The Auditor-General
Audit Report No.24 2005–06
Performance Audit

Acceptance, Maintenance and Support Management of the JORN System

Department of Defence
Defence Materiel Organisation

Australian National Audit Office

ISSN 1036–7632

ISBN 0 642 80883 X

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Australian National
Audit Office

Canberra ACT
23 January 2006

Dear Mr President
Dear Mr Speaker

The Australian National Audit Office has undertaken a performance audit in the Department of Defence and the Defence Materiel Organisation in accordance with the authority contained in the *Auditor-General Act 1997*. Pursuant to Senate Standing Order 166 relating to the presentation of documents when the Senate is not sitting, I present the report of this audit and the accompanying brochure. The report is titled *Acceptance, Maintenance and Support Management of the JORN System.*

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

AUDITING FOR AUSTRALIA

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Abbreviations

1 RSU	Number 1 Radar Surveillance Unit
ADF	Australian Defence Force
ANAO	Australian National Audit Office
BAE SYSTEMS	BAE SYSTEMS Australia Limited
CSIG	Corporate Services and Infrastructure Group
DAO	Defence Acquisition Organisation
DGTA	Director-General Technical Airworthiness
DMO	Defence Materiel Organisation
DSTO	Defence Science and Technology Organisation
GFE	Government Furnished Equipment
IPSSR	Improve Project Scheduling and Status Reporting
IPT	Integrated Product Team
ISO 9001:2000	International Organization of Standardization, 9001:2000, *Quality management systems-Requirements.*
JORN	Jindalee Operational Radar Network
JFAS	Jindalee Facility Alice Springs
LRU	Line Replaceable Unit
OTHR	Over-the-horizon Radar
OTHRSPO	Over-the-horizon Radar Systems Program Office
RLM	RLM Management Pty Ltd

ROMAN	Resource Output Management Accounting Network
SDSS	Standard Defence Supply System
SPO	System Program Office
Telstra	Telstra Corporation Ltd

Summary, Conclusions and Recommendation

Summary

Background

1. The Jindalee Operational Radar Network (JORN) Project received Government approval in April 1990. The Project has an approved budget of $1.24 billion, of which $1.14 billion had been spent by September 2005. The JORN system is based on advanced over-the-horizon radar technology that uses radio energy refracted from the ionosphere to detect and track airborne and surface objects over the horizon at ranges between 1 000 to 3 000 kilometres. It consists of two radars: one near Longreach, Queensland and the other near Laverton, Western Australia; and a network control centre located at the Air Force's Edinburgh Base near Adelaide, South Australia.

2. In June 1996, the ANAO reported the JORN Project to be experiencing significant project management and systems engineering difficulties. The Project's Prime Contractor at the time, Telstra Corporation Ltd (Telstra), had rescheduled JORN's completion from the contracted date of June 1997 to 1999, and was proposing a revised completion date of June 2000. In February 1997, Telstra relinquished its JORN Project management role to RLM Management Pty Ltd (RLM), and in October 1999, JORN's contracted delivery date was rescheduled to December 2001. In April 2003, RLM successfully completed JORN's development and in May 2003 JORN achieved Final Acceptance by Defence. RLM is now responsible for JORN's maintenance and support, through the 46-month initial maintenance and support provisions within the JORN Contract.

3. The JORN Project is regarded as a 'turn-key' project, with the total system design, development and maintenance being managed by RLM, leaving the Defence Materiel Organisation's (DMO's) Over-the-Horizon Radar Systems Program Office (OTHRSPO) responsible for monitoring and verifying performance. This has provided RLM with flexibility to optimise its JORN in-service support management structure and management systems, and so achieve cost effective outcomes for itself and ultimately for Defence.

4. The ADF also has an OTHR system located near Alice Springs, Northern Territory, which is known as the Jindalee Facility Alice Springs

(JFAS). JFAS is integrated into JORN to form a three-radar network centrally operated from the Air Force Base at Edinburgh, South Australia.

