Commercial Support Program aimed to ensure that non-core support services and products are provided to core Defence activities in the most cost-effective manner. Its central objective was to transfer support activities to the civil sector where operationally feasible, practical and cost-effective. ANAO Audit Report No.2, 1998-99, *Commercial Support Program,* Department of Defence, July 1998, p. 29.

[372] Deep-level maintenance includes scheduled maintenance, unscheduled maintenance and repairs, which require extensive Repairable Item dismantling in specialised jigs, and the use of specialised support equipment, technical skills or industrialised facilities.

5.43 As at March 2010, the majority of the RAN's fleet had safety and environment protection certifications issued by Classification Societies. The exceptions are the six Collins Class submarines, the four FFGs,[373] and the Landing Platform Amphibious (LPA) vessels HMAS *Kanimbla,* and HMAS *Manoora.*

5.44 Defence advised the ANAO in June 2010 that:

- The submarines are not in class as there is minimal return on investment given the complexity of the platform and the lack of commercial classification for naval submarines;
- The FFGs were not in class as there was little return on investment based on the projected decommissioning dates; and
- Det Norske Veritas were engaged in 2002 to classify the LPAs.[374] Defence advised the ANAO in February 2011 that a decision had been taken by the Chief of Navy Senior Advisory Committee (CNSAC) not to continue with the Classification of the LPAs.[375]

5.45 The two Amphibious Deployment and Sustainment ships currently under construction are the subject of Lloyds Register of Shipping survey,[376] and so are expected to be delivered in class.[377] At this time, Defence does not intend the three Hobart Class Air Warfare Destroyers, currently under construction, to be delivered in class.[378]

5.46 Table 5.2 lists the typical certificates the Classification Societies provide DMO in support of the Navy's fleet.

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373 HMA Ships *Sydney, Melbourne, Newcastle and Darwin*.

374 Department of Defence, OCAE/OUT/2010/136/30 June 2010, *Performance Audit - Acceptance Into Service Of Naval Capability*, Annex A, p. A5.

375 Department of Defence, AFCD/CAE/OUT/2010/48 11 February 2011, *Performance Audit - Acceptance Into Service Of Naval Capability,* Attachment: *Defence Response To 2nd Confirmation Paper On Acceptance Into Service Of Naval Capability*, p. 18.

376 Lloyd's Register provides classification and certification of ships, and inspects and approves important components and accessories, including life-saving appliances, marine pollution prevention, fire protection, navigation, radio communication equipment, deck gear, cables and anchors.

377 Navy Brief, DNC/OUT/2010/027 *Classification Status of the Fleet,* April 2010. A ship is known as being *in class* if it meets all the minimum requirements laid down by a Classification Society.

378 Navy Brief, 2004/1018041, Brief for CN, *NFA, IMO and Engagement of Classification Societies: consideration of Draft DI(N)* ADMINs *34-1 and 34-2*, April 2010, p. 2.

Table 5.2

Typical Certificates Provided by Classification Societies to DMO

Certificate	
Certificate of Class	Record of Approved Ship Safety Equipment
Certificate of Tonnage Measurement	Register of Ships' Lifting Appliances and Cargo Handling Gear
Document of Compliance – International Load Line	Statement of Compliance – International Sewage Pollution Prevention
Statement of Compliance – International Oil Pollution Prevention	Cargo Ship Safety Radio Certificate

Source: Director, Navy Certification and Safety, *Classification Status of The Fleet*, March 2010.

5.47 These certificates, for the most part, relate to International Maritime Organisation safety and environment protection conventions.

5.48 Classification Societies survey ships whilst they are in service to assist in the maintenance of their certification status.[379] In that role they may recommend remedial work needed to ensure compliance with the rules of classification. A failure to rectify a condition of class within a specified period will usually result in the vessel's compliance certification being suspended or withdrawn.[380]

5.49 Det Norske Veritas' October 2009 review of certification of the LPAs HMAS *Manoora* and HMAS *Kanimbla* revealed extensive classification non-compliance relating to the hull and its structure, machinery and electrical and other systems.[381]

Naval ship rules

5.50 Naval ship rules for the classification of warships have been in development for some decades in other jurisdictions. They include Lloyd's Register's Naval Ship Rules and the American Bureau of Shipping's Naval

[379] Navy Brief, DNC/OUT/2010/027 *Classification Status of the Fleet,* April 2010.

[380] Navy Brief, DNC/OUT/2010/027 C*lassification Status of the Fleet,* April 2010. North Atlantic Treaty Organization, NATO Standardisation Agency, ANEP 77 Naval Ship Code, December 2009.

[381] Det Norske Veritas, HMAS *Manoora, Review of certification of LPA vessels against DNV Rule Set*, 4 October 2007, This review found 193 non compliances against the Det Norske Veritas Rule Set. Det Norske Veritas, HMAS *Kanimbla*, *Review of certification of LPA vessels against DNV Rule Set*, 17 October 2007. This review found 127 non compliances against the Det Norske Veritas Rule Set.

Vessel Rules and are designed as alternative, but equivalent, rule sets to their commercial rule sets. The intent is to provide a common set of minimum specifications and parameters for the construction and operation of naval vessels, so as to assist design and construction and improve inter-operability and through-life-support logistics support.

5.51 The North Atlantic Treaty Organization's (NATO's) Standardisation Agency has developed a Naval Ship Code known as Allied Naval Engineering Procedure (ANEP) 77. ANEP 77 was promulgated by NATO in December 2009, and it provides a generic set of function and performance requirements related to safety and environmental protection requirements applicable for naval ships.

5.52 In September 2010, Defence advised the ANAO that SOLAS, the minimum safety benchmark for Safety of Life at Sea for commercial ships, has elements that inadequately address the safety needs and characteristics of warships. The objective of the Naval Ship Code is to offer a standard suitable for warships, which provides levels of safety equivalent to or better than SOLAS. Navy has been a member of the team developing the Code and is thus working actively to ensure the suitability of ANEP77 for RAN's needs.[382]

Navy Flag Authority arrangements

5.53 In addition to classification of type, commercial practice also involves arrangements between the national Flag Authority and the Classification Society. Australia's national Flag Authority for commercial shipping is the Australian Maritime Safety Authority (AMSA), which administers Australia's obligations under the various International Maritime Organisation's codes and conventions. AMSA provides local interpretation and determination of International Maritime Organisation requirements, and issues tailored requirements in the form of AMSA Marine Orders.[383] However, as military vessels are exempt from that arrangement under the *Navigation Act 1912*, clarification of requirements and interpretation of design and construction rules are not normally obtained by the Classification Societies from AMSA with respect to Navy vessels. Instead, the ANAO was informed that

[382] Defence advice to the ANAO 9 September 2010.

[383] Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual*, January 2009, Part 1, Chapter 12.

Classification Societies have informal arrangements with Navy with respect to design and construction rule interpretations.

5.54 Since 2005, Navy has been formulating a Navy Flag Authority arrangement that will, for RAN vessels, replace current informal arrangements by allowing Navy to, in terms of Navy ships, replicate AMSA's role.[384] The planned Navy Flag Authority is expected to establish a formal contractual relationship with the Classification Societies that, with respect to naval vessels, will facilitate improved requirements setting and design and construction rule interpretations.[385]

5.55 A formal and contractual relationship with the Classification Societies, through the proposed Flag Authority arrangement, will reduce the risks to Navy with respect to requirements setting and the interpretation of international maritime codes and conventions.[386] It will also provide a formal mechanism for the granting of design waivers for those elements that are not subject to the standards used by Classification Societies.

5.56 As at February 2011, two draft Navy Instructions relating to the Navy Flag Authority arrangement and the Certification Society engagement arrangements remained under development.[387] Navy advised the ANAO in March 2011, that Navy plans to achieve the necessary stakeholder agreement and clearances ready for Chief of Navy's approval by mid-2011.

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[384] Australian Navy Systems Command, 2000/19677, DGSCA/OUT/2007/-11, *Use of Classification Societies to Certify Naval Ships*, February 2007.

[385] Australian Book of Reference (ABR) 5454, *The RAN Regulatory Framework and Certification Manual,* January 2009, Part 1, Chapter 12 Annex A. Draft Defence Instructions (Navy) ADMIN 34-1, *Naval Flag Authority and Royal Australian Navy Compliance with International Maritime Codes and Conventions*, and Draft Defence Instructions (Navy) ADMIN 34-2 *Royal Australian Navy policy on the engagement of classification Societies*.

[386] Australian Navy Systems Command Minute, 2004/1014061 DNC/OUT/2005, *The Use of Classification Societies within the NRS Framework*, July 2005.

[387] Defence Instructions (Navy) ADMIN 34-1 *Navy Flag Authority and Royal Australian Navy Compliance with International Maritime Codes and Conventions* and Defence Instructions (Navy) ADMIN 34- 2 *Royal Australian Navy policy on the engagement of classification societies.*Naval Systems Command Brief, 2004/1018041, *NFA, IMO and Engagement of Classification Societies: Consideration of Draft DI(N) ADMINs 34-1 and 34-2,* May 2010.

Recommendation No.7

5.57 The ANAO recommends, in order to reduce the risks to Navy associated with requirements setting and the interpretation of international maritime codes and conventions, Navy and the DMO seek an early agreement on the arrangements for the Navy Flag Authority.

Defence response

5.58 Defence agreed to the recommendation and stated as follows:

> The Navy Safety Regulatory Council met on 19 May 2011 and endorsed that Navy would establish a Flag Authority that will enable the establishment of appropriate standards for naval ships and arrangements for certifying their compliance. This will be in place by the end of 2011.

Conclusion

5.59 Defence's Technical Regulatory Framework requires Defence organisations that undertake the design and construction of ADF materiel, or that accept designs and construction, to be certified to do so as Authorised Engineering Organisations (AEOs). All but one of the 18 DMO System Program Offices that managed projects considered in this audit were so certified.

5.60 In February 2011, Head Navy Engineering found the remaining project's Engineering Management System to be inadequate, and subsequently withdrew the System Program Office's certification.[388] This System Program Office had a history of difficulties in its Engineering Management System, and DMO's Maritime System Division could have better mentored and resourced it to overcome its difficulties.

5.61 The regulatory framework also requires approved certification processes and records management systems to compile and maintain evidence that the systems being offered to Navy are fit for service and pose no undue risk to personnel, public safety, and the environment. The requirement is given practical effect in each project's Certification Plans and the System Safety Program Plans. When executed, these plans result in DMO providing Safety Case Reports and TI 338s containing regulatory compliance certificates.

[388] File No HNE/OUT/2011/00x, *Removal of AEO Status – AASSPO*, 7 February 2011, p. 1

5.62 For the 13 Navy projects in this audit that had received Initial Operational Release and Operational Release, all but one project had Navy approved Safety Cases. The safety of the remaining project had been assured by assessments provided by the relevant Classification Society and other firms engaged by DMO. All projects provided TI 338s which were subsequently reviewed and endorsed by Navy regulators prior to the Chief of Navy authorising either Initial Operational Release or Operational Release.

5.63 In some instances, the information provided by DMO in support of Safety Cases and TI 338s was inadequate or incomplete. In other cases, DMO provided the information but at very late notice, in one instance leaving very little time for Navy to assess the safety of live missile firings. The ANAO has recommended (Recommendation 6) that Navy adopts streamlined regulatory review processes through improved verification cross referencing and that DMO mandates the adherence to the Navy's regulatory review schedule requirements.

5.64 Over the last decade, Defence has become increasingly reliant on shipping industry Classification Societies to provide independent verification that each naval vessel complies with the design, construction and operation requirements that govern the vessel's particular class. Since 2005, Navy has been formulating a Navy Flag Authority arrangement to establish a formal contractual relationship with the Classification Societies. The intention is to facilitate improved requirements setting and design and construction rule interpretations for naval vessels.

5.65 As at February 2011, the respective Defence Instructions for the Navy Flag Authority arrangement and the Certification Society engagement arrangements remained under development. The ANAO has recommended (Recommendation 7) that Navy and the DMO seek an early agreement on the arrangements for the Navy Flag Authority arrangements.

6. Operational Release

This chapter examines the Operational Release phase of Navy capability life cycle, with particular focus on operational test and evaluation, Navy's Materiel Condition Assessments and Combat System Qualification Trials.

Introduction

6.1 The Navy's two-stage Operational Release process involves:

- DMO delivering new or upgraded Mission and Support Systems to the Navy, and the Chief of Navy authorising the Initial Operational Release of Mission Systems into operational test and evaluation; and
- the Chief of Navy authorising the Operational Release of a capability when all Fundamental Inputs to Capability are delivered and integrated and found to be fit for service and only pose acceptable risk to personnel, public safety, and the environment.

6.2 This two-stage process reflects the need for Navy capability to be progressively accepted into service, typically through a series of sea operational tests and evaluations. These commence after platform systems, weapon and sensor systems have been installed and set to work, and end when the entire ship or submarine's systems and all other Fundamental Inputs to Capability have successfully completed operational test and evaluation.[389]

6.3 The Operational Release process commences with project specific Safety Case Reports and TI 338s provided to Navy by the DMO (see paragraphs 5.14 to 5.24). When new or upgraded Mission Systems have achieved a sufficient level of assurance as to their fitness for service, and the risks they pose to personnel, public safety, and the environment, the Chief of Navy authorises Navy's Test, Evaluation and Acceptance Authority (RANTEAA), and the ship or submarine's personnel, to commence the operational test and evaluation phase of the acceptance into service process. Operational tests and evaluations gauge the performance of the ship or submarine's platform systems, weapon and sensor systems and all other key

[389] The Defence Instruction for the acceptance into operational service of ADF capability provides for a tailorable multiple, staged, Operational Release approach, which is necessary to cater for the differing scale and complexity of projects. Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008.

Fundamental Inputs to Capability. They include the use of sea-based test scenarios that focus on the effectiveness and suitability of the new capability in its intended environment. The operational test and evaluation results are used in submissions to the Chief of Navy that seek authorisation to release the new or upgraded capability into operational service. These results are also used by DMO to complete the validation component of System Acceptance, through assembling evidence regarding the new or upgraded system's ability to achieve their contracted requirements when operated in their intended environment (see paragraphs 4.8, 4.58 to 4.61).

6.4 As at July 2010, RANTEAA had a total of 20 uniform personnel and four APS civilian personnel. The uniform personnel rotate every two to three years with the last major turnover occurring in 2009.

6.5 Navy Operational Release arrangements examined by the ANAO included:

- Navy's Operational Release milestones, system validation and operational test and evaluation;
- submissions to the Chief of Navy concerning Operational Release of Navy capability;
- Materiel Condition Assessments; and
- Combat System Qualification Trials.

Navy's Operational Release milestones

6.6 Operational Release milestones are a measure of a new or upgraded capability's maturity in terms of the development and integration of all eight Fundamental Inputs to Capability, as outlined in Table 2.1 and Figure 2.1. The Initial Operational Release milestone marks the point in time at which the control and responsibility of new or upgraded Mission and Support Systems transfers from the DMO to Navy, and the Chief of Navy accepts all Mission and Support System technical and operational risks from the DMO.[390]

[390] Royal Australian Navy, ABR 6205, *Naval Operational Test and Evaluation Manual*, Edition 4, January 2011, Chapter 4.

6.7 Ideally, Initial Operational Release would occur soon after Mission and Support Systems have undergone System Acceptance by the DMO.[391] At this point, Navy expects that DMO has:

- completed its acceptance testing of the Mission and Support Systems, including verification and validation that the systems comply with contractually specified requirements;[392]
- has developed satisfactory Safety Case Reports and TI 338s, and
- has complied with all other requirements of Initial Materiel Release.

6.8 Once a Safety Case Report produced by DMO is authorised by Navy's Director General Navy Certification Safety and the relevant TI 338 has been reviewed by the regulatory authorities. RANTEAA reviews these documents and together with DMO's acceptance test and evaluation results, prepares an Initial Operational Release Report. That report addresses the materiel and operational state of the new or upgraded Mission System, including deficiencies, training and Support Systems elements, and the risks to personnel safety and the environment. The Initial Operational Release Report is provided to:

- the respective Force Commander for endorsement;
- to the Fleet Commander for recommendation; and finally to
- the Chief of Navy for approval of the release of the capability into the Navy operational test and evaluation phase.[393]

6.9 On completion of the Navy operational test and evaluation, RANTEAA prepares an Operational Release Report, which addresses the Mission and Support System's overall ability to reliably conduct its mission with respect to its operational concepts as set out in the Operational Concept Document discussed in paragraph 3.9. Operational Release occurs when the Chief of

[391] System Acceptance is the acknowledgment by the DMO Project Authority that an acquired materiel system complies with contractual and single-Service requirements and is ready to be transitioned to the in-Service Phase. Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. A-2.

[392] Department of Defence, *ASDEFCON (Strategic Materiel) Handbook*, March 2002, Part 3, 7.2.3, and Supplementary information, Sect. 13. Verification and Validation. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, pp. 10, 12, 59.

[393] Defence Instructions (Navy) ADMIN 37-15, *Assuring the safety, fitness for service and environmental compliance of naval capability,* April 2007.

Navy or his delegate is satisfied, on an endorsement from the Force Commander and the recommendation of the Fleet Commander, that the new or upgraded capability has proven to be safe, effective and suitable for the intended role and is ready for operational service.[394] Any shortfalls in satisfying Navy's contemporary requirements are to be referred back to Capability Development Group for possible inclusion into a subsequent project phase or into a new project.

Operational test and evaluation

6.10 As discussed in Chapter 4 and outlined above, DMO conducts System Acceptance verification and validation, and the validation component of System Acceptance may require the materiel system to be operated by its intended user in its intended environment. For Navy systems, validation often requires periods at sea in Defence practice areas with members of the Defence force conducting exercises including the firing of weapons.

6.11 Navy accepts that full naval operational capability may not be available at Initial Operational Release, as it may take some time for all Fundamental Inputs to Capability to be fully realised. That factor provides the basis for the two-stage Operational Release process, which reflects the need for Navy capability to be progressively accepted through a series of operational test and evaluations. For that reason RANTEAA manages an operational test and evaluation program, aligned with the development of the Fundamental Inputs to Capability, to assess the capability's operational effectiveness and operational suitability.[395]

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[394] Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. 5.