5. From the 1970s, JFAS was supported through a series of contracts, the last of which is a $88.3 million (June 2005 prices) contract awarded in February 2000 to BAE SYSTEMS Australia Limited (BAE SYSTEMS).[1] This contract, (the JFAS Contract) includes JFAS system maintenance and engineering support services covering upgrades, integration, design and development. The JFAS Contract expires in February 2007.

Audit approach

6. The audit scope covered key lessons learnt from the JORN Project's acquisition and acceptance phases, and JORN and JFAS maintenance and support. The audit objective was to assess the effectiveness of DMO's JORN and JFAS maintenance and support arrangements. The audit examined the maintenance and operation of the JORN and JFAS radars, and their facilities.

Overall audit conclusions

7. The JORN Project has successfully transitioned from its acquisition to in-service support phase, and experience to-date indicates the Project has achieved its major objectives, namely: to provide the Australian Defence Force (ADF) with broad-area surveillance of aircraft and sea-going vessels in Australia's northern approaches; and to develop Australian industry capability to support over-the-horizon radar operations, maintenance and evolutionary development.

8. ANAO observations of JORN's performance diagnostics and performance monitors, and operational availability records indicate both JORN radars are effectively maintained and are operating within their design parameters. Similarly, JFAS performance diagnostics, performance monitors and operational availability records indicate the JFAS radar is achieving its requirements.

9. The ANAO found key factors contributing to the successful turnaround and delivery, maintenance and support of the JORN system include:

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[1] The contract price is adjusted for approved variations in the cost of labour.

- the application of sound systems engineering plans and procedures;
- the application of well-designed maintenance plans and procedures, supported by suitably defined performance targets; and
- the use of a JORN Maintenance Management System with extensive functions covering inventory management, maintenance scheduling, records management, and maintenance management reporting.

Key findings

Jindalee Operational Radar Network Acceptance (Chapter 2)

10. The ANAO found that from February 1997 until October 1999, RLM revalidated the Project's requirements and instituted improved systems engineering changes. These initiatives initially added to the Project's schedule slippage. However, they resulted in major sustained improvements in the JORN Project's cost and schedule performance, and assisted in the delivery of continuously reliable outcomes.

11. The original JORN Contract with Telstra scheduled JORN to be complete by June 1997, which is almost six years prior to the achieved final acceptance date of May 2003. Given the Project's delays, Defence invoked the JORN Contract's liquidated damages provisions and obtained an undertaking from RLM to do additional JORN development studies and logistics work to the value of $8 million, at no cost to Defence. This work was completed in September 2004.

12. The ANAO found that steps taken by RLM and Defence to resolve the JORN Project's problems and achieve Final Acceptance by Defence included:

- Organisational structure improvements: RLM formed a co-located Integrated Product Teams (IPTs) structure comprising contractor, DMO, Defence Science and Technology Organisation (DSTO), and Air Force personnel covering systems, software and hardware development, test engineering and cost and schedule control disciplines. IPT Managers had the authority and responsibility for their team's cost, schedule and performance, and for achieving cost effective outcomes related to production versus in-service support costs.

- Engineering process and systems integration improvements: RLM established a design baseline for all JORN sub-systems and their interfaces. They also established a Configuration Management Team, responsible for all JORN hardware, software, drawings and documentation, and a standardised set of software development tools and procedures. RLM also established an integration facility in Melbourne, which housed 350 IPT engineers and laboratory space for seven versions of JORN hardware and software elements. These initiatives allowed RLM to simultaneously develop, integrate and test JORN computing system configuration items, and hardware systems and sub-systems.

- Project monitoring and verification improvements: DMO sought improvements in its personnel knowledge and skills levels, and in its ability to manage project schedules and to monitor, verify and report on each project's progress, risk trends and potential difficulties. The need for these improvements was highlighted by OTHRSPO's formation in July 2001, and its consolidation in Edinburgh in 2003, which resulted in a complete changeover of DMO's JORN Project personnel. This required the SPO to develop a new project team of 45 personnel with highly specialised JORN system knowledge. OTHR specialists from DSTO, Air Force and Contractors, which were already located at Edinburgh, assisted OTHRSPO to become established. Since then, these specialists have maintained the collaborative approach needed for the continuing support and development of the ADF's OTHR capability. In 2001, DMO began developing its Improve Project Scheduling and Status Reporting (IPSSR) system. As at October 2005, IPSSR was in various stages of implementation throughout DMO and was used for the JORN enhancement program.