[395] Operational effectiveness is the ability of a system to perform its intended function over its intended operational spectrum, in the expected operational environment, and in the face of expected threats when operated by typical operational personnel. Operational Suitability is defined as the capacity of the system, when operated and maintained by typical operational personnel in expected numbers, at the expected level of competency, to be reliable, maintainable, available, logistically supportable, compatible, interoperable, safe and ergonomically satisfactory. Defence Instructions (General) OPS 43-1, *Defence Test and Evaluation Policy,* November 2007, Annex A.

An important element of suitability is supportability, which DMO is to address through a supportability test plan. Supportability is the system's capacity to sustain its assigned role, when operated and maintained by adequate numbers of skilled personnel. For a system to be operationally supportable, the DMO Project Office needs to deliver a Support System that provides the level of Integrated Logistics Support needed to ensure the Mission System can reliably perform its assigned role. The logistics support arrangements typically consist of six integrated elements:

- logistics engineering, which evaluates a system's safety, reliability and maintainability, and determines the most effective through life support plan;

Footnote continued on the next page…

6.12 Both the System Acceptance process and the progressive realisation of the Fundamental Inputs to Capability development, raise the need for acquisition contract provisions that allow operational test and evaluation involvement by Navy, and for DMO's test and evaluation schedule and resources to have the flexibility to facilitate Navy's involvement in system validation leading to System Acceptance. This flexibility also requires DMO to remain engaged following Initial Operational Release and during operational test and evaluation conducted by Navy, in order to provide resources and to also remediate capability deficiencies identified against the approved project requirements.

6.13 International experience indicates that many weapon systems fail operational testing because of problems that should have been identified and corrected during development testing, which occurs much earlier in the acquisition process. For that reason the United States Weapon System Acquisition law requires the integration of developmental test and evaluation with operational test and evaluation.[396]

6.14 Recent system development projects in DMO indicate the integration of system verification and system validation through operational test and evaluation resources can lead to successful results for DMO, its contractors and Navy.[397] The SEA 1448 Anzac Class Anti-Ship Missile Defence project identified the advantages of the early involvement by Navy in the project's verification and validation program. Navy has been involved throughout the developmental test and evaluation phase, with RANTEAA personnel committed to sea-riding during critical phases of Sea Acceptance Trials leading to an Early Operational Assessment of the first production, or prototype systems. Early Operational Assessments enable the Chief of Navy to be informed of a system's performance. In the case of SEA 1448, Early Operational

- maintenance engineering, which determines maintenance procedures and schedules;
- technical documentation development, covering equipment operation and maintenance manuals;
- supply support analysis, which determines the range and depth of spare parts and test equipment, and provides the initial spares support;
- operator and maintainer training; and
- information technology development to support each of the above logistics elements.

[396] United States Government Public Law 111–23 111th Congress, Weapon Systems Acquisition Reform Act of 2009, Sect. 102 (a) (5) (A) ii.

[397] These resources need to be additional to the resources DMO needs to provide for Navy, for the conduct of Category 5 Sea Acceptance Trials (see Appendix 5 Table A5.2).

Assessment will inform the Chief of Navy's decision regarding his endorsement of the Cabinet Submissions seeking government approval for the next phase of the project.

6.15 The ANAO examined 12 recent RANTEAA Initial Operational Release Reports, and the associated classified Operational Capability Statement submitted to the Chief of Navy. The overall the scope and content of these submissions vary considerably and to a degree that could not be explained solely by the differences between the systems for which approval for Initial Operational Release and Operational Release was being sought. Each submission arrived at a conclusion based, to varying degrees, on Safety Cases, TI 338s and on the results of acceptance test and evaluations and operational test and evaluations.

6.16 As a result of the overall variability within Safety Cases, TI 338s and the test and evaluation data, it was not possible to make comparisons between the RANTEAA submissions as to the quality of the supporting data that underpinned the submissions. At the time of the audit, RANTEAA was seeking to reduce this variability by implementing a more consistent and systematic approach to developing Initial Operational Release and Operational Release Reports and Operational Capability Statements. RANTEAA has now implemented a standard format for these reports, which is managed under RANTEAA's accredited Quality Management System.[398]

6.17 RANTEAA was also devising ways to more quickly and accurately produce the Initial Operational Release and Operational Release reports, including a significant upgrade of the TI 338 report. This work was completed in early 2011, and Deputy Chief of Navy approved an updated Naval Operational Test and Evaluation Manual and TI 338 in January 2011. These documents were endorsed by DMO's Head Maritime Systems.

Revised materiel delivery milestones

6.18 At the time of this audit, CDG, DMO and Navy were working together to develop new performance milestones to further clarify DMO's progress in delivering major systems, Support Systems and certain facilities. These milestones make the distinction that DMO delivers only Mission Systems and Support Systems, and some facilities; rather than delivering ADF capability,

[398] ISO 9001:2008, *Quality management systems – Requirements*, November 2008.

which requires additional inputs that are the responsibility of the Services or of other defence groups (see Table 2.1). DMO and Navy are proposing Initial Materiel Release and Final Materiel Release milestones, which contribute to capability milestones, namely Initial Operational Capability and Final Operational Capability.

6.19 Under these arrangements, Initial Materiel Release is the delivery of materiel by DMO to the Chief of Navy for the Chief of Navy's acceptance. Acceptance of the materiel by Navy at the point of Initial Operational Release, is dependent upon the materiel being assessed as sufficiently fit for service and posing only acceptable risk to personnel, public safety, and the environment; to an extent that allows its release into Navy's operational test and evaluation program. Navy Regulators may provide conditional recommendation for Initial Operational Release, and may identify deficiencies that do not preclude commencement of Naval operational test and evaluation, but which need to be rectified prior to Operational Release.

6.20 Final Materiel Release is the completion and release of DMO acquisition project supplies required to support the achievement of Final Operational Capability. Final Materiel Release is proposed by DMO and accepted by the Chief of Navy when they are satisfied that the operational and materiel state of the defined deliverables is sufficient to achieve Final Operational Capability, in conjunction with all remaining Fundamental Inputs to Capability.

6.21 Navy recognises that the materiel release milestones have the potential to strengthen the acquisition process by clearer definition of Capability Managers' materiel requirements for Initial Operational Release. Navy also recognises that the process for Initial Materiel Release and Final Materiel Release place additional emphasis on both the DMO and the Capability Manager to adequately specify the deliverables and milestones set out in the Materiel Acquisition Agreements. This entails agreement on the materiel acceptance criteria derived from materiel function and performance requirements, and on the test and evaluation program, so that adequate evidence is provided to the Capability Manager on the extent that materiel requirements have been verified and validated.

6.22 At the time of the audit, the Defence Instructions (General) Ops 45-2, *Capability acceptance into operational service*, and the Defence Capability Development Handbook and the DMO Acquisition and Sustainment Manual were being revised to include the materiel release milestone processes. The

Materiel Acquisition Agreements between DMO and Navy were also being revised to include these new milestones.

Materiel Condition Assessments

6.23 Once Mission Systems have achieved Initial Materiel Release, Navy crews are required to assess the materiel condition of their ships. The Navy Technical Regulatory Framework specifies that materiel condition of fleet units is to be assured through audit and in-service trials,[399] and Navy instructions state that Commanding Officers of RAN ships are responsible for ensuring that no unauthorised configuration changes to their ship are undertaken.[400] Consequently, Navy's Australian Fleet General Orders include a requirement for the Materiel Condition Assessments of a ship to be assessed during the force preparation phase of a ship's activity program, and as a minimum, these assessments are to be conducted within 12 months of achieving Initial Materiel Release.[401]

6.24 The Materiel Condition Assessment process is intended to provide a consistent, repeatable, and auditable mechanism for satisfying the requirement to assess and assure the materiel condition of the Navy's ships. The objectives of this assessment process are to:

- assess whether the item under assessment provides the minimum required functional performance, and confirm fitness-for-service; and
- determine whether the risks to mission, the environment, and personnel of the item under assessment are in excess of the level ordinarily tolerated when the item's physical condition meets Navy requirements.[402]

6.25 A required outcome of the Materiel Condition Assessment process is the gathering of information that enables the ship's Commanding Officer to:[403]

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399 Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM)*, July 2003, Vol.1 Sect.1 Chapter 2. p. 1

400 Defence Instructions (Navy) ADMIN 30-3, *Instructions to the Commanding Officer*, November 2002, p. 9.

401 Royal Australian Navy, *Australian Fleet Tactical Publication AFTP1(C)*, June 2009, Chapter 323. Defence advice to the ANAO, *DMO Additional Information and Proposed Amendments – Revised S.19 Summary*, 8 June 2011.

402 Royal Australian Navy, *Australian Fleet Tactical Publication AFTP1(C)*, June 2009, Chapter 323.

403 ibid.

- identify non-compliances in the materiel condition of systems;[404]
- understand the risks associated with the use and maintenance of those systems in the assessed materiel condition;
- develop remedial action plans to address materiel condition non-compliances; and
- manage residual risks to levels that are As Low As Reasonably Practicable (ALARP) and tolerable until the non-compliance is rectified.

6.26 Navy's Materiel Condition Assessment process is to contribute to the achievement of ADF operational preparedness objectives (readiness and sustainability) by providing assessments of the reliability, availability and maintainability (RAM) of Navy materiel.[405] These assessments would enable DMO Systems Program Offices to investigate the causes of any significant discrepancies between an equipment's specified reliability, availability and maintainability, to that which is achieved in practice.

6.27 Materiel Condition Assessments are reliant upon the Configuration Management process to:

- identify the configuration baseline, which is to be maintained through the configuration control;
- determine any variance from the configuration baseline, which configuration control needs to correct; and
- determine the level of confidence in the configuration baseline.

6.28 As previously indicated, there has been inconsistency in the application of configuration management in DMO for many years, including the need for improved configuration records and audits (see paragraphs 4.70 to 4.85). The various Configuration Management Information Systems used by DMO and

[404] Non-compliance is defined as any functional performance or physical condition deficiency or shortcoming. Systems comprise structures, compartments, fittings and fixtures, and equipment that combine as a group of interacting, interrelated or independent elements to form the complex whole that is the ship. Royal Australian Navy, *Australian Fleet Tactical Publication AFTP1(C)*, June 2009, Sect. 323.6.

[405] Reliability governs the frequency at which a system will fail in service, and thus the frequency of maintenance demands for the system, whilst maintainability governs the speed at which a failed system can be brought back on-line. Defence Instructions (General) LOG 4–5–007, *Defence policy on Reliability, Availability and Maintainability*. February 2006, p. 1. This instruction required DMO to develop and maintain Centre(s) of Expertise for Reliability, Availability and Maintainability in Defence.

Navy are also in a poor state as reported by various internal reviews. A 1999 review of configuration management in the RAN found:

> DAO [now DMO] may at times appear compliant with configuration management policy in relation to documented plans and procedures but unless Navy takes a stand on configuration baseline deliverable requirements the idea of a *'complete configuration record that is capable of being directly accepted into service'* will remain conceptually different for each project, and this seems inconsistent with the purpose of configuration management across Navy. Common plans and procedures amount to nothing if the data product is not fit for purpose.[406]

6.29 Navy and DMO primarily rely on the following four Configuration Management Information Systems to provide accurate and complete configuration data:

- *Configuration Management Tool (CMT).* As at September 2010, four DMO Maritime Systems Division System Program Offices were reported to use CMT, and DMO considered that CMT should be the principal tool for recording configuration baseline data and for controlling changes to those configuration baselines;
- *Asset Management Planning System (AMPS).* AMPS is used by most System Program Offices and fleet units to schedule maintenance, and to capture the maintenance data needed to inform the planning and conduct of future maintenance activities, and various other support functions;
- *Ships Information Management System/Ships Information System (SIMS/SIS).* SIMS/SIS is utilised by shore based submarine sustainment agencies and COLLINS class submarines. In general terms, SIMS/SIS embodies the functionality incorporated in CMT and AMPS to manage the configuration of the submarines and to schedule and record maintenance; and
- *Navy Allowance Management System (NAVALLOW).* NAVALLOW provides the principal repository of the component level configuration of Navy's platforms, and is managed by the Logistics Data and

[406] *Report of a Review of Configuration Management in the RAN*, August 1999, p. 21.

> Allowances (LDA) section of DMO's Maritime Systems Division. It identifies component parts required to carry out planned and corrective maintenance onboard ships or at fleet support units. The data retained in NAVALLOW is also used to compute the shipboard spare and repair part allowances needed to facilitate the timely conduct of that maintenance at the shipboard level.[407]

6.30 Defence records indicate these information systems suffer chronic shortfalls in data integration and data integrity. A September 2010 DMO report states:

> For several reasons, most of them related to dysfunctional organisational relationships or stove piped organisational structures; these systems were developed and now exist in virtual isolation. To the detriment of the delivery of effective and efficient logistic support, there is a fundamental lack of appreciation of the complementary nature of these systems - and the primary and critical function of NAVALLOW in particular.[408]
>
> Due to the various systems' isolated development and disparate 'ownership', the configurations recorded in each are, on average, approximately 60% discrepant (much higher in the case of certain platforms), and the accuracy of the configurations recorded in any one system is highly questionable. While the systems continue to retain different configurations, and of most concern, plausibly inaccurate configurations, the ability to maintain technical integrity and provide cost effective logistic support is badly prejudiced.[409]

6.31 This situation represents a significant breach of Defence and Navy technical regulations, which require that Authorised Engineering Organisations undertaking design, construction or maintenance, are to be supplied with relevant and authorised data. Data generated during these

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[407] Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report,* September 2010, Sect. 4.20.

[408] Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report,* September 2010, Sect. 4.

[409] Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report,* September 2010, Sect. 4. Figures used are based on a report rendered by Relegen on behalf of DMARSS in the first half of 2009, and Accuracy in this context means that the configuration recorded in the various databases precisely reflects the physical entity i.e. the ship/submarine and its fitted equipment.

activities is to be managed to ensure its completeness, accuracy, accessibility and appropriateness.[410]

6.32 Regarding maintenance and inspection requirements for ship safety and seaworthiness, managed under Classification Society arrangements, Navy's Maintenance Administration Manual advises that:

> On occasion the Royal Australian Navy (RAN) may elect to operate and maintain a ship or class of ship 'In Survey' with an external Classification Society (eg. Lloyds Register, Germanischer Lloyd, and Bureau Veritas). This will impact on the maintenance and inspection requirements and it is vital that all Engineer Officers of such ships have a thorough understanding of any additional responsibilities or limitations imposed. As contracts with Classification Societies are managed by the System Program Offices (SPOs), ship's Engineer Officers are advised to approach their SPO for details of requirements, responsibilities and limitations.[411]

6.33 Classification society requirements for shipboard maintenance and inspections should be accurately recorded in the Configuration Management Information Systems available to ship's Engineer Officers.

6.34 These findings underscore the need for DMO and Navy to both institute more robust configuration information systems and an enhanced Configuration Management policy compliance regime.

Combat System Qualification Trials

6.35 The purpose of Combat System Qualification Trials is to verify and validate that an individual ship's combat system has been installed correctly (particularly regarding combat system software upgrades) and can be operated and maintained in a safe and effective manner. System Qualification Trials focus on gathering the data required for full assessments of system performance and operator proficiency. This involves live target tracking and naval gun and guided weapons firing events, or simulated firings that serve as the final verification of the safe and effective use of the combat systems.

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[410] Department of Defence, Defence Instructions (General) LOG 08-15, *Regulation of technical integrity of Australian Defence Force materiel*, June 2004, p. 4. Defence Instructions (Navy) LOG 47–3, *Regulation of technical integrity of Australian Defence Force maritime materiel*, January 2009, p. 6. Regulations for the management of technical data are incorporated in Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM)*, July 2003, Vol. 2, Sect. 7 - Technical Data Management.

[411] Royal Australian Navy, ABR 5230, *Ship Maintenance Administration Manual*, Revision 5 Original, November 2004, Chapter 1, p. 1

6.36 The ANAO was informed that System Qualification Trials allow Navy crews time to conduct a series of technical trials to ensure the materiel state of the combat system in preparation for work up to operations, or in the case of new capability, operational testing. These trials were once conducted by the Fleet In Service Trials (FIST) section of the former Maritime Command Australia,[412] but are now conducted by each ship's Officers and crew as part of the Materiel Condition Assessment (outlined above). This practice may not be ideal as it places the responsibility for conducting System Qualification Trials with each ship, and the System Qualification Trials period may be subject to scheduling pressures due to other commitments or issues concerning the availability of suitably skilled and resourced trials personnel and facilities.

6.37 Naval gun and guided weapons firing events that serve as the final verification of the safe and effective use of the combat systems are expensive to conduct in terms of the cost of the ordnance expended and the provision of suitable ranges, targets, and telemetry facilities. The ANAO recommended in 2002 that the DMO's Joint Ammunition Logistics Organisation and the Services examine options for using stores of guided munitions cost effectively before their safe service lives expire. Defence agreed with the thrust of the recommendation and advised implementation action had commenced.[413] In May 2011, Defence advised the ANAO that:

> As guided weapons are difficult to procure and expensive to acquire and sustain, they are closely managed by both Navy and the DMO. To ensure maximum value is gained from each guided weapon firing, several outcomes are planned. These are, in order of priority: end-to-end assessment of the weapon systems performance; weapon system crew proficiency; and tactical development. Crew proficiency and tactical development can be achieved by means other than live firings,

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[412] The former FIST section was responsible to Maritime Command Australia for:
a. pre condition assessment of minor war vessels prior to major maintenance activities;
b. combat and communications system assessment of major fleet units prior to major maintenance activities;
c. material readiness assessment of ships following major maintenance activities (and, inter alia, of new build ships);
d. ship qualification trials of ships following major maintenance activities (and, inter alia, of new build ships); and
e. in-service trials of combat systems during the operational cycle of ships. ABR 5230 - *Ship Maintenance Administration Manual,* 2002.

[413] ANAO Audit No. 30, 2002-2003, *Defence Ordnance Safety and Suitability for Service*, Department of Defence, February 2002, p. 46.

including comprehensive theoretical training, the use of simulation and emulation and optimising a system's related live firing to achieve crew proficiency training or tactical development objectives. Technical surveillance of the weapon to ensure proper performance is a by product of all live firings. Other considerations when planning a guided weapon firing include the provision of a suitable range, targets, and telemetry facilities.

Most of these facilities are not available in Australia to effectively support Navy's current guided weapons suite. With the introduction of higher performance, longer range missiles, due to enter service in the RAN early in the next decade, Navy recognises it can not afford to supply these facilities in country and is shifting toward leasing more capable facilities from the US Navy. Navy now sends ships to the US Navy missile firing range in Hawaii when required for live firings and routinely attends the Rim of the Pacific (RIMPAC) multi national maritime warfare exercise every two years. Guided weapon training allowances have been adjusted to reflect a number of firings at each RIMPAC, that will result in 25 per cent of Navy's surface fleet firing at two yearly intervals.[414]

Conclusion

6.38 Operational release milestones are a measure of the development and integration of all eight Fundamental Inputs to Capability and the degree of maturity of a new or upgraded capability. Navy accepts that Final Operational Capability may not be available at System Acceptance by the DMO.[415] It may take some time for all Fundamental Inputs to Capability to be fully realised and the two stages of Initial Operational Release and Operational Release reflect Navy's progressive acceptance of capability, typically through a series of operational tests and evaluations.

6.39 Both DMO's System Acceptance process and the progressive realisation of the Fundamental Inputs to Capability development, raise the need for

[414] Defence advised that guidance on these allowances was promulgated by Chief of Navy in June 2010 (CNSAC Action 64/09) and is being incorporated in the current revision of ABR 6304 - RAN Warrant of Naval Armament Stores and Practice Allowances - Edition 6, due for release in late 2011.

[415] Ideally, Initial Operational Release would occur soon after Mission and Support Systems have undergone System Acceptance by the DMO. Department of Defence, Defence Instructions (General) OPS 45-2, *Capability Acceptance into Operational Service*, February 2008, p. A-2

acquisition contract provisions that allow operational test and evaluation involvement by Navy, and for DMO's test and evaluation schedule and resources to have the flexibility to facilitate Navy's involvement in system validation leading to System Acceptance. This flexibility would include provision for periods at sea following Initial Operational Release, when the capability is being operated by the Navy. The recent experience of the SEA 1448 Anzac Class Anti-Ship Missile Defence project indicates that this approach is feasible: the integration of system verification and system validation through operational test and evaluation resources led to successful results for Navy and DMO and the system development contractors.

6.40 An integrated and consistent approach would also provide greater assurance to key decision-makers. To date, the overall scope and content of Initial Operational Release Submissions and Operational Release Submissions to the Chief of Navy has varied considerably. At the time of the audit, RANTEAA was seeking to reduce this variability by implementing a more consistent and systematic approach to developing Initial Operational Release and Operational Release Reports and Operational Capability Statements. RANTEAA has now implemented a standard format for these reports, which is managed under RANTEAA's accredited Quality Management System.

6.41 Navy recognises that the introduction of the materiel release milestones (Initial Materiel Release and Final Materiel Release), have the potential to strengthen the acquisition process by clearer definition of Capability Managers' materiel requirements for Initial Operational Release. Navy also recognises that the process for the materiel release milestones requires additional emphasis by both the DMO and the Capability Manager on the adequate specification of the deliverables and milestones set out in the Materiel Acquisition Agreements. This entails agreement on the materiel acceptance criteria derived from materiel function and performance requirements, and on the test and evaluation program, so that adequate evidence is provided to the Capability Manager on the extent that materiel requirements have been verified and validated.

6.42 At the time of the audit, the Defence Instructions (General) Ops 45-2, *Capability acceptance into operational service*, and the Defence Capability Development Handbook and the DMO Acquisition and Sustainment Manual were being revised to include the materiel release milestone processes. The Materiel Acquisition Agreements between DMO, CDG and Navy were also being revised to include these new milestones.

6.43 Once Mission Systems have achieved Initial Materiel Release, Navy crews are required to assess the materiel condition of their ships. This occurs during the force preparation phase of a ship's activity program, and as a minimum, these assessments are to be conducted within a 12 month period. Materiel Condition Assessments would provide important information on Navy equipment reliability, availability and maintainability as demonstrated in its operating environment. However, their timely completion is presently hampered by deficiencies in configuration management conducted by DMO, and deficiencies in the state of the various Configuration Management Information Systems used by DMO and Navy, as reported by various internal reviews.

6.44 The Materiel Condition Assessments include Combat System Qualification Trials, which validate that an individual ship's combat system has been installed correctly (including software upgrades) and can be operated and maintained in a safe and effective manner. These trials, were once conducted by the former FIST section of the former Maritime Command Australia, but are now conducted by each ship's officers and crew. This practice may not be ideal, as the ship may not have available suitably skilled and resourced trials personnel and facilities, or may be subject to scheduling pressures due to other commitments. It is rare for live firings of guided munitions to occur for operator proficiency purposes. For preparedness and cost reasons, in-service guided weapon live firings are generally restricted to systems qualification and testing activities. Wherever possible, these firings are also optimised for operator proficiency training and tactical development. In May 2011, Navy advised the ANAO that it has reviewed the allowances for guided weapon live firings and has developed a pragmatic firing policy that balances the cost of conducting live firings against the need for system testing and operator training.

7. Navy Capability Management

This chapter examines Navy's role of coordinating the delivery of all fundamental inputs to Navy capability.

Introduction

7.1 Defence's policy for accepting capability into operational service holds the Single-Service Capability Managers responsible for:

(a) monitoring, coordinating and reporting the transformation of Fundamental Inputs to Capability elements, to support Acceptance Into Operational Service;

(b) determining acceptance criteria for Operational Release to achieve the endorsed capability; and

(c) defining the capability shortfall if the capability is not safe, suitable or effective for its intended role and has not achieved the endorsed capability state for which the Capability Manager is responsible, and either:

1. accepting that shortfall; or
2. not accepting the capability into operational service, and determining a remedial course of action.[416]

7.2 These responsibilities align with changes made to the capability procurement process as a result of the 2008 Defence Procurement and Sustainment Review, and with the Capability Managers' responsibility of ensuring the technical integrity of ADF materiel in accordance with the ADF Technical Regulatory Framework.[417]

[416] Defence Instructions (General) OPS 45-2, Capability Acceptance into Operational Service, February 2008, p. 11. Defence advised the ANAO in February 2011, that Defence Instructions (General) OPS 45-2 Capability Acceptance Into Operational Service is being updated to incorporate the outcomes of the Defence Procurement and Sustainment Review, and to include Materiel Release milestones.

[417] Defence Instructions (General) 4-5-012, *Regulation of the technical integrity of Australian Defence Force materiel*, September 2010.

Capability Management structures and processes

7.3 Until the changes made by the 1997-2000 Defence Reform Program, Defence acquisitions and their logistics support were managed by project managers responsible to a military two star officer in each Service, known as the Assistant Chief of Staff – Materiel (ACMAT).[418] The ACMATs were 'two hatted' in that they were responsible and accountable to both their Service Chiefs, and to the civilian Deputy Secretary Acquisition and Logistics, for equipment acquisitions.[419]

7.4 The Defence Efficiency Review, the basis of the Defence Reform Program, found this form of matrix structure impractical. The reform program subsequently made the ACMATs responsible only to the head of Acquisition and Logistics, and formed the DMO on 1 July 2000,[420] bringing together within one organisation responsibility for:

- the acquisition of new and upgraded materiel, which was formerly the responsibility of DAO; and
- the provision of logistics policy and logistics support of all equipment placed into operational service, which was formerly the responsibility of Support Command Australia.[421]

7.5 This resulted in the Chief Executive Officer of DMO having authority over Mission and Support System acquisition and sustainment, and the Service Chiefs relying on customer-supplier agreements with DMO for the acquisition and sustainment of ADF materiel. The principle agreements are the

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[418] Department of Defence, *Capital Equipment Procurement Manual (CEPMAN 1),* April 1992, Part 1 Chapters 5 and 6.

[419] Department of Defence, *Capital Equipment Procurement Manual (CEPMAN 1),* April 1992, Part 1 Chapter 5. See also Department of Defence, *Future Directions for the Management of Australia's Defence, Addendum to the Report of the Defence Efficiency Review, Secretarial Papers*, 1997, p. 149.

[420] Department of Defence, *Future Directions for the Management of Australia's Defence, Report of the Defence Efficiency Review,* 1997, pp. 27, E5. Department of Defence, *Future Directions for the Management of Australia's Defence, Addendum to the Report of the Defence Efficiency Review, Secretarial Papers*, 1997, pp. 21, 149-150, 165.

[421] Support Command Australia (SCA) was formed on 1 July 1997 by the amalgamation of the three Single Service Logistics Management organisations. SCA was headed by a Military Officer responsible to the Chief of the Defence Force and responsive to each Service Chief. Department of Defence, *Defence Annual Report 1997-1998*, pp. 221-224.

DMO-CDG Materiel Acquisition Agreements and DMO-Capability Manager Materiel Sustainment Agreements.[422]

7.6 The 2008 Defence Procurement and Sustainment Review saw a need for Defence to reinforce its Service Chiefs' involvement in capability development. It recommended that:

- as a fundamental principle, oversight and coordination of all elements necessary for the introduction of a capability should be exercised by the relevant Service Chief, as Capability Manager;
- Defence should implement a framework, through the Capability Managers, to coordinate all the inputs to developing military capability; and
- Capability Managers should report regularly to government on the status of the capability-development initiatives for which they are accountable. [423]

7.7 As of March 2011, the Capability Managers' responsibility for oversighting and co-ordinating all elements necessary to introduce the full level of operational capability into service by the date agreed to by government, was being drafted into Project Directives for all new projects that receive the Governments' Second Pass approval from March 2011. Hence there were no Project Directives for the projects included in this audit.

7.8 At the time of the audit, Navy was addressing the task and resource implications of implementing these changes, particularly those related to:[424]

- increased involvement in the capability definition process, including developing and signing Materiel Acquisition Agreements that confirm

[422] Department of Defence, *Defence Capability Development Manual 2006*, February 2006, pp. 40, 71. Department of Defence, Defence Materiel Organisation, *DMO Acquisition and Sustainment Manual,* 2007, pp. 49-50, 83-84.

[423] Defence Materiel Organisation, *GOING TO THE NEXT LEVEL the report of the Defence Procurement and Sustainment Review*, September 2008, pp. 33-34. Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review,* May 2009, pp. 12, 26-27.

[424] Department of Defence, Draft Defence Committee Agendum Paper, *Capability Manager Roles and Responsibilities in the Capability Life Cycle Post-Mortimer,* May 2010.

scope, schedule and capability baselines by which delivery of equipment will be measured;[425]

- increased need for detailed Capability Realisation Plans; and
- greater oversight, coordination and reporting of the development of all Fundamental Inputs to Capability necessary for the introduction of a capability into service. This includes reporting on events and activities outside of the DMO's span of control that impact on the delivery of capabilities.[426]

7.9 Navy has established dedicated teams to coordinate all of the activities required to deliver complete capability. As at September 2010, there were five Navy Capability Implementation Teams, with a total of 17 personnel. These were assisted by six personnel responsible for the Army aspects of JP 2048 Amphibious Deployment and Sustainment project. Navy has identified that it will need additional personnel to undertake newly assigned Capability Management responsibilities, and that these personnel will be required to hold specific skill-sets in project management.[427]

7.10 The CDG-DMO-Navy Materiel Acquisition Agreements now being agreed place significant responsibilities on the Service's newly formed Capability Implementation Teams, in terms of providing professional advice on:

- operational requirements;
- certification requirements for new and upgraded Navy capability;
- objective evidence requirements for certification and the means of certifying compliance; and
- Technical Regulatory Authority, security and accreditation and certification requirements.[428]

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[425] Defence Materiel Organisation, *GOING TO THE NEXT LEVEL the report of the Defence Procurement and Sustainment Review*, September 2008, p. 32. Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review,* May 2009, p. 26.

[426] Defence Materiel Organisation, *GOING TO THE NEXT LEVEL the report of the Defence Procurement and Sustainment Review*, September 2008, pp. 34, 44. Department of Defence, *The Response to the Report of the Defence Procurement and Sustainment Review The Mortimer Review,* May 2009, pp. 26, 31.

[427] Mortimer Review Implementation Governance Committee, *The Role of the Capability Manager under Mortimer Framework–Capability Manager Input (Navy)*.

[428] The agreements also include Navy, CDG and DSTO providing resources required to support tender evaluation and to support training delivery by the Supplier (DMO), including the release of trainees.

7.11 Within this context, the ANAO examined the following Navy capability management issues:

- Engineering support for Navy Capability Management;
- Navy's Technical Regulation; and
- Acceptance into service processes.

Engineering support for Navy Capability Management

7.12 Navy's responsibilities, with respect to capability development, now mainly centre on coordinating the Fundamental Inputs to Capability and for applying technical and safety regulations during:

- requirements definition by CDG;
- systems acquisition by DMO; and
- operational service by Navy.

7.13 Since 1984, Navy has undergone a range of significant organisational changes mainly brought about by the establishment of the Capital Procurement Organisation in 1984, the Defence Commercial Support Program commencing in 1991,[429] and the Defence Reform Program in 1998. These changes included the transfer of all Navy's design, construction, and deep-level maintenance functions to the private sector,[430] and the transfer of naval materiel requirements definition, materiel acquisition and logistics support functions to other Defence Groups, principally to CDG and DMO.

7.14 Table 7.1 lists these changes which, from the perspective of Mission and Support System development, divested Navy of significant elements of systems engineering management responsibility, with a consequential loss of engineering skills development opportunities. At the same time, the organisational changes now being implemented place increased demands on Navy's program management role of monitoring and coordinating activities across the various organisations involved with developing each Fundamental Input to Capability. The increase over time in the number of Defence groups has also complicated the task of integrating Fundamental Inputs to Capability to form effective capability.

[429] ANAO Audit Report No.2, 1998-99, *Commercial Support Program*, July 1998.

[430] Deep-level maintenance includes scheduled maintenance, unscheduled maintenance and repairs, which require extensive Repairable Item dismantling in specialised jigs, and the use of specialised support equipment, technical skills or industrialised facilities.

Table 7.1

Location of Naval Engineering Functions, 1985 and 2011

Organisational Function	Location in 1985	Location in 2011
Definition of Navy requirements, including planning and development of Navy capabilities and force structure.	Navy Office– Naval Operational Requirements and Plans Division, Office of the Chief of Naval Operational Requirements and Plans.	Capability Development Group - Maritime Systems Division.
Navy platforms and weapon system acquisition and Integrated Logistics Support.	Navy Office– Until July 1984 Naval Materiel Division, Office of the Chief of Naval Materiel. Capital Procurement Organisation– Since July 1984 when it brought together the three Services' Materiel Divisions.	Defence Materiel Organisation.
Administration of Navy materiel design, deep-level repair and maintenance.	Navy Office– Naval Engineering Division, Office of Chief of Naval Engineering.	Defence Materiel Organisation's Systems Program Offices that manage contracts with private sector firms for materiel design, deep-level repair and maintenance.
Navy ship construction, modernisation and repair.	Garden Island Dockyard NSW and Williamstown Dockyard VIC.	Defence Materiel Organisation's Systems Program Offices that manage contracts with private sector firms for Naval ship construction, modernisation and repair.
Navy equipment installation inspections, tests and evaluations, and System Qualification Trials.	Defence Science and Technology Organisation– Director of Trials–RAN Trials and Assessing Unit and RAN Fleet Headquarters.	Defence Materiel Organisation– acquisition contract progress monitoring, and development and acceptance test and evaluation. RAN Test, Evaluation and Acceptance Authority and RAN ship crews.
Technical Regulation	Navy Office– Naval Engineering Division with technical regulation oversight as an integral part of the Naval Engineering Division's management system.	Chief of Navy, delegated to Head Navy Engineering, which in turn delegates technical regulation oversight to Design Acceptance Representatives located in Defence Materiel Organisation's Systems Program Offices.

Source: ANAO analysis of Defence records including Department of Defence, *Functional Directory* (DRB 6), November 1985.

Navy Engineering Branch personnel numbers

7.15 The ANAO examined the impact the organisational changes since 1984 have had on Navy's Engineering Branch in terms of Navy's ability to maintain a skilled engineering workforce.

7.16 Table 7.2 compares the number of engineer positions in Navy and Air Force. These Services are similar in size,[431] and their war fighting ability is equally critically dependent on Mission System design, maintenance and repair.

Table 7.2

Navy and Air Force Positions filled by Engineers, November 2009

Organisation	Engineer Positions		Positions filled by Engineers	
	Navy	Air Force	Navy	Air Force
Own Service	317	466	221 (68%)	481 (103%)
DMO	124	393	97 (72%)	332 (84%)
CDG	11	12	4 (36%)	15 (125%)
Other Defence Groups	36	53	15 (42%)	46 (86%)
Total	488	924	337 (67%)	874 (95%)

Source: Royal Australian Navy, *Report on the Strategic Review of Naval Engineering*, November 2009, pp. 3-13.

7.17 The table shows Navy has filled only two-thirds of its own engineering positions, a little more (72 per cent) of the Navy engineer positions in DMO, and only about one-third of the Navy engineer positions in CDG. This limits Navy engineers' ability to perform the vitally important role of bringing their knowledge of the operating environment into the capability definition and acquisition stages of the capability life-cycle.

7.18 In particular, the Navy's Report on the Strategic Review of Naval Engineering 2009, ordered by the Chief of Navy,[432] found that:

> Decisions made in formulating operational concept documents and functional performance specifications can have far-reaching implications for the technology that is acquired, the way in which it will be supported, and the

[431] In June 2010 the Navy and Air Force were comprised 13,669 and 14,672 personnel respectively. Department of Defence, *Annual Report 2009-10*, Vol.1, p. 342.