13. The ANAO found that the JORN Project's effective transition from system acquisition to final acceptance and introduction into service was achieved with close co-operation between DMO, DSTO and the Air Force's No.1 Radar Surveillance Unit (1 RSU). The Unit, in its capacity as the JORN operating authority, prepared for JORN's introduction into service by remaining closely involved with OTHRSPO in categorising System Problem Reports, in developing documents associated with JORN's Final Acceptance, and in developing JORN's Standard Operating Procedures.

Jindalee Operational Radar Network In-Service Support (Chapter 3)

14. The ANAO found that between May 2003 and September 2005, JORN's overall operational availability had not fallen below 99 per cent, thus satisfying the contractual requirement of a minimum of 96 per cent. At the same time, the JORN system's average time between critical equipment failures was 45.6 hours, and the average time taken by RLM to repair those failures and to return JORN to operations was 28 minutes.

15. The original estimated cost of maintaining and supporting JORN, during the 46-month initial support period, was $145.5 million (June 2005 prices). The 2005 revised cost estimate amounted to $121.4 million, based on maintenance cost trends. On that basis, JORN will be some $24.1 million less costly to maintain than first estimated over the initial support period.

16. The JORN Contract also requires RLM to perform supplementary maintenance of the systems and facilities that directly support the JORN. The current firm cost of the JORN systems supplementary maintenance is $11.9 million (December 2005 prices), which covers the period from May 2003 to February 2007. By September 2005, expenses incurred by RLM for JORN facilities maintenance totalled $2.65 million.

Jindalee Facility Alice Springs In-Service Support (Chapter 4)

17. The ANAO found that JFAS has not benefited from a system-wide formal logistics support analysis. Nevertheless, from September 2001 to September 2005, the JFAS radar's overall operational availability had not fallen below 99 per cent. Between May 2003 and May 2005, the JFAS radar's average time between critical equipment failures was 47 hours, and the average time taken by BAE SYSTEMS to repair those failures and to return JFAS to operations was 13 minutes. Since early 2000, there was only one occasion where the contractual limit of four continuous hours of downtime was exceed, and this was by 10 minutes in February 2004. This downtime resulted from faulty Government Furnished Equipment, which was beyond the scope of the JFAS Support Contract with BAE SYSTEMS.

18. However, even though the JFAS system met its contracted operational availability, there is scope for improvements in its logistics management system. Also, the ANAO inspection of the JFAS facilities indicated a need for

improved facility maintenance. The JFAS arrangements are that Defence Corporate Services and Infrastructure Group (CSIG) is responsible for managing Alice Springs facilities. There appears justification for negotiating the inclusion of facilities maintenance in the post February 2007 JFAS Contract. This would align with the JORN contracting policy of providing the Contractor with clear lines of responsibility and accountability for managing all aspects of the radar's operational availability.

Recommendation

19. The ANAO made one recommendation aimed at improving the JFAS logistics management system and its facilities management. Defence agreed with the recommendation.

Defence's response

20. The Department of Defence provided a response (see Appendix 1) on behalf of DMO and Defence. Defence advised the ANAO that:

> The Jindalee Operational Radar Network (JORN) Project (JP2025) has achieved a remarkable turnaround since the 1996 ANAO Audit. Since then, the Project has delivered, in May 2003, arguably the world's leading over-the-horizon-radar capability.
>
> The JORN successes have continued; with a system delivering a highly reliable, well maintained, wide area surveillance capability for the Australian Defence Force (ADF). An achieved operational availability of 99 per cent, has continually exceeded the contracted requirements. The Project is on target to complete the acquisition and initial sustainment phase (of 46 months duration) under budget.
>
> A key factor in the successful transition of JORN into service and also for the future of JORN development is the effective partnership between Defence Science and Technology Organisation, Defence Materiel Organisation (DMO) and the Royal Australian Air Force (RAAF). This partnership, working in conjunction with the industry alliance involving RLM Management Pty Ltd and BAE SYSTEMS Australia Limited, will enable the ADF to realise the full potential of the JORN system through an evolutionary development program.