[432] Royal Australian Navy, *Report on the Strategic Review of Naval Engineering,* November 2009, Annex A, Terms of Reference, Strategic Review of Naval Engineering.

skills of the people required to do so. It is critical that Navy improve its ability to influence fundamental capability decisions which may lead to unanticipated, undesirable and potentially costly consequences. In particular, Navy needs to ensure that the concept and requirements documents are not focused solely on capability, cost and schedule but also on sustainment.[433]

7.19 A key systems engineering principle is that answers to engineering problems must be provided in an accurate and timely manner. This would require uniformed engineers to bring their knowledge of the operating environment into the requirements definition and acquisition phases of systems engineering. The naval engineering review commented that, while it may be theoretically feasible for such advice to be delivered to DMO from external Navy sources, the practicality of doing so effectively is highly questionable, as the day-to-day decisions that occur in project offices cannot always be referred externally for advice. Specifically:

> …. [a] lack of involvement during [the] development stage leads to differences of opinion and difficulties in acceptance and transition into Navy service by the Capability Manager. Understanding the impact of operational and technical trade-offs and influencing those decisions from within will have long-term benefit for Navy. Essentially, Navy engineers within DMO Project Offices will assist Navy to get what it wants from the acquisition process.[434]

7.20 In its 2003 report on materiel acquisition and management in Defence, the Senate's Foreign Affairs, Defence and Trade References Committee found that:

> It is abundantly clear …that effective acquisition depends critically upon the proper definition of the capability to be developed. The requirements phase includes the determination of costs and schedule. Given that those involved in acquisition are bound to operate within those cost and time parameters it is vital that those involved in defining capability are fully cognisant of the practicalities of acquisition.[435]

7.21 The engineering review extended to Navy's civilian engineering specialists, and it found that:

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[433] Royal Australian Navy, *Report on the Strategic Review of Naval Engineering*, November 2009, pp. 2-21.

[434] ibid., pp. 2-27.

[435] Commonwealth of Australia, Senate Foreign Affairs, Defence and Trade References Committee, *Report on the inquiry into materiel acquisition and management in Defence,* March 2003, p. 22.

> … most of Navy's present civilian engineering specialists were grown in organisations that no longer exist. Because of their dispersal across Navy and the Defence Materiel Organisation, it is difficult to ascertain whether there is full coverage of required technical disciplines, whether there is sufficient depth in both the organisational structure and in the individuals themselves, whether there are sufficient billets to undertake the volume of work within the timescales, and whether there are sufficient funds to provide for the necessary professional development needs. Anecdotal evidence suggests that there is a high level of fragility and it is important that this be fully investigated and remedied. Navy is reliant on these specialists to ensure future capabilities are appropriately specified and the existing Fleet operates safely and effectively. [436]

Wider Navy systems engineering capacity

7.22 In 1998 the Joint Standing Committee on Foreign Affairs, Defence and Trade warned of the long-term effects of transferring a given Defence support capability to a civilian company, where that transfer can be shown to be more economical than retaining the capability in the ADF:

> Frequently, the successful tenderer for the support contract relies on recruiting the trained Defence personnel who have been made redundant in the ADF because of the function's transfer to the commercial sector. Through employing these already-trained personnel, the successful civilian tenderer is able to provide a commercially attractive initial price for a support capability because there is no need to factor in staff training costs in the contract. This process becomes disadvantageous to Defence where the successful tenderer becomes the monopoly supplier of the support service, and Defence must subsequently renegotiate that contract from a position of weakness, having eliminated its own in-house capability to perform the particular function. [437]

7.23 The ANAO notes that, in the case of Navy, the Committee's prediction may have eventuated with the Navy engineering review finding that transfer of technical functions to the commercial sector has:

> … limited [the] amount of maintenance [technical personnel] perform onboard (or ashore for that matter) and the resultant loss of confidence in their abilities means that they leave more work to be done by the contractor (with associated increase in costs). This has become somewhat of a vicious cycle.[438]

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[436] Royal Australian Navy, *Report on the Strategic Review of Naval Engineering*, November 2009, pp. viii.

[437] Parliament of Australia, Joint Standing Committee of Foreign Affairs, Defence and Trade, *Funding Australia's Defence,* 1998, p. 35.

[438] Royal Australian Navy, *Report on the Strategic Review of Naval Engineering*, November 2009, pp. 4-13.

7.24 The Joint Standing Committee on Foreign Affairs, Defence and Trade also warned in 1998 that:

> While Defence currently advocates the efficiencies of the commercialisation process, there is evidence that the short-term gains resulting from the process may not be sustainable in the medium term. With the need for the civilian support agency to begin training replacement personnel, the increased costs will be reflected in the cost of the support function to Defence, and the apparent gains achieved in the short term may not be sustained.[439]

7.25 The ANAO has not examined the extent to which the cost of training the Defence contractors is factored into the cost of Navy systems acquisition and logistic support. However, the ANAO notes that Defence's Skilling Australia's Defence Industry Program (SADI) was established in 2005 to increase the quality and quantity of skilled personnel available to the Defence industry sector. The SADI Program provides funding to companies and industry associations for training and/or skilling activities in trade, technical or professional skills sets where that training is linked to a Defence Capability.[440]

7.26 Defence records indicate that in 2010-11, 68 SADI assistance packages were funded by this program at a total cost of $8.229 million.[441] In February 2011, DMO advised the ANAO that expenditure on the SADI program from its commencement in 2004-05 to the end of 2010-11 is estimated to total $30 million.

Reviews of Navy's Technical Regulation

7.27 An August 2006 Portfolio Evaluation Report on the ADF Technical Regulatory System conducted by Defence's Inspector General Division, recommended that Navy establish an expanded, full-time audit capability within Navy's Directorate of Technical Regulation.[442] The evaluation found that the staffing arrangements of Directorate Technical Regulation–Navy, presented a significant vulnerability to assuring the integrity of the Navy's

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[439] Parliament of Australia, Joint Standing Committee of Foreign Affairs, *Defence and Trade, Funding Australia's Defence*, p. 35

[440] Department of Defence, Annual Report 2009-10, Vol. 2, p. 117. Department of Defence, Defence Materiel Organisation, *Skilling Australia's Defence Industry, Funding Guidelines*, p. 1.

[441] www.defence.gov.au/dmo/id/sadi

[442] Department of Defence, Inspector General Division, Portfolio Evaluation Report, *The ADF Technical Regulatory System*, August 2006, p. viii.

Technical Regulatory System's regulatory framework. The evaluation found that:

> … the Directorate of Technical Regulation–Navy should have a sufficient, organic capacity to staff AEO [Authorised Engineering Organisation] certifying appraisals (five person team) and AEO conformance appraisals. This would require four-five additional billets.[443]

7.28 In 2009 the Navy Safety and Regulatory Council agreed the terms of reference for a review of the Navy Regulatory System (NRS).[444] The review was completed in May 2010 by a private firm, which reported, amongst other things, that:

> … for a number of reasons the NRS has never been fully implemented. The result today, seven years after the inception of the idea of a regulatory system, is a system that is not sufficiently understood, used only in pockets and being abused to the point where it is being blamed for delays in delivery of new capability. In its current form, the regulatory system is not providing Senior Naval Commanders, in all cases, with the assurance that capability is safe, fit for service and environmentally compliant. [445]

7.29 In November 2010, Head Navy Engineering provided his assessment of Navy's regulatory framework, including its level of resourcing, skills and audit processes. His assessments included:

(a) *problems regarding the appropriateness of the Capability Maturity Model Integrated (CMMI) as the foundation of Navy's appraisal of Authorised Engineering Organisations.* During the first quarter 2010, Head Navy Engineering and Director Technical Regulation–Navy re-developed Navy's Authorised Engineering Organisations appraisal policy, and the methods whereby organisations are appraised for compliance with Navy Regulations. The new arrangements were reported to have been applied in the last quarter of 2010;[446]

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443 Department of Defence, Inspector General Division, Portfolio Evaluation Report, *The ADF Technical Regulatory System,* August 2006, p. 2-7.

444 Royal Australian Navy, *Navy Safety and Regulatory Council Agendum Paper, NRS Invigoration 2 June 2010*, May 2010, p. 1.

445 Navy Regulatory System, *Navy Safety Regulatory Council Paper 25 May 2010*, p. 1.

446 Royal Australian Navy Minute, 2010/1132565 HNE/OUT/2010/118, Request For Professional Engineering Assessment – Technical Regulatory System & Fleet And Amphibious And Afloat Support Group Engineering Certifications, 4 November 2010, p. 1.

(b) *maturity of the Maritime Materiel Requirements Set*. Navy considers the Maritime Materiel Requirements Set to now represent a significant "parent navy" impost,[447] which is possibly beyond the capability of the shrinking Navy engineering resource base. The Maritime Technical Materiel Requirements Set is a collection of requirements, from which appropriate standards are applied to various types of ships. Head Naval Engineering reported that a major focus for the past few years has been to finalise the full range of Materiel Requirement Set documents, which currently stand at 132 documents out of the required 142 documents. Navy now intends to record the Materiel Requirements Set documents in a requirements database such as DOORS®, thus creating a strong synergy for CDG's Director General Maritime Development to generate the provisional Function and Performance Specifications in a form available for electronic transfer into a specific project's DOORS® database;[448] and

(c) *inadequate resourcing.* Head Navy Engineering reported that since inception, Director Technical Regulation–Navy has never achieved full staffing. The impact of which is reported to limit regulatory compliance surveillance appraisals of DMO Authorised Engineering Organisations to one appraisal each three years. It is also reported to limit Director Technical Regulation–Navy's capacity to further develop the Navy Technical Regulatory System.[449]

7.30 Head Navy Engineering considered that a combination of the revised appraisal methodology and better resourcing is likely to allow identification of

[447] Being the 'Parent Navy' of a class of ship or submarine requires that Navy, and its acquisition and sustainment organisation and its supporting industry, invest in and manage the through-life support of that class. The investments cover the full range of Integrated Logistic Support such as engineering services, configuration control, supply support, training, intellectual property, and technical comprehension of design concepts, principles and systems. It also requires development of an industry capacity that includes an understanding of the design philosophy to the extent necessary to design and implement modifications and to undertake major repairs safely and effectively. That investment is costly. For example, the costs of establishing a Defence capability as a Parent Navy, including establishing a national industry capacity, proved much more costly for the Collins-class than envisaged during the build. ANAO Audit Report No.23, 2008–09, *Management of Collins-class Operations Sustainment*, February 2009, p. 12.

[448] Royal Australian Navy Minute, 2010/1132565 HNE/OUT/2010/118, Request For Professional Engineering Assessment–Technical Regulatory System & Fleet And Amphibious And Afloat Support Group Engineering Certifications, 4 November 2010, p. 2.

[449] Royal Australian Navy Minute, 2010/1132565 HNE/OUT/2010/118, Request For Professional Engineering Assessment–Technical Regulatory System & Fleet And Amphibious And Afloat Support Group Engineering Certifications, 4 November 2010, p. 2.

lead indicators such as those that lead to the current Landing Platform Amphibious (LPA) situation (see paragraph 3.16). Head Navy Engineering stated:

> The relentless drive for efficiency over the past 20 years has seen massive fragmentation, knowledge loss and reduction in numbers in Navy's engineering workforce. This is highlighted in the Strategic Review of Navy Engineering, the general tenor of which describes a need for a larger engineering resource within Navy.[450]

7.31 The 2009 Report on the Strategic Review of Naval Engineering found:

> The effect of multiple reform and efficiency initiatives over the past two decades has been to fragment and dilute engineering resources to the stage where Navy is struggling to meet its responsibilities for capability management.[451]

7.32 In March 2011 the Director General Navy Certification and Safety compiled Table 7.3, which compares a sample of the functions of, and personnel resources provided to, Navy technical regulation and ADF aircraft technical regulation. The ADF Navy Aviation assets have similar technical regulatory needs as they both contain complicated and dangerous technology. This table shows Navy's technical regulation organisation to be under-resourced in comparison with that of ADF Aviation, and its vacancy rate provides one indication why the Navy Regulatory System was found to be never fully implemented.

[450] Royal Australian Navy Minute, 2010/1132565 HNE/OUT/2010/118, *Request For Professional Engineering Assessment–Technical Regulatory System & Fleet And Amphibious And Afloat Support Group Engineering Certifications,* 4 November 2010, p. 3.

[451] Royal Australian Navy, *Report on the Strategic Review of Naval Engineering,* November 2009, p. 2-4.

Table 7.3

Regulatory functions and workforce comparisons, ADF Aviation and Navy, March 2011

Regulatory Function	Aviation	Navy
Assessing compliance of organisations involved in design, construction and maintenance of materiel.	Directorate Aviation Compliance (DAVCOMP) section within the Directorate General Technical Airworthiness (DGTA) comprising: Management section of 10 positions; and Compliance Assurance–8 Teams covering aviation materiel and Explosive Ordnance. Each are comprised of 3 to 12 positions with a total of 62 positions (7 vacant).	Director Technical Regulation – Navy (DTR-N) Authorised Engineering Organisation accreditation and compliance surveillance: Management section of 2 positions (1 vacant) shared with policy section; Accreditation section of 4 positions (2 vacant); and Compliance section of 4 positions (1 vacant).[452]
Development of the technical integrity management framework, technical regulations and technical workforce standards.	Directorate Aviation Regulation (DAVREG) within the DGTA: Regulators including DAVREG: 9 positions (2 vacant). Note: DAVREG also has a maintenance policy section of 17 positions (5 vacant). However, DGTA's role in maintenance regulation is not reflected in the Naval Technical Regulatory System.	DTR-N policy and standards: Management section of 2 positions (1 vacant) shared with policy and assessment sections; and Standards: 3 positions including DTR-N - 1 vacant. Note: Navy relies on DMO to ensure the contractors are made aware of and comply with Navy's technical regulatory standards.
Workplace Safety Program	Directorate Aviation and Air Force Safety Air Force Safety section: 16 positions (1 vacant); and Safety Communications section: 5 positions.	DG Navy Certification and Safety: Directorate Navy Certification: 1 position; and Directorate Navy System Safety (DNAVSAFE): 8 positions (2 vacant).
Total personnel	119 with 15 vacancies (11 per cent vacancy rate).	24 with 8 vacancies (33 per cent vacancy rate).

Source: ANAO, assisted by the Director General Navy Certification and Safety

7.33 There are extensive differences between the ADF's Technical Airworthiness Regulatory Framework and the Navy's Technical Regulatory Framework. Even though both require Defence organisations that undertake or accept designs and construction of ADF materiel to be authorised to perform

[452] In March 2011 Director Technical Regulation–Navy advised the ANAO that following an evaluation of the Navy Technical Regulatory System by the Director Navy Certification, it was determined by the Director Technical Regulation–Navy that:
- the Accreditation section requires 2 average full-time service billets to be created to fully implement an improved Authorisation Engineering Organisation accreditation method; and
- the Compliance section requires 2 average full-time service billets to be created to fully implement an improved compliance method of verifying that Authorised Engineering Organisations are complying with Navy's Technical Regulations.

their tasks through Authorised Engineering Organisation certification, the Technical Airworthiness Regulatory Framework is more extensive.

7.34 Airworthiness regulations require organisations that undertake ADF aircraft maintenance to be authorised to perform their tasks through Authorised Maintenance Organisation certification. Airworthiness regulation certification requirements for Authorised Engineering Organisation and Authorised Maintenance Organisation also apply to commercial organisations engaged in design, construction and/or maintenance of ADF aircraft and related systems.

7.35 Navy does not have an Authorised Maintenance Organisation certification system for its ships and submarines, relying instead on its Authorised Engineering Organisation certification system to include engineering and maintenance functions.[453] Also, commercial organisations that undertake design, construction or maintenance of ADF maritime materiel are not required to seek or maintain Authorised Engineering Organisation status. Instead, Authorised Engineering Organisations within DMO's Maritime Systems Division are responsible for ensuring that their commercial service providers are made aware of Navy's technical regulatory standards, and that they comply with these standards.

Design Acceptance Representatives

7.36 Key personnel in the Navy engineering organisation are the Design Acceptance personnel engaged in assessing the safety and fitness for service of Navy materiel.

7.37 In general Defence capability terms, design acceptance is a key acquisition function involving the determination of whether or not a product is, or would be, technically acceptable to the ADF. Its purpose is to provide confidence to ADF agencies and staff that platforms and systems are fit for service and only pose acceptable risk to personnel, public safety, and the environment.[454] Defence personnel who perform Navy platform and weapon systems design acceptance activities in DMO are known as the Design

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[453] However, Navy's aircraft are maintained under an Authorised Maintenance Organisation arrangement set out in Department of Defence, AAP 7001.053 (AM1) *Technical Airworthiness Management Manual*, Sect. 4 Chapter 2, and regulated by the ADF Technical Airworthiness Regulator.

[454] Defence Instructions (General) Log 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010, p. 2.

Acceptance Representatives, and they operate under a delegation from the Head Navy Engineering.[455] Design Acceptance Representatives for Navy materiel are to assess and report:[456]

- compliance with requirements; and
- risk to the technical integrity of the design.

7.38 The Design Acceptance Representatives are normally holders of senior engineering positions within organisations that have Engineering Authority awarded by Head Navy Engineering. Authorised Engineering Organisations (AEOs) receive engineering authorisation after having been found to comply with Navy's technical regulations (see paragraphs 5.6 to 5.8). This process requires the organisation's Engineering Management Plans being critically reviewed by Head Navy Engineering and the organisation to successfully complete an assurance review by the Directorate Technical Regulation–Navy.[457]

7.39 Design Acceptance Representatives are required to have wide-ranging engineering expertise and experience so that they may apply engineering rigour and process to their Design Acceptance tasks. The Design Acceptance process includes the progressive review of design activities and associated milestones, culminating in the Design Acceptance certification of systems being offered to Navy for acceptance. The Design Acceptance Representatives are required by the Navy Technical Regulations to manage the Design Acceptance process in accordance with approved Certification Plans, using approved procedures implemented by competent personnel using an approved Engineering Management System.

7.40 The engineering expertise necessary for assessing Design Acceptance of Navy platforms and weapon systems may take a decade to develop, and would ideally extend to:

- project engineering management, and sustainment engineering management carried out within DMO System Program Offices and

[455] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 2, Sect.5 Chapter 2. p. 1

[456] Royal Australian Navy, ABR 6492, *Navy Technical Regulations Manual (NTRM),* July 2003, Vol. 1, Sect.1 Chapter 6. p. 5.

[457] Defence Instructions (Navy) Log 47-3, *Regulation of technical integrity of Australian Defence Force maritime materiel,* January 2009.

contractor organisations, so that they may assess materiel safety and fitness for service management;

- shipboard maintenance engineering, so that they may assess how well Navy materiel safety and fitness for service may be maintained in the operational environment by Navy personnel; and
- assessing compliance with ship design standards, seaworthiness certification standards, Navy Technical and Safety Regulations, and conducting regulation compliance audits.

7.41 The structural changes shown in Table 7.1 have significantly limited the opportunities for Navy engineers to gain that range of experience.

7.42 The devolution of the Navy's engineering functions to organisations outside Navy, together with shortages in Navy engineers, places the Chief of Navy and the Commanding Officers and Chief Engineers of Navy ships in a difficult position. Responsibility for maintaining each Navy ship's seaworthiness and safety rests with the Navy, regardless of engineering supervision provided by DMO and by Prime Contractors under contract to DMO. Once new or upgraded Navy capability commences operational service,[458] Navy is responsible for its safe operation and operational maintenance,[459] both of which are subject to Navy technical and safety regulation.

7.43 The structural changes Navy has undergone since July 1984 include:

- the transfer of all Naval design, construction, and deep-level maintenance to the private sector; and
- the transfer of Naval materiel requirements definition, materiel acquisition and logistics support functions to other Defence groups principally CDG and DMO.

7.44 This has significantly limited the professional development of Navy's systems engineers and technicians. Navy is experiencing shortfalls in the number of engineers in its own Service (as well as in DMO and CDG), and in the number of personnel in its Directorate of Technical Regulation. This

[458] Operational service by Navy includes operational test and evaluation, which commences with the systems acceptance process conducted by DMO.

[459] Operational maintenance is undertaken by Navy technical personnel, who provide platform and weapon system onboard servicing and fault diagnosis and repairs at the Line Replaceable Unit level.

impacts Navy's ability to implement its technical regulations and, from a Design Acceptance perspective, to assess and report compliance with requirements, and the technical integrity of Mission System designs.

7.45 The structural changes and the apparent inability of Navy to maintain its engineering branch personnel resources have been a significant factor in the deficiencies in the implementation of Navy's Technical Regulations. These deficiencies are evident in inconsistent evidence provided to the ANAO against each system engineering process set out in Chapter 4. This is particularly so with regard to evidence provided on system requirements verification and validation, functional and physical configuration audits, and evidence of System Acceptance based on acceptance criteria and on System Acceptance Audits. There is a particular need for Navy to institute a more robust regulatory compliance assurance regime.[460]

The acceptance into service process

7.46 In May 2011, Defence advised the ANAO that RANTEAA does not test to contemporary requirements, when evaluating a naval system for operational release. RANTEAA evaluates the major systems' performance against the operational concept Critical Operational Issues approved at Second Pass and may also report against current threats for the purpose of identifying potential capability deficiencies for operational tasking considerations. Any deficiencies identified would be the subject for future capability development. Prior to acceptance into service, RANTEAA may conduct early operational testing to inform the fitness for service for Initial Operational Release.[461]

7.47 During the course of the audit, DMO advised the ANAO that on occasion it has been determined that a Naval system is not fit for service based upon contemporary requirements and threats, rather than on the Second Pass approved decision of government as then captured in the Materiel Acquisition Agreement. It was DMO's view that Navy's desire to meet contemporary requirements, and the inability to satisfy them on the basis of historical specifications, has proven contentious for maritime projects.[462] DMO also

[460] Defence Materiel Organisation, Maritime Systems Division, *Configuration Management Improvement (CMI) Project Summary Report,* September 2010, Sect. 5.10.

[461] Department of Defence, DMO, Navy & CDG, *Additional Information and Proposed Amendments*, 24 May 2011, p. 25.

[462] Department of Defence, Chief Audit Executive, OCAE/OUT/2010/136, *Performance Audit – Acceptance into Service of Naval Capability*, 30 June 2010, Annex A, A-4

advised that the opinions and expectations of the many key stakeholders and regulators involved, especially for longer running projects, change over time and this also has proved contentious.[463]

7.48 In the light of that advice, the ANAO sought evidence of changes to or drift in requirements and expectations after the commencement of the 20 projects considered in the course of this audit. The ANAO considered the materiel requirements and testing framework that are required to be:

- aligned with the original government approval, and with approved Capability Definition Documents (see paragraph 3.9);
- agreed between CDG, DMO and the Capability Manager prior to each project's System Definition Review (see Appendix 5); and
- accurately recorded in each project's Verification Cross Reference Matrix (see paragraphs 4.35 to 4.55).

7.49 However, the ANAO was not able to determine, from the available records, the extent to which the Navy's requirements of DMO changed during the acquisition period of the projects included in this audit. Nor could ANAO determine the extent to which changed requirements were addressed through a configuration management process for recording changes in the relevant Verification Cross Reference Matrix.

7.50 Rather, the ANAO found evidence of other significant factors that could give rise to the mismatched expectations on the part of Navy and DMO. These include:

(a) known instances of projects approved and signed into contract without the benefit of agreed Capability Definition Documents and Certification Plans and System Safety Plans, thus proceeding with a high-level of risk that what was delivered might not meet Navy's expectations (see Chapter 3);

(b) the risks arising from DMO, CDG and Navy interpreting requirements and their verification procedures concurrently with the development of Mission Systems, and the uncertainty of materiel certification status and System Acceptance criteria compliance (see Chapter 4);

[463] ibid.

(c) the changes over time within the materiel certification framework, and the use of Classification Societies (Chapter 5);

(d) the lack of a consistent approach to advising decision-makers on the suitability of the capability of the systems being offered (see Chapter 6); and

(e) the significant changes in key stakeholder responsibilities over the life of some projects (see paragraphs 7.3 to 7.10).

7.51 Under these circumstances, it is likely that risks and issues propagating through the system definition, verification and validation and configuration management processes may result in some materiel delivered to Navy not being fully fit for service. When this occurs, clear up-front agreement on requirements and their verification procedures may minimise the likelihood of disagreement about requirements and the adequacy of verification, thus ensuring that the focus remains on resolving the capability deficiency.

7.52 Clearly, disagreements about changing requirements and the adequacy of verification need to be avoided as far as possible, especially for fixed-price contracts, which are sensitive to changes, or perceived changes, in the contracted scope of work. It also underscores the importance of agreed Capability Definition Documents serving as the basis for contract Statements of Work prior to contract signature, and the key role of System Definition Reviews, which provide for final agreements on requirements and their verification procedures.

7.53 In an environment where project durations cover multiple years, and technological advances and operational requirements may change, it is to be expected that reasonable efforts are made to keep pace with those changes. It is also reasonable to expect that properly conducted configuration management processes, supported by change-management processes, will enable agreed changes to occur in a controlled manner.

Recommendation No.8

7.54 The ANAO recommends that, in order to ensure the efficient and effective management of both the Capability Manager's Acceptance into Operational Service requirements, and DMO's verification and validation program:

(a) both the Acceptance verification and validation program and the operational test and evaluation program are formally endorsed by CDG, DMO and Navy prior to materiel contract signature;

(b) once endorsed, these requirements and programs are entered into a project's Verification Cross Reference Matrix and controlled by the project's Engineering Manager, in the capacity of the Design Acceptance Representative; and

(c) significant changes to requirements and the applicable Verification Cross Reference Matrix are subject to an authorised Configuration Management process.

Defence response

7.55 Defence agreed to the recommendation and stated as follows:

> This will be addressed progressively (not retrospectively) through amendments to the Materiel Acquisition Agreement, flowing the Test Concept Document and Test and Evaluation Plan (TEMP) requirements into the Verification Cross Reference Matrix and, ensuring the TEMP and Project Certification Plan are endorsed by CDG, DMO and Navy prior to contract signature.

Conclusion

7.56 Since 1984, Navy has undergone a range of significant organisational changes mainly brought about by the establishment of the Capital Procurement Organisation in 1984, the Defence Commercial Support Program commencing in 1991,[464] and the Defence Reform Program in 1998. These changes included the transfer of all Naval design, construction, and deep-level

[464] ANAO Audit Report No.2, 1998-99, *Commercial Support Program*, July 1998.

maintenance functions to the private sector,[465] and the transfer of responsibility for Naval materiel requirements definition, materiel acquisition and logistics support functions to other Defence groups, principally to CDG and DMO.

7.57 The changes have had a significant impact on Defence's ability to attract and retain qualified engineering staff. Currently, Navy has filled only two-thirds of its own engineering positions, 72 per cent of the Navy engineer positions in DMO, and only about one-third of the Navy engineer positions in CDG. This limits the availability of Navy engineers to perform the vitally important role of bringing their knowledge of the operating environment into the capability definition and acquisition stages of the capability life-cycle.

7.58 The effects of ongoing skills shortages are evident in the application of the Navy Technical Regulatory System, which is dependent on qualified and experienced engineering staff. The 2006 and 2009 internal reviews of Navy's Regulatory system found that the integrity of the Navy Technical Regulatory System was vulnerable to staffing deficiencies, that this presented a significant risk to regulatory framework assurance, and had led to significant deficiencies in the implementation of Navy's Technical Regulations. While obviously a challenge, this needs to be reviewed as a priority.

7.59 The findings of these internal reviews are corroborated by the significant variations in the quality and completeness of the evidence supporting critical stages of the systems engineering cycle set out in Chapter 4 of this report. This is especially so with respect to information concerning system verification and validation, configuration management, and System Acceptance. The ANAO has recommended (Recommendations 4 and 8) improvements in naval requirements management and configuration management by CDG, DMO and Navy to assist the Chief of Navy in his role as Capability Manager.

7.60 The Acceptance into Service process has been adversely affected by mis-matched expectations between DMO and Navy. The ANAO identified a range of factors which could give rise to this including: instances of projects proceeding with high-level risk because of a lack of agreed Capability Definition Documents and Certification Plans and System Safety Plans; risks arising because of DMO , CDG and Navy interpreting requirements and their

[465] Deep-level maintenance includes scheduled maintenance, unscheduled maintenance and repairs, which require extensive Repairable Item dismantling in specialised jigs, and the use of specialised support equipment, technical skills or industrialised facilities.

verification procedures concurrently with the development of Mission Systems, and the uncertainty of materiel certification status and System Acceptance criteria compliance; changes over time within the materiel certification framework, and the use of Classification Societies; the lack of a consistent approach to advising decision-makers on the suitability of the capability of systems being offered; and the significant changes in key stakeholder responsibilities over the life of some projects.

7.61 Under these circumstances, it is likely that risks and issues propagating through the system definition, verification and validation and configuration management processes may not be appropriately addressed resulting in some materiel delivered to Navy not being fully fit for service. Clear up-front agreement on requirements and their verification procedures may minimise the likelihood of disagreement about requirements and the adequacy of verification, thus ensuring that the focus remains on resolving the capability deficiency.



Ian McPhee
Auditor-General

Canberra ACT
28 June 2011

Appendices

Appendix 1: Glossary of Terms[466]

ACAT (Acquisition Categories) are defined as follows:

> ACAT I projects are major capital equipment acquisitions that are normally the ADF's most strategically significant. They are characterised by extensive project and schedule management complexity and very high levels of technical difficulty, operating, support and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 1.
>
> ACAT II projects are major capital equipment acquisitions that are strategically significant to the ADF. They are characterised by significant project and schedule management complexity and high levels of technical difficulty, operating, support arrangements and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 2.
>
> ACAT III projects are major or minor capital equipment acquisitions that have a moderate strategic significance to the ADF. They are characterised by the application of traditional project and schedule management techniques and moderate levels of technical difficulty, operating, support arrangements and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 3.
>
> ACAT IV projects are major or minor capital equipment acquisitions that have a lower level of strategic significance to the ADF. They are characterised by traditional project and schedule management requirements and lower levels of technical difficulty, operating, support arrangements and commercial arrangements. They are normally assigned to a Certified Professional Project Manager Level 4.

Acceptance into Operational Service (AIOS). The process by which the Fundamental Inputs to Capability (FIC) comprising a Capability System are proven to comply with endorsed capability requirements, usually specified in an Operational Concept Document (OCD), and assembled such that in all

[466] Except where otherwise referenced, this glossary has been sourced from; Department of Defence, Defence Instructions (General) OPS 54-2, *Capability Acceptance into Operational Service*, February 2008, Annex A.

aspects the capability has been realised and is acceptable for operational service. Defence Materiel Organisation, Major Projects Report 2007-08, Appendix 2.

Acceptance Test and Evaluation (AT&E) – Test and evaluation carried out to demonstrate whether the materiel developed and produced fulfils the contractual requirements and specifications. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

Acquisition Baseline. Is the approved configuration documentation describing the performance (functional, inter operability, and interface characteristics) of the System(s) to be acquired, the commercial conditions governing the acquisition, and the Verification required to demonstrate the achievement of those specified characteristics. The Acquisition Baseline is established immediately prior to release of solicitation documentation (draft or final) to industry and will usually require modification to reflect changes arising from contract negotiation. Department of Defence, *Defence Capability Definition Documents Guide,* March 2005, p. 3

Acquisition Phase. This is the third of the five-phase Defence capability life cycle. The Acquisition Phase is the process of procuring an appropriate materiel system to comply with the identified requirements while achieving the best value for money over the life of the system.

Availability. Availability is a measure of the degree to which materiel is in an operable or committable state when the mission is called for at an unknown (random) time. Availability, in simple terms, can be considered as the ratio of time period that the materiel is useable (or uptime) to the total time under consideration. Two views of Availability, both valid, are:

(a) the percentage of systems that are in a specific state of readiness or capability; or

(b) the percentage of some referenced time that the system(s) is in the specified operational state.

Baseline. This is the approved configuration documentation describing the performance (functional, inter operability, and interface characteristics) of the system(s) to be acquired, the commercial conditions governing the acquisition and the verification required to demonstrate the achievement of those specified characteristics. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

Capability Baseline. Is the approved configuration documentation describing a Capability's performance (functional, inter operability, and interface characteristics) and the Verification required to demonstrate the achievement of those specified characteristics. The Capability Baseline is normally documented in the Capability Definition Documents (ie. OCD, FPS and TCD). The Capability Baseline is usually established at the point of transition of a project from CDG to the DMO, and forms the basis of the agreed requirements between the two parties (as documented in the Materiel Acquisition Agreement). As such, it cannot be unilaterally changed by either party. Department of Defence, *Defence Capability Definition Documents Guide,* March 2005, p. 3

Capability Definition Documents (CDD). The CDD define the Capability System baseline, and comprise the Operational Concept Document (OCD), Function and Performance Specification (FPS) and the Test Concept Document (TCD).

Capability Manager. The role of the Capability Manager is to raise, train and sustain in-service capabilities through coordination of the Fundamental Inputs to Capability. Capability Managers are often the proponents of proposals and play an important contributing role, and sometimes the primary role, during all stages of the capability life cycle. There are seven Capability Managers, each responsible for the following areas of ADF capability:

a) Chief of Navy for Maritime force capability management;

b) Chief of Army for Land and Special Forces capability management;

c) Chief of Air Force for Air Force capability and airworthiness management;

d) Chief Joint Operations for Joint capability management, including Joint logistics;

e) Chief Information Officer for Defence Information Environment (DIE) capability management;

f) Deputy Secretary Intelligence and Security for Defence intelligence agencies capability management; and

g) Deputy Secretary Defence Support for Estate and infrastructure management, including key government ownership issues connected to the Estate, such as sustaining capability through management of environmental impacts. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B, Department of Defence, *Defence Annual Report 2009-10*, Volume 1, p. 39.

Capability Realisation Plan (CRP). The Capability Manager leads the development of the CRP and takes primary responsibility for carrying out the plan following the Government Second Pass project approval. The CRP outlines how the Capability Manager will co-ordinate the fundamental inputs to capability elements and realise the agreed new capability. Its generation and execution by the Capability Manager may involve significant resources and ongoing support in the Requirements and Acquisition Phase, proportional to the scale and complexity of the project. Department of Defence, Draft Defence Committee Agendum Paper, Capability Manager Roles and Responsibilities in the Capability Life Cycle Post-Mortimer, May 2010.

Capability System. The Capability System is the combination of the eight FIC which are the standardised elements required to deliver capability. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

Certification. The act of issuing a certificate that provides assurance that an entity, including product, service or organisation, complies with a stated specification, standard or other requirement. DI(G) Log 08-15, *Regulation of Technical Integrity of Australian Defence Materiel,* June 2004. Defence Instructions (General) Log 4-5-012, *Regulation of technical integrity of Australian Defence Force materiel*, September 2010.

Certification Basis. The Certification Basis is the suite of standards, agreed during contract negotiation, that the item of ADF Maritime Materiel will be designed, constructed and maintained to throughout its life cycle. The technical component of the Certification Basis may only be changed with the endorsement of the Chief Naval Engineer. ABR 4692, *Navy Technical Regulations Manual (NTRM)*, July 2003, Volume 2 Section 2 Chapter 1 Annex A. The suite of standards against which materiel is to be certified, derived from or judged to be equivalent to a subset of the materiel standards approved by a Technical Regulatory Authority. Defence Instructions (General) LOG 4-5-012, *Regulation of Technical Integrity of Australian Defence Force Materiel*.

Contractual Delivery. Contractual Delivery, which occurs at System Acceptance, is the physical movement of supplies from the contractor to Defence.

Critical Issues – issues that are deemed critical because any one, if not resolved, could lead to the failure of a materiel system to achieve Operational Release. Critical issues are usually categorised as either Critical Operational Issues or Critical Technical Parameters (CTPs). CTPs can be derived from policy; cost related or specified technical constraints. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

Critical Operational Issues (COI) – Is a question (hence qualitative issue) that needs to be answered to prove functional aspects (operational and support) of the required Capability System have been met by the acquired system. The COIs or questions are decomposed into testable elements to provide a number of measures of effectiveness, suitability and performance that collectively provide data that enables the issues to be resolved. [Adapted from DSCI 1/04] Department of Defence, *Defence Capability Definition Documents Guide,* March 2005, p. 4

Critical Technical Parameters (CTPs) – Are quantitative (preferred) and qualitative test measurements of technical data that provide information on how well a system, when performing mission essential tasks as specified in the OCD, is designed and manufactured. CTPs are derived from the TCD and from technical performance measures as specified in the Systems Engineering Management Plan (SEMP). CTPs provide a measure of the capability of the hardware and software within a system to provide needed capabilities to accomplish mission essential tasks. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

Defence Trial. A Defence Trial is a specific Trial which is conducted by the Australian Defence Test and Evaluation Office and is performed on capabilities and systems that require test and evaluation (test and evaluation) that is independent of a Group or single-Service.