Recommendation

Set out below is the ANAO's recommendation, with the report paragraph reference and an indication of the Defence response.

Recommendation No.1

Para. 4.41

The ANAO recommends that Defence and DMO consider the cost and benefits of:

(a) replacing the JFAS logistics management system with a Maintenance Management System having similar functionality to that used to maintain JORN; and

(b) including facilities maintenance in the request for tender for the new JFAS Maintenance and Support Contract.

Defence response:

Agreed.

Audit Findings

1. Introduction

This chapter provides an overview of the Australian Defence Force's over-the-horizon radar capability and sets out the scope and objectives of the audit.

Background

1.1 The Jindalee Operational Radar Network (JORN) Project (Joint Project 2025 Phases 3&4) has an approved project expenditure of $1.24 billion,[2] of which $1.14 billion had been spent by September 2005.[3] JORN was developed largely for the Australian Defence Force (ADF) during the period 1991–2003, and is based on advanced Over-the-Horizon Radar (OTHR) technology. JORN uses radio energy refracted from the ionosphere to detect and track airborne and surface objects over the horizon at ranges between 1 000 to 3 000 kilometres as shown in Figure 1.1.[4]

1.2 The JORN system consists of two radars: one near Longreach, Queensland and the other near Laverton, Western Australia; and a network control centre located at the Air Force's Edinburgh Base near Adelaide, South Australia.

1.3 The JORN Project had two major objectives:

- to provide the ADF with broad-area surveillance of aircraft and sea-going vessels in Australia's northern approaches; and
- to develop Australian industry capability to support over-the horizon radar operations, maintenance and evolutionary development.

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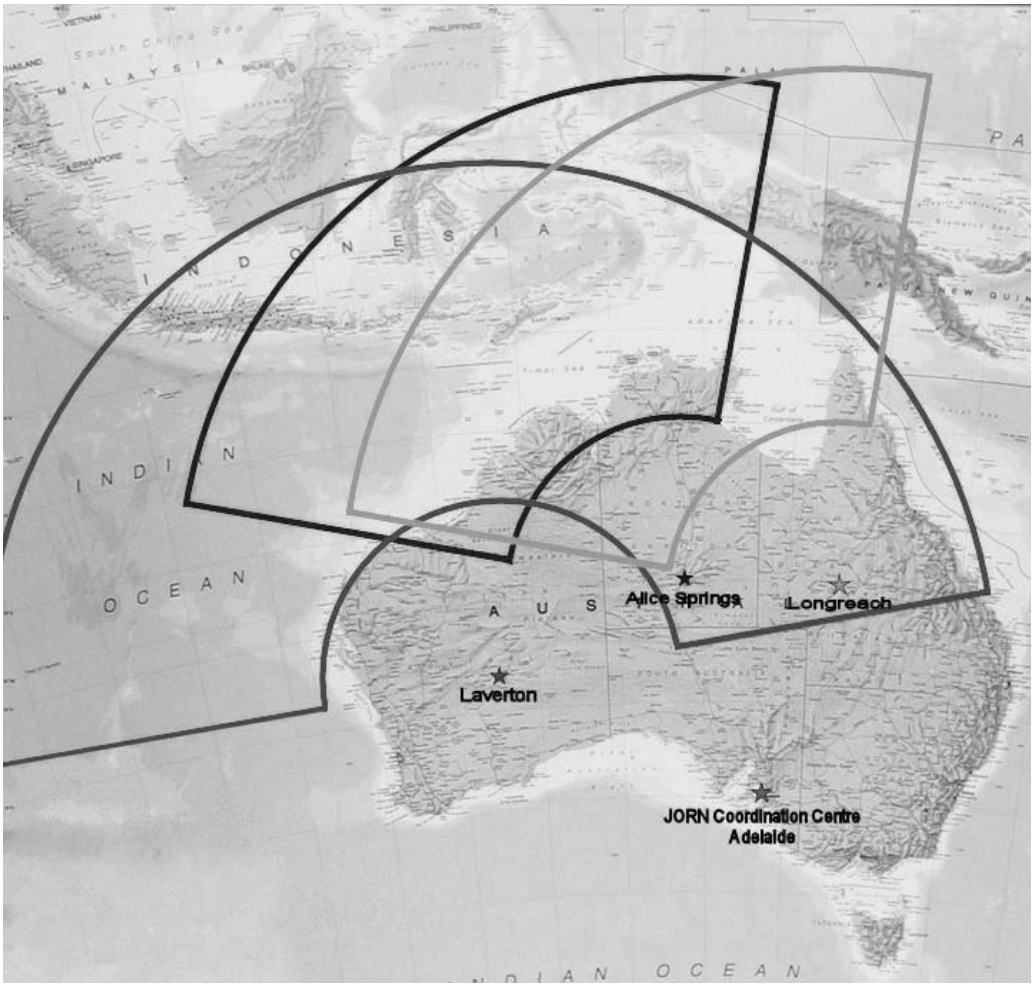
[2] That amount consists of the original project approval of $970 million (December 1990 prices), $257 million in price escalation in accordance with labour and materiel indexation, $32 million in foreign exchange variations, and $16 million in price reductions due to a net reduction in project scope.