Design Acceptance. Certification by the Design Acceptance Authority (DAA) or Representative (DAR) that a materiel design is fit-for-service, safe and environmentally compliant. It is the judgement made by the DAA/DAR that a materiel design is technically acceptable to the ADF, as a result of examination of the design process applied, the design product and design certification presented. This requires certifying that an approved design is acceptable and meets the individual Defence technical requirements, as detailed in the project's Technical Certification Plan. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

Design Acceptance Representative (DAR). Design Acceptance Representatives are the competent Engineering Authority who, in accordance with Navy Technical Regulatory Policy conducts Design Certification. This individual may be a member of the ADO or an independent contractor to the ADO and must not be involved with the design. ABR 4692, *Navy Technical Regulations Manual (NTRM)*, July 2003, Volume 2 Section 2 Annex A to Chapter 1.

Designer's Certificate. The certificate issued by an authorised individual within an organisation producing a design, that a design meets specified design requirements and is fit-for-service, safe and environmentally compliant.

A designer's certificate should include the objective evidence to support the design claim. The Designer's Certificate, along with the objective evidence, is delivered to the Design Acceptance Representative for design certification. ABR 4692, Navy Technical Regulations Manual (NTRM), July 2003, Volume 2 Section 2 Annex A to Chapter 1.

Development Test and Evaluation (DT&E) – test and evaluation conducted specifically to assist the system design and development process and to verify attainment of technical or other performance criteria and objectives. It normally applies in the design stage when developing new systems, but applies to in-service systems when developing upgrades or modification to those systems. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

Final Materiel Release (FMR). A milestone that marks the completion and release of DMO Acquisition Project Supplies required to support the achievement of Final Operational Capability. FMR is proposed by the DMO and accepted by the CM when they are satisfied that the operational and materiel state of defined deliverables is sufficient to achieve FOC. Mortimer Review Implementation Governance Committee, Role of the Capability Manager under Mortimer Frameworks – Capability Manager Input (Navy), p. 3.

Final Operational Capability (FOC). FOC is the point in time at which the final subset of a Capability System that can be operationally employed is realised. FOC is a capability state endorsed at project approval at Second Pass, and reported as having been reached by the Capability Manager.

First Pass approval. The process that gives Government the opportunity to narrow the alternatives being examined by Defence to meet an agreed capability gap. First Pass approval allocates funds from the Capital Investment Program to enable the options endorsed by Government to be investigated in further detail, with an emphasis on cost and risk analysis.

Function and Performance Specification (FPS). The purpose of the FPS is to define a validated set of requirements for the Capability System, which will provide a basis for acquiring the system, satisfy the needs expressed in the Operational Concept Document at an affordable cost, and invite maximum reasonable competition consistent with the acquisition strategy. It details the necessary function and performance criteria including a definitive list of user requirements to be delivered to the Capability Manager. The FPS is used by Defence as the basis for the Test Concept Document. AWD EMP.

Fundamental Inputs to Capability (FIC). The standard list for consideration of what is required to generate 'capability', comprising organisation, personnel, collective training, major systems, supplies, facilities, support, and command

and management. It is to be used by Defence agencies at all levels and is designed to ensure that all agencies manage and report capability, using a common set of management areas.

Independent Verification & Validation (IV&V). Activities that perform independent review of system design documents produced by a third party (verification) and comparison of developed products against real world requirements (validation).

Initial Materiel Release (IMR). IMR is a milestone that marks the completion and release of DMO Acquisition Project Supplies required to support the achievement of Initial Operational Release (IOR). IMR is proposed by the DMO and accepted by the CM when they are satisfied that the initial operational and materiel state of defined deliverables, including any deficiencies, is such that it is sufficiently safe, fit for service and environmentally compliant for IOR. Mortimer Review Implementation Governance Committee, Role of the Capability Manager under Mortimer Frameworks – Capability Manager Input (Navy), p. 3.

Initial Operational Capability (IOC). IOC is the point in time at which the first subset of a Capability System that can be operationally employed is realised. IOC is a capability state endorsed at project approval at Second Pass, and reported as having been reached by the Capability Manager.

Initial Operational Release (IOR). IOR is the milestone at which the Capability Manager is satisfied that the initial operational and materiel state of the Capability System—including any deficiencies in the FIC—are such that it is sufficiently safe, fit for service and environmentally compliant to proceed into a period of operational test and evaluation (operational test and evaluation) leading to an endorsed capability state.

Initial Operational Test and Evaluation (IOT&E) – Test and evaluation that is the first time the system (full or partial capability) is tested on production representative test articles used by typical operators with typical field equipment in a realistic environment. The objective of this type of testing is to determine operational effectiveness and suitability through resolution of Critical Operational Issues, and to ensure deficiencies discovered in earlier operational assessments/evaluations have been corrected. Whether this will include the involvement of the Contractor will depend upon the Mission System Validation clause in the contract. **IOT&E** usually follows System Acceptance, but can be combined with test and evaluation in support of System Acceptance. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

In-Service Date (ISD). ISD is the point in time that symbolically marks the beginning of the transition of a Capability System, in part or full, from the Acquisition Phase to the in-Service Phase. ISD coincides as closely as is practicable with IOR.

Latent Defect. A deficiency in design, materials or workmanship not discoverable by reasonable care or inspection prior to System Acceptance which causes:

- a software failure; or
- a failure of supplies other than software which falls outside the incidence of random failures to be expected from those supplies.

Maintainability. The relative ease and economy of time and resources with which an item can be retained in, or restored to, a specified condition when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair.

Major system. That element of capability that directly performs the operational function, which includes platforms (e.g. ships, vehicles or aircraft), distributed systems (e.g. communications network), and discrete systems that integrate into other major systems (e.g. radar).

Materiel System. A subset of the Capability System and is the combination of the Major system and the Support System. The Materiel System covers those aspects of the FIC that are provided by the acquirer.

Operational Capability (OC). OC states are intermediate capability outcomes at the Project level, where required, between IOC of the first item and FOC. They are identified as Operational Capability 2, 3, etc (OC2, OC3).

Operational Concept Document (OCD). The OCD is the primary reference for determining fitness-for-purpose of the desired capability to be developed, and is a complementary document to the FPS and the TCD which form the CDD to define the Capability System baseline.

Operational effectiveness. The ability of a system to perform its intended function over its intended operational spectrum, in the expected operational environment, and in face of expected threats when operated by typical operational personnel.

Operational Release (OR). OR is the acknowledgment by the relevant Capability Manager that a Capability System, or subset, has proven effective

and suitable for the intended role and that in all respects is ready for operational service.

Operational suitability. The capacity of the system (when operated and maintained by typical operational personnel in expected numbers, at the expected level of competency), to be reliable, maintainable, available, logistically supportable, compatible, interoperable, safe and ergonomically satisfactory.

Operational Test and Evaluation (OT&E). Operational test and evaluation is test and evaluation conducted under realistic operational conditions with representative users of the system, in the expected operational context, for the purpose of determining its operational effectiveness and suitability to carry out the role and fulfil the requirement that it was intended to satisfy.

Reliability. The reliability of materiel is its capability to remain in operation without failure. The inherent reliability of materiel is primarily determined by its design however, in-service reliability is determined by the way in which the materiel is designed, manufactured, operated, and maintained**.**

Second Pass approval. The final milestone in the Requirements Phase, at which point Government endorses a specific capability solution and approves funding for the Acquisition Phase. The project cannot proceed to the Acquisition Phase until this approval is obtained from Government.

Support System. The Support System is the sum of the existing support infrastructure and the additional support elements being generated under the contract to enable the Major system to be effectively operated and supported so that it can meet its operational requirements. The Support System includes the support required for Support System Components. The Support System embraces the support responsibilities undertaken by Defence, in-service support contractors and in-service support subcontractors (source: DI(G) LOG 03-6). Defence Materiel Organisation, Defence Materiel Verification and Validation Manual, November 2008, Annex B.

System Acceptance. System Acceptance is the acknowledgment by the Defence Materiel Organisation (DMO) project authority that an acquired materiel system complies with contractual and single-Service requirements and is ready to be transitioned to the in-Service Phase. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, Annex B.

System Reviews – A series of events in a development program at which the progress of the technical effort (including that of engineering and integrated logistics support) in a contract is assessed relative to its governing plans and

technical and contractual requirements. The formal reviews are conducted at logical transition points in the development effort to identify and correct problems resulting from the work completed thus far before the problem can disrupt or delay the technical progress. The reviews provide a method for the contractor and procuring authority to determine that the development of a system or system element is meeting contractual requirements (source: ASDEFCON (Strategic Materiel)). Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

System Specification – Defines the validated requirements for the system, and the contractor and Commonwealth use this as the basis for common understanding of the system technical requirements. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

Test and Evaluation (T&E). T&E is a process to obtain information to support the objective assessment of a Capability System with known confidence, and to confirm whether or not a risk is contained within acceptable boundaries across all facets of a system's life cycle. The individual terms are defined as:

- a test is an activity in which a scientific method is used to obtain quantitative or qualitative data relating to the safety, performance, functionality, contractual compliance, and supportability of a system; and
- evaluation is analysis of test results to determine (verify) or prove (validate) something. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

A process to obtain information to support the objective assessment of a capability system with known confidence, and to confirm whether or not a risk is contained within acceptable boundaries across all facets of a system's life cycle. A test is an activity in which a scientific method is used to obtain quantitative or qualitative data relating to the safety, performance, functionality, contractual compliance, and supportability of a system. Evaluation is the analysis of test results to determine (verify) or prove (validate) something. Department of Defence, *Defence Capability Development Handbook (Interim)*, March 2010, Glossary.

Test and Evaluation Master Plan (TEMP). The TEMP is the plan for traceability between test and evaluation activities and the endorsed Critical Issues, to further ensure that only the required testing is undertaken. Results of test and evaluation planned in the TEMP are used to provide proof that new or upgraded capability meets its baseline, is safe and fit for service throughout its life cycle. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

Test Concept Document (TCD). The TCD provides the basis for DMO's development of the TEMP, and is the highest level document that considers test and evaluation requirements within the Capability System's life cycle management. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

Validation – Proof through evaluation of objective evidence that the specified intended end use of a product or system is accomplished in an intended environment. ISO 9000:2006 Quality Management System – Fundamentals and Vocabulary**.** Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

Verification – Confirmation by examination and provision of objective evidence that specified requirements to which a product or service, or aggregation of products and services, is built, coded, assembled and provided have been fulfilled. ISO 9000:2006 Quality Management System – Fundamentals and Vocabulary). Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, Annex B.

Verification and Validation is independent of the design process and is conducted on a continuing basis throughout a system's development. Defence Materiel Organisation, *DMO Acquisition and Sustainment Manual*, 2007, pp.74-75. DMO's verification and validation manual categorises verification and validation procedures into inspections, demonstrations, analysis, modeling and simulation, tests, system reviews, audits, defence trials, walkthroughs, experiments, red teaming, operational analysis and research and explosive ordnance proof. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual*, November 2008, pp.18-19, 56-66.

Appendix 2: Past ANAO Performance Audit Reports on the projects included in this audit

ANAO Audit Report No.11, 2007-08, *Management of the FFG Capability Upgrade,* Department of Defence, Defence Materiel Organisation, October 2007. This report also includes that SM1 Replacement Project.

ANAO Audit Report No.29, 2004–05, *The Armidale Class Patrol Boat Project: Project Management*, February 2005.

ANAO Audit Report No.20, 2006–07, *Purchase, Chartering and Modification of the New Fleet Oiler,* January 2007, (HMAS *Sirius* Acquisition).

ANAO Audit Report No.8, 2000-2001, *Amphibious Transport Ship Project,* September 2000 (LPA ship acquisition).

ANAO Audit Report No.37, 2009–10, *Lightweight Torpedo Replacement Project*, May 2010.

ANAO Audit Report No.36, 2005–06, *Management of the Tiger Armed Reconnaissance Helicopter Project—Air 87*, May 2006.

Appendix 3: Project Lessons Learned

1. The following extracts from the DMO 2009-10 Major Projects Report,[467] outline the lessons learned by DMO as at July 2010. Table A3.1 lists the lessons learned by DMO that relate to the 11 projects considered by the ANAO in the course of this audit, which were also included in the 2009-10 Major Projects Report.

Requirements Management and First of Type Equipment

2. Guidance provided in the range of documents, including the Capability Definition Documentation (CDD) Guide, continues to undergo an update program to ensure it remains consistent with external policy process change and reflects improvement in practice. The update program includes development of CDD 'Lite' guidance intended for Requirements Development of minor projects, less complex major projects and rapid acquisitions where full application of the Guide is not warranted.

3. DMO is continuing to develop components of a Requirements Management System which supports sound requirements management across acquisition and sustainment activities. The Requirements Management System ensures that the requirements associated with capability systems and their components are traceable to one or more official sources and that these requirements continue to be managed rigorously throughout the materiel lifecycle. The status of the system comprising people, processes and tools is summarised as follows:

- Defence Materiel Instruction regarding the practice of Requirements Management has been issued.
- Requirements Management Guide; providing guidance on the practice of Requirements Management has been issued.
- A tailored Requirements Management Training course has been developed and is being piloted for commencement in 2011.

[467] DMO Major Projects Report was published in ANAO Report No.17, 2010-11, *2009-10 Major Projects Report Defence Materiel Organisation*, November 2010, pp. 87, 141-398.

Introduction of Initial Materiel Release and Final Materiel Release Milestones

4. The provision of DMO support to capability is managed through the DMO agreements framework. The principal agreement for all DMO acquisition projects is the Materiel Acquisition Agreement (MAA). The MAAs define the DMO's acquisition services to be delivered to Defence for all major and minor equipment projects, and specifies the project in terms of the scope and schedule to be delivered, and the approved budget.

5. As part of the Mortimer reforms, the MAA framework has been further strengthened by including the relevant Capability Manager as a signatory along with the DMO and Capability Development Group. The intent of this change is to gain the key stakeholder's formal acknowledgement of the baseline requirements against which the DMO's delivery of equipment will be measured. Consequently, the DMO is currently in the process of transitioning from using Initial Operational Capability (IOC) and Final Operational Capability (FOC) to using Initial Materiel Release (IMR) and Final Materiel Release (FMR). IMR and FMR represent the milestones against which the materiel elements of the FIC are delivered.

6. The DMO's materiel supplies are just one element of a number of fundamental inputs necessary to realise a capability that can be operationally employed by a Capability Manager. IMR and FMR will mark the DMO milestones for delivery and release to the Capability Managers of materiel supplies to support the Capability Manager's achievement of IOC and FOC. The IOC and FOC are Defence milestones that represent the estimated timeframe for when a capability system, comprising all FICs, will achieve full capability. Consequently, the shift to IMR and FMR will provide greater clarity of responsibilities between the DMO and Capability Managers.

7. IMR and FMR milestones have been included in the MAA template for use by all new DMO projects, and all existing DMO major projects will transition to this new MAA template by the end of 2011.

8. The terms used to describe key schedule milestones in an MAA are defined as follows:

- Initial Materiel Release (IMR): The milestone that marks the completion and release of DMO acquisition project supplies

required to support the achievement of Initial Operational Release.

- Initial Operational Capability (IOC): The point in time at which the first defined subset of a capability system that can be operationally employed is realised. IOC is a capability state endorsed at project approval at Second Pass, and reported as having been achieved by the Capability Manager.
- Initial Operational Release (IOR): The milestone at which the Capability Manager is satisfied that the initial operational and materiel state of the capability system–including any deficiencies in the fundamental inputs to capability–are such that it is sufficiently safe, fit for service, and environmentally compliant to proceed into a period of operational test and evaluation leading to an endorsed capability state.
- In-Service-Date (ISD): The point in time that symbolically marks the beginning of the transition of a capability system, in part or full, from the acquisition phase to the in-service phase. ISD coincides as closely as is practicable with IOR.
- Final Materiel Release (FMR): The milestone that marks the completion and release of DMO acquisition project supplies to support the achievement of FOC.
- Final Operational Capability (FOC): The point in time at which the final subset of a capability system that can be operationally employed is realised. FOC is a capability state endorsed at project approval at Second Pass, and reported as having been achieved by the Capability Manager.

Resourcing

9. During 2009-10 the DMO finalised the Workforce Plan to support the Defence Capability Plan. As a result, the DMO now has projected future workforce requirements by project, skill set, work level and geographical location for all existing and known future acquisition and sustainment activities.

10. In parallel, the DMO has progressed the implementation of a strategic recruitment capability which incorporates: university partnering and sponsorships; improved DMO employment branding; and more

innovative recruitment strategies. Entry level programs aimed at recruiting graduates, undergraduates and vocational employees also continue with a focus on critical job disciplines.

11. The DMO also continues to expand the range of competency based development opportunities to ensure that the DMO workforce is able to apply the necessary knowledge and skills to the standard required. Evaluation of DMO courses has resulted in the reinvigoration of a number of courses as well as the introduction of new courses for project management, engineering, logistics and procurement, and contracting job families.

Off-The-Shelf Equipment

12. The Capability Development Handbook, issued in 2009-10, provides better definition of off-the-shelf equipment and guidance on the development of new major investment proposals for consideration by Government.

13. The Australian Standard Defence Contracting (ASDEFCON) framework of templates, guidance and training have been further developed to incorporate lessons and to reflect improved contract management processes. In particular, these enhance DMO's ability to satisfy Defence's Smart Sustainment objectives of maintaining required performance levels whilst reducing the total cost of ownership for capability systems. Major revisions include:

- Development and release of a new Standing Offer for goods and maintenance services template to streamline the contracting process for the procurement and maintenance of Off-The-Shelf components.
- Development of new ASDEFCON Performance Based Support Contracting provisions. During 2009-10, these new draft provisions have been used in several pilot contracts and have been the subject of consultation with the members of industry. This new template is being finalised for release in 2011.
- Development and release as an exposure draft of a new ASDEFCON (Shortform Support) statement of work template, to streamline the contracting process for support of less complex materiel systems. The new template is being finalised for release in 2011.

14. DMO has also worked with industry to scope out improvements to reduce the business costs of strategic procurement by streamlining data requirements in the ASDEFCON (Strategic Materiel) template. These improvements are to be piloted during 2011 in key acquisition projects.

Schedule Management

15. A program of improvements is being implemented in DMO to promote improved project planning and schedule management by both DMO and industry, as detailed in paragraphs 17 to 22.

Project Planning Framework

16. DMO is improving its project performance measuring and monitoring systems to enable earlier identification and treatment options to mitigate potential risks to schedule. To promote better planning, guidance on the development of project execution plans is being finalised. Furthermore, risk reduction activities (Offer Definition) will be conducted with preferred tenderers to undertake a thorough examination of assumptions and estimates to reduce project risks and to improve the viability of schedules prior to contract commitment by the Commonwealth. Milestone entry criteria and performance remedies in the ASDEFCON templates will be adjusted to promote earlier visibility of schedule performance variances and to incentivise better schedule performance.

Introduction of Schedule Compliance Risk Assessment Method (SCRAM)

17. To foster and encourage schedule performance improvement across Defence and industry the DMO has led the development of a Schedule Management capability model and associated assessment methodology. Collectively, the process is known as the Schedule Compliance Risk Assessment Method (SCRAM).

18. The SCRAM is an approach for identifying risks to compliance with program schedule, i.e. SCRAM can be used for the assessment and remediation of issues generating schedule risk. SCRAM can also be used:

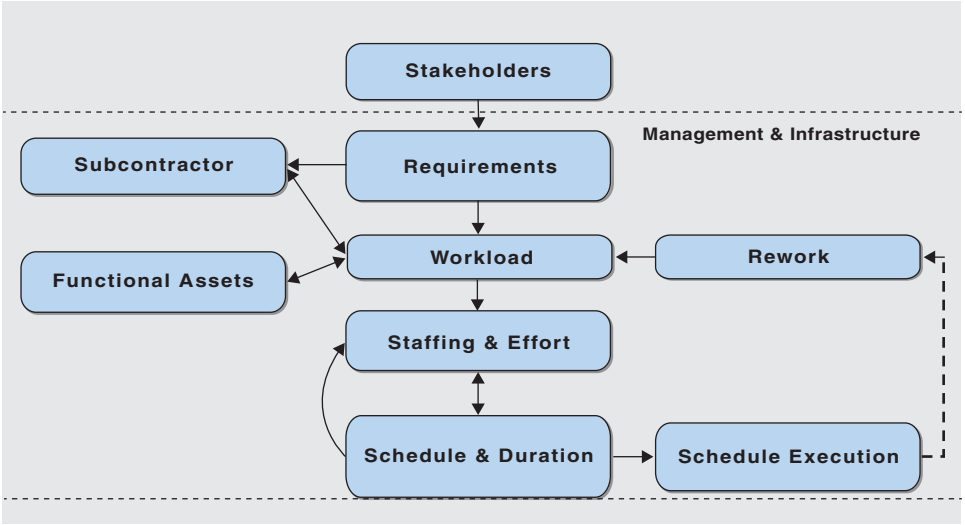
- By organisations to construct a schedule that maximises the likelihood of schedule compliance. To ensure common risks are addressed before the project schedule is baselined at the commencement of a project.

- To monitor project status, performed either ad hoc or to support appropriate milestone reviews.
- To diagnose challenged projects, to assess the likelihood of schedule compliance, root cause of schedule slippage and recommend remediation of root causes.

19. SCRAM is based on an ISO 15504 (Assessment Framework Standard) compliant Process Reference and Assessment Model and is a model of Schedule Management better practice, structured using a 'cause and effect' architecture to facilitate the identification of root cause of schedule slippage, as shown in Figure A.3.1.

Figure A 7.1

SCRAM PR/AM Model Architecture



Source: ANAO Report No.17, 2010-11, *2009-10 Major Projects Report Defence Materiel Organisation*, November 2010, p. 92.

20. The audience for the model includes customer and contractor project managers, project schedulers, hardware and system/software engineers, SCRAM assessment team members, educators and anyone interested in achieving project schedule compliance.

21. To encourage industry wide use of Schedule Management better practices and to foster improvements to the DMO Process Reference

and Assessment models through wider use and feedback from users, the model has been released by the DMO into the Public domain.[468]

Governance

Implementation of Gate Review Assurance Boards

22. The Gate Review Assurance Board (GRAB) initiative is an assurance process intended to ensure that the DMO is able to provide high quality and reliable advice to Defence and Government as to the health and outlook of major projects. The reviews provide an internal mechanism for the early identification and resolution of problems across the various project lifecycle stages, with a heavy focus on the requirements definition stages of First Pass and Second Pass. Following on from the Mortimer Review, the GRAB commenced operation in July 2009 focusing on selected high value and high complexity projects.

23. The establishment of a GRAB (including independent external advisors) provides a forum for robust discussion, an expert assessment of project development and status, and the prospects of a project achieving the agreed outcome. For the more complex projects, the Board process involves a robust independent evaluation before the Board meeting. If a project fails to convince the Board of its maturity or readiness to progress to the next stage of its lifecycle, project progression is reviewed and the project is directed to address those risks and issues. Once the identified risks and issues have been addressed, the project is then provided the opportunity to once again present to the Board its case for progression to the next lifecycle stage.

24. The GRAB process is a proactive activity that has led to early identification, intervention and resolution of risks and issues across numerous projects in DMO. Given the success of this methodology, the GRAB process will be extended to all major projects.

Implementation of Project Manager Charters

25. The DMO is committed to enhancing its performance management system through establishment of a charter system that improves the

[468] Further information on SCRAM and access to SCRAM products can be obtained from the website: http://scramsite.org

accountability, responsibility and authority of individuals managing complex and demanding projects and products.

26. Charters clarify accountability, but importantly they are not just a 'oneway street'. In the same way that each charter describes the results the project or product manager must deliver, they also document the commitments the DMO makes to support them to acquire new equipment or sustain existing materiel systems. Consequently, the charters ensure that the DMO continues to focus on its reason for existence–supporting the ADF.

27. The CEO endorses a Project Charter that nominates the Project Manager who will be personally accountable to deliver the outputs specified in the MAA. The Charter forms the basis of that Project Manager's individual performance agreement, describing the results that are expected, support to be provided and high level guidance on achieving expected results.

28. Under the Charter, there is a DMO commitment to resourcing the manager to do the job in accordance with workforce plans and budgets. General Managers and Divisions are also committed to ensuring that delegations and authorities are specified and effective, and must assist the manager to obtain support from Defence or the DMO if this is agreed but not forthcoming.

Better Targeted Management Reporting

29. The DMO provides regular performance reports to its key stakeholders including the Government, Central Agencies, and the Department of Defence.

30. In 2009-10 the DMO began a program of reviewing both its internal and external project performance reports. The aim of the review is to have an integrated, targeted and simple set of performance management reports that meet user requirements to support timely and informed decisions about DMO projects. The reports will also improve information flow. The review, called the Report Simplification Program, includes several initiatives to ensure the DMO performance management reports are:

- Targeted: to suit the user's specific information needs.
- Timely: defined either by statutory requirements such as the annual reports, or by agreement such as the MAA agreements.

- Accurate: reflective of the current status.
- Consistent: across all management reports and at a specified point in time.
- Informative: to focus attention on key issues and avoid information overload through elimination of extraneous data.
- Efficient: capture data once and use as necessary.

31. In 2009-10, the DMO consulted with external stakeholders to identify their information requirements. Feedback was then used to revise the DMO's core suite of performance management reports.

32. Internal performance management reports are also being reviewed to determine their utility, accuracy, reliability and timeliness. Reports will be simplified and exception based to focus attention on issues that require line management attention. Managers will have access to reports which address key project performance issues relevant to their level of responsibility and accountability. Where necessary, managers will have the ability to access more detailed information on an 'as required' basis.

33. One of the key initiatives of the Report Simplification Program is to increase DMO project management insight into acquisition performance and set trigger points to identify when further analysis or action may be necessary. Clear guidance for DMO line management and project personnel helps them to make better use of information to ensure their projects meet required performance levels and outcomes.

Strengthening Projects of Concern Process

34. As stated previously, major projects in the DMO are characterised by very high levels of complexity and present highly challenging conditions for successful delivery to Defence. The vast majority of the DMO's major projects are delivering capital equipment assets to the ADF as planned. However, a small number of DMO projects and sustainment activities require additional senior management attention to address significant risks or issues relating to schedule, cost or capability.

35. In consultation with the Government, the DMO has an intense management framework for these troubled projects, known as 'Projects of Concern' (POC). Projects subject to the POC process are remediated

through close engagement with industry, Defence and Government to deliver sound value for money outcomes to Defence. In some cases, however, if remediation cannot be achieved, there may be no alternative but for Government to cancel the project or its contract.

36. Since the POC framework was introduced in early 2008, the DMO has closely consulted with Government in order to proactively and transparently remediate projects against defined objectives. Remediation objectives are broad ranging, given the diverse nature of projects, and tailored to meet individual project needs. Typical remediation objectives include: resolving complex commercial and technical issues; improving stakeholder engagement; and improving internal project management practice.

37. In addition, 'lessons learned' through the POC process are applied to understand, pre-empt and remediate systemic issues in the delivery of all DMO projects.

38. On 15 October 2010, the Minister for Defence Materiel announced the following projects as POCs:

- JP 129 Ph2–Tactical Unmanned Arial Vehicle;
- JP 2070–Lightweight Torpedo Replacement;
- AIR 5333–Vigilare;
- JP 2048 Ph1A–LCM 2000 Watercraft for Landing Platform Amphibious Ships;
- AIR 5276 Ph8B–Electronic Support Measures Upgrade for the AP-3C
- Orion Aircraft;
- CN 10–Submarine Sustainment;
- AIR 5402–Air to Air Refuelling (MPR project);
- JP 2043 Ph3A–High Frequency Modification (MPR project);
- AIR 5077 Ph3–AEW&C Wedgetail (MPR project);
- LAND 121 Ph3–Overlander (Medium-Heavy Capability only) (MPR project); and
- SEA 1448 Ph2B –ANZAC Ship Missile Defence (MPR project

Table A 1

Projects considered in the course of the audit and their lessons learned by DMO as at July 2010.

Project Number and Phase	Project Name	Key Lessons Learned	Category of Systemic Lessons
SEA 1390 Phase 2.1	FFG Upgrade	Requirements and specifications must be well defined and agreed before contract signature. Where detailed specifications cannot be defined fully prior to contract signature, such as when systems definition and new design work must be undertaken within a developmental project phase, then the end capability requirements and priorities must be well defined and agreed.	Requirements Management
		A fundamental issue to consider at the time of capability and project definition is how the capability should be acquired. If the project is developmental, then consideration should be given to methods other than a fixed price contract for achieving the capability. Contracts should include appropriate clauses that recognise the complexities of verifying and validating a software development project. Multi platform upgrades should allow for implementation and testing/acceptance of the first platform without committing to a full class upgrade of all platforms. Conducting an upgrade of an existing capability concurrent with scheduled maintenance availability requires very detailed planning and careful consideration of the supporting contract clauses.	Contract Management Schedule Management First of Type Equipment
		Procurements that include significant change to software-intensive systems and complex system integration have many inherently high-risk activities, which must be analysed and appropriate risk mitigation processes applied. Such risks are often under-estimated in the planning phase	First of Type Equipment

Project Number and Phase	Project Name	Key Lessons Learned	Category of Systemic Lessons
		The contract schedule must be accepted by all parties as realistic and achievable from the outset. Each party must be committed to achievement of the schedule and aware of the consequences of non-achievement, plus any provisions for delay outside the contractor's control. The contract should contain: • milestones which enable the Commonwealth to unambiguously assess Contractor performance from the outset of the Contract; • with the exception of non-recurring engineering effort, payment of all or a substantial part of the contract price should be subject to achievement of clear project milestones; • milestones should reflect delivery of contracted requirements to the Commonwealth, not just reaching intermediate points on the timeline; • milestones which enable use of the equipment and supplies (such as integrated logistics support and training) should be given similar weight as delivery of the equipment itself; • payment on achievement of milestones should be conditional on achievement of previously scheduled milestones; • payment of milestones should also be tied to remedies under the contract to allow the Commonwealth to seek redress; and • clear entitlements of the Commonwealth to access all contractor project data (including internal workforce planning data) so as to be able to make informed assessments if a milestone is not achieved.	Contract Management
		For very large developmental contracts, project managers must ensure that the contractor maintains sufficient focus and resourcing on documenting what is being delivered and how to use it (through ILS, configuration management and training). Milestones must be structured so that the contractor is not tempted to focus on equipment deliverables only. Payment for equipment milestones should be conditional on achievement of related ILS milestones. The contract should be clear on configuration management requirements of ILS products in an incremental delivery software development project. This should align to milestones and remedies in the contract.	Contract Management Requirements Management
		Objective acceptance criteria are required to ensure there is no scope for dispute as to whether the criteria have been met. Criteria for determining contractual achievement should support those criteria used by Defence for determining achievement by DMO of the measures of effectiveness in the MAA.	Contract Management Requirements Management

Project Number and Phase	Project Name	Key Lessons Learned	Category of Systemic Lessons
		Major maritime software development should be incremental and delivery does not have to be aligned with the platform modification program.	Requirements Management First of Type Equipment
		Implement a progressive acceptance methodology from the outset for all project data/ documentation supplies and requirements acceptance objective quality evidence in order to progressively increase confidence of all stakeholders involved with regard to project outcomes.	Contract Management
SEA 1429 Phase 2	Replacement Heavyweight Torpedo	Ensure that adequate staffing is available to execute the project particularly in the start up phase.	Resourcing
		Ensure that all project dependencies are established before schedule is established.	Schedule Management
		Identify all requirements for technical data and technology as early as possible in the project to allow the transfer requests to be administered. US Government International Traffic in Arms Regulation can require up to a year to progress.	Requirements Management
		Engaging in a joint development project where Australia is the junior partner and largely dependent on the US Government program, can introduce project management, cost, technology and schedule risk that needs to be addressed.	First of Type Equipment
SEA 1439 Phase 4A	Collins Replacement Combat System	Ensure that adequate staffing is available, in particular if DMO is to be the prime system integrator.	Resourcing
		Ensure that all project dependencies are established before schedule is established.	Schedule Management
		Identify all requirements for technical data and technology as early as possible in the project to allow the transfer requests to be administered. US International Traffic in Arms Regulation can require up to a year to progress.	Requirements Management
		Engaging in a joint development project where Australia is the junior partner can introduce project management, cost, technology and schedule risk that needs to be addressed.	First of Type Equipment

Project Number and Phase	Project Name	Key Lessons Learned	Category of Systemic Lessons
SEA 1444 Phase 1	Armidale Class Patrol Boat	For a new or significantly modified design there will be a number of design changes emanating from initial sea trials. The aggressive delivery schedule for the ACPB did not allow time for changes from initial sea trials to be built into the follow-on build boats prior to their construction. This resulted in an evolving design baseline throughout the production phase that was not stabilised until after delivery of the last boat. Consequently the redesign, build, test and acceptance aspects of boats built after the first of class became unnecessarily complicated, expensive and inefficient. Time should be allowed after the first (or second depending on the size of the class) boat build to conduct sea trials and modify and stabilise the design as appropriate prior to the main production run.	First of Type Equipment
		Failure at project inception to articulate, tailor and agree naval standards to be applied to a ship designed and built to commercial 'Classification Society' standards has resulted in considerable debate and potential cost increase.	Requirements Management
		An acquisition strategy combining the acquisition and support of the fleet in one single contract rather than the traditional acquisition model followed by a separate support contract can lead to significant disputation and complications in closing out latent defects where the prime contractor is not also the builder. Invariably, once the capability is delivered and being operated and the contract is into the sustainment phase, there is a greater reluctance on the part of the prime contractor to progress rectification of build-related defects that may result in a cost to the contractor and disputation with the builder.	Contract Management
SEA 1448 Phase 2A	ANZAC Anti-Ship Missile Defence	Adequate implementation of Project Systems Engineering processes. In light of this, the ASMD Project has rigidly followed a disciplined systems engineering process that has ensured the complete traceability from requirements through to final acceptance testing.	Requirements Management
		Ensuring that Stakeholder engagement at all levels (engineering and strategic) is culturally embedded within the Project Team.	Contract Management
SEA 4000 Phase 3	Air Warfare Destroyer (AWD) Build	Phase 3 commenced with the formation of the Alliance, a new organisational structure. Alliance based contracting offers significant advantages over traditional contracting methods but it must be recognised that it takes time and effort to develop the culture necessary to achieve improved outcomes. Visible high level management commitment is required from all parties. An external facilitator was engaged to assist in the initial and ongoing development of the Alliance and this has proved invaluable.	Governance
		The Program Office was originally located in both Canberra and Adelaide with separations in functions and personnel. With the formation of the Alliance, the separate locations became an issue to the effective operation of the Program Office. The establishment of a single location in Adelaide involved considerable effort and a resultant loss in knowledge of staff who did not relocate. In hindsight, earlier consolidation of the Program Office would have been beneficial.	Resourcing

Project Number and Phase	Project Name	Key Lessons Learned	Category of Systemic Lessons
		The interpretation of the requirements for fitness of purpose of drawings is different between contracting parties. A review of all product types prior to contract and interrogation of the delivery schedule to confirm sufficient time for reviews and incorporation of comments is necessary.	Contract Management
JP 2043 Phase 3A	High Frequency Modernisation	Risks associated with requirements instability, software development and systems engineering were known at the time of contract signature but in the light of subsequent events were clearly not adequately addressed in pre-contract negotiations. The experience underlines the importance of having well-defined and stable requirements at contract award, and of contractors having sound systems engineering and software development processes.	Requirements Management
		A proper balance needs to be kept between proper engineering processes and contractor-perceived commercial imperatives to minimise risk that unrealistic technical programs will actually result in delays to the overall schedule.	Contract Management
		Accessibility requirements should be agreed, specified and documented early in the contracting process to minimise risk of incurring excusable delays when access to the system to be upgraded is constrained due to operational reasons.	Contract Management Schedule Management
		Better practice would suggest that for a capability acquisition that includes significant software development, a contract that allows for both fixed price elements as well as alternative cost structures which include; appropriate controls, incentive and penalty models that can be applied to the highly developmental elements involving significant risk, may be appropriate. Milestone payments could be selected for those deliverables that have well defined objectives and the alternative payment method with incremental work packages could be applied to the software aspect of the project. This approach would require strict controls and metrics to limit the risk to the Commonwealth.	Contract Management
		Substantial developments in the information technology field over the extended term of the project means that some elements of the system could now be delivered via off-the-shelf solutions or by other contemporary products, rather than attracting extended software development, thereby reducing risk, schedule and possibly cost. The proposed approach for capability development involving substantial software or software systems development over an extended period needs to be considered carefully to enable best use of emerging developments within appropriate risk, schedule and cost constraints.	First of Type Equipment Off the Shelf Equipment
JP 2048 Phase 4A/4B	Amphibious Deployment & Sustainment	Not applicable.	