[3] This total expenditure includes $78 million in JORN maintenance and support payments since May 2003.

[4] Conventional ground-based microwave radar has limited over the horizon detection capabilities, which result in their detection ranges being shorter than that achieved by OTHR systems.

Figure 1.1

JORN coverage.



Source: Defence Materiel Organisation.

1.4 Initially, the JORN Project contained many uncertainties. Defence, although able to make some assessment of financial risk, could not estimate a reasonable price for JORN's development, construction and initial in-service support. Accordingly, Defence sought competitive target price and price-ceiling incentive bids from the JORN tenderers to reduce their financial risk premiums.

1.5 Telstra Corporation Ltd (Telstra) successfully tendered for the Project and agreed with Defence on a price-ceiling cost-incentive contract containing:

- a target price of $685.5 million (April 1991 prices);
- a maximum (ceiling) price payable by Defence equal to the target price plus 60 per cent of any cost overruns up to a maximum of 10 per cent above the target price. This yielded a ceiling price of $754.1 million (April 1991 prices);
- a financial risk share where Telstra was responsible for 40 per cent of any cost overrun up to the ceiling price, and 100 per cent of all costs that exceed the ceiling price; and
- a savings share provision that entitled Telstra to 40 per cent of the savings if JORN was completed for less than the target price.

1.6 In June 1996, the ANAO reported that the JORN Project was experiencing significant project management and systems engineering difficulties.[5] Telstra had rescheduled JORN's completion from the contracted date of June 1997, to 1999 and was proposing a revised schedule with a completion date of June 2000. Trends at the time indicated that the Project's ceiling price would be reached in 1997, resulting in the effective conversion of the contract to a fixed price contract.[6]

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[5] ANAO Audit Report No.28 1995–96, *Jindalee Operational Radar Network Project*, June 1996; reported that the Project's problems included:

- Difficulties in the contracting team arrangements led to poor relationships among contractors, which in turn delayed system development and added to project costs.
- During the first four years of full-scale development, Defence had been concerned about JORN's top-level system design integrity and completeness and general project management issues. A technical audit of the project, completed in September 1995 by the contractors, revealed serious project management and systems engineering difficulties.
- By mid-1996, the Jindalee Project Office had paid the Contractor 80 per cent of the contract target price of $814 million. However by May 1996, Defence had reviewed less than 20 per cent of the JORN system critical designs against the contract's technical review standards, and important risk management and abatement plans were not provided as required by the contract.
- Milestone progress payment amounts were not necessarily linked to the project's earned value at each milestone. Progress payment trends indicated that Defence's JORN full-scale development budget would have been spent by mid-1997, but at that time there would still have been at least two more years of system development work required.

[6] Fixed price contracts allow contractors to claim price variations based on agreed labour and material cost indices and currency exchange rates, which are negotiated with the intention of fairly compensating contractors for the difference between the date the contract was executed and price conditions at the time the work was actually undertaken.