Project Number and Phase	Project Name	Key Lessons Learned	Category of Systemic Lessons
AIR 87 Phase 2	Armed Reconn-aissance Helicopter	Aircraft still undergoing development by their parent Defence force or Original Equipment Manufacturer should not be classed as off-the-shelf.	Off the Shelf Equipment
		Resolve or escalate minor disputes as they arise to prevent escalation to major contract dispute.	Contract Management
		Use integrated teams with strong processes and empowered staff facilitated by appropriate contractual arrangements.	Resourcing Contract Management
		Delays in the French program flowed through to the ADF's ARH program and delivery of operational capability to the Army. This has caused slippage in the aircraft and system certification, simulator development and aircrew training. The delays in the program have resulted in the contractor failing to achieve the IOC critical milestone.	Off the Shelf Equipment
AIR 9000 Phase 2	Multi-Role Helicopter-90	Early establishment of the Sustainment organisations. Both Commonwealth and Industry teams need to be set up well in advance of the delivery of the first of type for projects. The provision of accepted aircraft to an Operational Squadron has led to a range of lessons in regard to command and control of assets and people, stakeholder management and the relationship with Industry.	Resourcing
		The impact of attaining limited Intellectual Property rights has been critical to the ongoing development of the capability and achievement of value for money in further contract negotiations. It has also limited the provision of data for integration with other platforms (such as the Landing Helicopter Deck ships).	Contract Management
		The MRH Project was viewed as a Military off-the-Shelf (MOTS) acquisition. Lessons associated with MOTS procurements include: that it is essential that the maturity of any offered product be clearly assessed and understood; and that elements of a chosen off-the-shelf solution may not meet the user requirement.	Off-the-shelf Equipment

Source: ANAO compiled from the Source: 2009-10 Major Projects Report, Defence Materiel Organisation.[469]

[469] ANAO Report No.17, 2010-11, *2009-10 Major Projects Report Defence Materiel Organisation*, November 2010, pp. 141-398.

Appendix 4: System Acceptance Audit Objectives

1. The objectives of the System Acceptance Audit (SAA) are to:[470]

a. demonstrate that each Mission System and, where applicable, associated Support System elements (e.g. delivered Support Resources and Training) meet the required criteria to enable Mission System Acceptance to be achieved;

b. confirm that, prior to Acceptance, each Mission System has been assessed as safe and suitable for service, and satisfactorily meets the specified requirements, including, where applicable, those requirements in relation to technical and operational regulation;

c. if applicable, confirm that, as part of Mission System Acceptance, sufficient elements of the Support System are in place to enable the Mission System(s) to be effectively operated, and that these elements are safe, suitable, and meet requirements;

d. confirm that all requirements of the Contract (Acquisition) in relation to Mission System Acceptance have been satisfied; and

e. confirm that all requirements of any associated Contract (Support) in relation to Mission System Acceptance have been satisfied.

2. The System Acceptance Audit process applies to each of the Mission Systems being submitted for Acceptance as well as any accompanying Support Resources and Training that are being submitted for Acceptance at the same time. The principal outcome of a successful System Acceptance Audit is the signing of the Supplies Acceptance Certificate for the System Acceptance Audit Supplies by the Commonwealth Representative, in accordance with the Contract, to formally certify that the System Acceptance Audit Supplies have been Accepted. While each Mission System (or set of Mission Systems) is the primary item of Supplies being assessed during the System Acceptance Audit, the audit is also assessing the total ability of the Commonwealth to effectively and safely operate and support the Mission System(s), but only to the extent that the Contractor (Acquisition) is responsible for these aspects. Multiple Mission Systems may progress through a System Acceptance Audit at the same time, and this would typically be the case for production deliveries of Mission Systems.[471]

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[470] ASDEFCON DMO-CHECKLIST-SAA-V2.1

[471] ibid.

Appendix 5: Engineering Reviews and Test and Trials Activities

Table A 2

Engineering reviews and tests conducted at development facilities

Activity Name	Activity Description
System Requirements Review	This review is conducted to ensure that all system and performance requirements derived from the Function and Performance Specification are defined and consistent with cost, schedule, risk, and other system constraints. The review ensures consistency between the system requirements and the preferred system solution and available technologies.
System Definition Review	The System Definition Review (SDR) shall be conducted in accordance with the System Review Plan and shall be consistent with the Systems Engineering Management Plan, the Integrated Support Plan; and the Verification and Validation Plan. Primarily, the SDR addresses the requirements embodied in the System Specification and the Support System Specification, which have been derived from analyses of such documents as the Function and Performance Specification, the Operational Concept Document, and other regulatory and stakeholder requirements as defined by the Statement of Work. The mandatory objectives of the SDR include: (a) The Operational Concept Document has been reviewed to ensure that the operational and support concepts and scenarios for the Mission System and Support System are current. Proposed changes to the Operational Concept Document to address any inconsistencies between the Operational Concept Document and the Sub System Specification and Support Sub System Specification have been Approved by the Commonwealth Representative; (b) Proposed deviations to the Function and Performance Specification, to address any conflicts between the proposed Sub System Specification and Support Sub System Specification requirements and the Function and Performance Specification, have been Approved by the Commonwealth Representative; (c) All documentation to form part of the functional baselines for both the Mission System and Support System has been placed under configuration control; (d) Specification requirements for both the Mission System and the Support System have documented traceability to their source; and (e) Verification methods for both the Mission System and the Support System have documented traceability to their source. ASDEFCON DMO-CHECKLIST-SDR-V1.2 At, or around SDR, the Verification Cross Reference Matrix (VCRM) is agreed with the contractor and the verification methods are contractually binding and require a Contract Change Proposal for change. The contractor completes the VCRM progressively as the V&V program progresses. The project office must ensure that the VCRM states the appropriate verification method to be used for all requirements and must ensure that it is updated to accurately reflect the current status of system verification. Defence Materiel Organisation, *Defence Materiel Verification and Validation Manual,* November 2008, p. 36.

Activity Name	Activity Description
System Function Review	This review is conducted to ensure that the system under review can proceed into preliminary design, and that all system requirements and functional performance requirements derived from the Function and Performance Specification are defined and are consistent with cost, schedule, risk, and other system constraints.
Software Specification Review	As system design decisions are made, typically some functions are allocated to hardware items, while others are allocated to software. A separate specification is developed for software items to describe the functions, performance, interfaces and other information that will guide the design and development of software items.
Preliminary Design Review	This review is conducted to ensure that the system under review can proceed into detailed design, and can meet the stated performance requirements within cost, schedule, risk, and other system constraints. Generally, this review assesses the system preliminary design as captured in performance specifications for each configuration item in the system (allocated baseline), and ensures that each function in the functional baseline has been allocated to one or more system configuration items. Configuration items may consist of hardware and software elements.
Detailed (Critical) Design Review	This review is conducted to ensure that the system under review can proceed into system fabrication, demonstration, and test; and can meet the stated performance requirements within cost, schedule, risk, and other system constraints. Generally this review assesses the system final design as captured in product specifications for each configuration item in the system (product baseline), and ensures that each product in the product baseline has been captured in the detailed design documentation. Product specifications for hardware enable the fabrication of configuration items, and may include production drawings. Product specifications for software (e.g., Software Design Documents) enable coding of a Computer Software Configuration Item. Configuration items may consist of hardware and software elements, and include items such as weapons, crew systems, engines, trainers/training.
Test Readiness Review	A review conducted for each configuration item to determine whether the test procedures are complete and to assure DMO that the contractor is prepared for formal configuration item testing. Test procedures are evaluated for compliance with test plans and descriptions, and for adequacy in accomplishing test requirements. At the Test Readiness Review, the contracting agency also reviews the results of informal testing and any updates to the operation and support documents. A successful Test Readiness Review is predicated on the contracting agency's determination that the test procedures and informal test results form a satisfactory basis for proceeding into formal system configuration item testing.
Category 0 Tests - Design and Engineering Development Tests.	These tests apply to individual equipment items, hardware and software. They are required during the detailed engineering design stage of development and aim to verify compliance with technical performance specifications. They are to be completed prior to commencement of Category 1 testing for that particular item. Design and Engineering Tests are not required for equipment that is in service onboard service combatants with the RAN or a foreign Navy with standards acceptable to the Project Authority.

Activity Name	Activity Description
Category 1 Tests - Factory Acceptance Tests	The purpose of Category 1 tests is to verify that all system and interface requirements have been met. System Test Procedures and System Test Reports are required to be recorded in the Prime Contractor's test database. The Prime Contractor is responsible for Category 1 tests, however this responsibility may be allocated to sub-contractors that developed the respective systems.
Initial Stress Test	Initial Stress Tests involve subjecting items under test to extreme operational loads in order to measure their tolerance to software failures. These loads are designed to exceed the maximum rate of inputs which are likely to occur in real operational and tactical situations.
Category 2 Tests - Environmental Qualification Tests.	These tests demonstrate that individual equipment types/items are able to operate in adverse environmental conditions as stipulated in the Contract. Environmental testing is not required for equipment that is in service onboard service combatants with the RAN or a foreign Navy with standards acceptable to the Project Authority. Category 2 testing, as applicable to the relevant equipment, will be conducted after Category 1 testing for equipment not already qualified and must be completed prior to release of equipment for Category 3, 4 or 5 testing.
Category 3 Tests - System Development Integration Tests at System Integration Laboratory	These intra-system tests are conducted to demonstrate that the system resulting from the integrated equipment items under development will meet operational and functional requirements of the Contract Specification. Details of the System Development Tests are contained within the Statement of Work and the Contract Specification. Category 3 integration testing, as applicable to the relevant equipment items, will be completed before the commencement of the applicable Category 4 Stage 5 testing for the lead ship. Similarly, Category 3 tests will be completed before the commencement of installation acceptance (Category 4) testing at the Land Based Test Site, as applicable to the relevant equipment or system.

Source: ANAO, based on general systems engineering documents, and ABR 6205 – *Naval Test, Evaluation and Acceptance Manual*, October 2003.

Table A 3

Engineering reviews and test activities conducted onboard each ship

Activity	Description
Test Readiness Review	A review conducted for each configuration item to determine whether the test procedures are complete and to assure DMO and Navy that the contractor is prepared for formal system configuration item testing. Test procedures are evaluated for compliance with test plans and descriptions, and for adequacy in accomplishing test requirements. At the Test Readiness Review, the contracting agency also reviews the results of informal testing and any updates to the operation and support documents. A successful Test Readiness Review is predicated on the contracting agency's determination that the test procedures and informal test results form a satisfactory basis for proceeding into formal system configuration item testing.
System Stress Test	System Stress Tests are also designed to place the system under high-loads in order to reveal if the system can operate continuously at maximum specified values.

Activity	Description
Category 4 Tests - Shipyard Installation and Contractor Acceptance Tests	These tests consist of shipyard and contractor Harbour Acceptance Trials (HATs) that evaluate the performance of equipment and systems once the systems have been installed into the ship. The Contractor shall conduct the testing of shipboard equipment and systems to confirm the satisfactory operation of all systems, and to ensure the retained or new systems or machinery are ready for Provisional Acceptance.
Category 5 Tests - Sea Acceptance Trials (or Contractor Delivery Tests)	These consist of Contractor's Delivery Tests, and are to be conducted once Fleet Headquarters and Ships Staff have completed necessary post production work and Sea Safety Checks, providing approval for the ship to proceed to sea. The contractor conducts the trials to prove the performance of the upgraded systems and provides personnel to monitor and adjust the supplies and test equipment during the trials. The Category 5 sea acceptance testing occurs immediately prior to Provisional Acceptance.
Configuration Audits	Functional Configuration Audits comprise formal audits to validate that the development of a configuration item has been completed satisfactorily and that the configuration item has achieved the performance and functional characteristics specified in the functional or allocated configuration identification. In addition, the completed operation and support documents shall be reviewed. Physical Configuration Audits comprise technical examinations of a designated configuration item to verify that the configuration item 'As Built' conforms to the technical documentation which defines the configuration item.
System Verification Review	The Functional Configuration Audits and Physical Configuration Audits combined with a consolidating Systems Requirements Review re-examine and verify the customer's needs, and the relationship of these needs to the system and subsystems technical performance descriptions. They determine if the system produced is capable of meeting the technical performance requirements established in the specifications.
System Acceptance	System Acceptance is the acknowledgment by the DMO project authority that an acquired materiel system complies with contractual requirements and is ready to be transitioned into the In-Service Phase. Defence contracts typically require contractors to complete and present a signed form SG1 Supplies Acceptance Certificate to the Defence Contract Manager and provide supporting evidence that the supplies meet the requirements of the contract. The Supplies Acceptance Certificate (SG1) certifies that the: a. contracted platform or system is considered by the contractor to be complete and ready to offer to the Commonwealth in accordance with the conditions of the contract; and b. The acquisition authority agrees and accepts delivery of said platform or system.

Source: ANAO, based on general systems engineering documents, and ABR 6205 – *Naval Test, Evaluation and Acceptance Manual*, October 2003.

Table A 4

Navy acceptance test and trials.

Activity	Description
Category 6 - Operational Test and Evaluation	Category 6 testing is Operational Test and Evaluation (OT&E). OT&E is conducted in an 'as-realistic' operational environment as possible, when the capability is maintained and operated by sailors, subjected to routine wear-and-tear, and employed in typical combat conditions against a simulated enemy who fights back. It is designed to test a capability's effectiveness and sustainability against Critical Operational Issues in order to inform recommendations to be made to Chief of Navy on Operational Release (OR) and subsequent Operational Employment of the capability.
Category 7 - Follow-on Operational Analysis Tests	Category 7 tests comprise any operational sea trial devised to assess the extent to which a ship and its systems can operate at levels beyond the originally contracted or currently approved performance envelope. Category 7 tests can be initiated by Navy at any time during the post-acceptance life of the ship in response to scenario planning or new operational environments or requirements.

Source: ABR 6205 – Naval Test, Evaluation and Acceptance Manual, October 2003.

Appendix 6: ADF Airworthiness Management

Airworthiness certification

1. While the ADF is self-regulating with regards to airworthiness, it is implicit under the International Civil Aviation Organisation regulations, and Australia's Civil Aviation Act, that the ADF airworthiness regulatory system should be no less rigorous than the civil system. The Australian Military Type Certificate is therefore the military equivalent of the civil Type Certificate required for all aircraft registrations in Australia.[472]

2. Airworthiness has three components - Design (Engineering) and Maintenance that are grouped together under Technical Airworthiness, and Operational Airworthiness that covers all aspects of flying management, including Flying Safety.

3. Airworthiness Boards are chaired by two Air Commodores with specialisations in Engineering and Operations who report directly to the Chief of Air Force as the Airworthiness Authority. While boards are routinely convened for each aircraft type every 12 months, should there be cause to suspect that an ADF aircraft is not meeting the required standards, a board can be convened at any time. In addition to the formal submissions required from the operators, Aviation Safety section, Technical and Operational Airworthiness Authorities, Airworthiness Boards also have the ability to call any person to provide evidence to the board members.

4. Should the Airworthiness Board deem that action is to be taken to ensure ongoing airworthiness of the aircraft type, an Airworthiness Corrective Action Request is raised. Further, the board will determine the level of flight operations that are permitted prior to the action being completed, and will either allow continued operations under the existing Service Release, or raise an Airworthiness Directive to authorise specific flights that may be undertaken.

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[472] Department of Defence, AAP 7001.048 (AM1), *ADF Airworthiness Manual;* Department of Defence, AAP 7001.053 (AM1) *Technical Airworthiness Management Manual*, Department of Defence, AAP 7001.54 (AM1) *Airworthiness Design Requirements Manual*, Department of Defence, AAP 7001.059 (AM1) *ADF Aviation Maintenance Management Manual.* Department of Defence, AAP 800.010 ADF *Operational Airworthiness Manual* DI(G) OPS 02-2 Australian Defence Airworthiness Management Safety Manual Vol. 3 - Aviation Safety.

5. Only qualified test pilots, operating under a Special Flying Permit are authorised to fly ADF aircraft that have not been awarded Service Release. The Special Flying Permit is issued by the Airworthiness Authority on advice from the Operational Airworthiness Authority and Technical Airworthiness Authority and specifies the types of flying activities that may be undertaken, any conditions or limits on those activities and the period of validity of the permit.

6. The process described is for new aircraft acquisitions. For in-service aircraft undergoing modification, the Statement of Operating Intent is amended, and a Supplemental Type Certificate rather than a new Australian Military Type Certificate is awarded for the modified design. The process is otherwise the same.

7. Following Type Certification and Service Release, each individual aircraft is checked for compliance with the accepted design prior to it being authorised to commence flying operations.

Aircraft maintenance management

8. Aircraft Maintenance Management Systems (AMMS) section of DGTA, is responsible for the development and harmonisation of corporate solutions for the management of ADF maintenance activities. This is achieved through the coordinated development of policy governing:

- ADF aviation maintenance management practices;
- determination, development and promulgation of maintenance policy; and
- implementation of maintenance policy through the use of electronic maintenance management systems.

9. Aircraft Maintenance Management Systems is divided into three subsections. AMMS1 is responsible for:

- Developing ADF aviation maintenance management procedures and processes;
- providing the approved ADF corporate solution for aircraft maintenance management activities performed on State aircraft and associated aeronautical product through AAP 7001.059(AM1), for the purposes of maintaining safety, consistency and organisational efficiency; and

- ensuring the common approach to aircraft maintenance management across the ADF is compliant with technical airworthiness regulations where applicable, in support of maintaining technical airworthiness.

10. AMMS2A is responsible for:

- Developing policy and procedures for the determination and promulgation of maintenance policy, through the process of maintenance requirements determination (MRD); and
- Providing assistance in the development of technical maintenance plans and planned servicing schedules, as well as assistance in compiling and managing logistics support analysis records.

11. AMMS2B is responsible for ensuring that ADF electronic maintenance management systems remain aligned to ADF maintenance business processes, MRD policy and regulatory requirements where applicable, in support of maintaining technical airworthiness.

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