1.7 In February 1997, Telstra relinquished its JORN Project management role to RLM Management Pty Ltd (RLM).[7] In October 1999, after lengthy system engineering reviews and contract negotiations, Defence, Telstra and RLM agreed to novate the JORN Prime Contract whereby RLM took on all the JORN Contract's Prime Contractor responsibilities from Telstra. At the same time, JORN's contracted delivery date was rescheduled from June 1997 to December 2001, and its contract price was amended to a firm price of $945 million (September 1997 prices).[8] This price equalled the original contract's ceiling price plus $20 million.[9]

1.8 The JORN system achieved Final Acceptance by Defence in May 2003. The Chief of the Defence Force has assigned JORN's operational command and control to the Air Commander Australia. JORN is operated by the Air Force's No.1 Radar Surveillance Unit (1 RSU).

Jindalee Facility Alice Springs (JFAS)

1.9 The ADF also has an OTHR system located near Alice Springs, Northern Territory, which is known as JFAS. From the early 1970s to 1992, JFAS evolved from the Defence Science and Technology Organisation (DSTO) OTHR experiments into an ADF operational OTHR system. JFAS is integrated into JORN to form a three-radar network centrally operated from Edinburgh. JFAS is used by 1 RSU for OTHR operations, and by the DSTO, in cooperation with industry, for continuing OTHR technology development.

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7 RLM is a Lockheed Martin Corporation and Tenix Group joint venture company formed in 1997 to manage the JORN Project.

8 Firm priced contracts do not have provisions that allow contractors to claim price variations for changes in the cost of labour and materials over time. This provides strong incentives for completing these contracts early.

9 The additional $20 million was a payment to Telstra for:

- changing the JORN Prime Contract from a cost incentive contract to a firm price contract, thus forgoing all post June 1997 price escalation adjustments;
- agreeing to 85 per cent of progress payments being based on Earned Value;
- agreeing to increased penalties for late delivery; and for
- withdrawing all claims, potential claims and disputes between Telstra and Defence.

This was funded from the JORN Project's contingency budget.

1.10 JFAS has design features that allow prototyping of advanced OTHR waveform generation and signal processing. This, when combined with the numerous advances in computing hardware and software, resulted in JFAS achieving major advances in OTHR capability during the 1990s. However, many of these advances could not be transferred to JORN without increasing the risk of significant JORN Contract scope changes and associated escalation of JORN project costs and schedule slippage. Defence is addressing this technology transfer issue through the JORN enhancement program outlined below and in Chapter 3.

Over-the-Horizon Radar Systems Program Office

1.11 The Defence Materiel Organisation's (DMO's) Over-the-Horizon Radar Systems Program Office (OTHRSPO) is located close to 1 RSU and within the DSTO precinct at Edinburgh. OTHRSPO is accountable through DMO's Electronic and Weapon Systems Division to the DMO's Chief Executive, for managing the acquisition and logistics support of the JORN and JFAS systems. OTHRSPO has 45 personnel, mainly located at Edinburgh.

1.12 OTHRSPO currently manages JORN's $121.4 million 46-month maintenance and support contract with RLM.[10] This contract is an integral part of the JORN acquisition contract, and it expires in February 2007. OTHRSPO also manages the five-year $88.3 million (June 2005 prices) JFAS Maintenance and Support Contract with BAE SYSTEMS Australia Limited (BAE SYSTEMS). That contract also expires in February 2007. OTHRSPO's management function is predominantly focused on monitoring and verifying the Contractors' performance of their JORN and JFAS maintenance and support obligations. OTHRSPO, along with contractors and DSTO, effectively form the original equipment manufacturer for the ADF's OTHR capability. In that capacity, OTHRSPO and DSTO extensively contribute to the strategic management of this capability.

1.13 OTHRSPO, in close cooperation with DSTO, manages the ongoing technological development of the JORN and JFAS systems. This includes a

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[10] The initial JORN maintenance and support period extends for 46-months following JORN's Final Acceptance in May 2003. This is valued at $121.4 million (January 2005 prices), and includes operation and maintenance of buildings, fresh water and sewerage treatment plants, electrical power production and distribution, and personnel catering and living quarters upkeep. The Contractor's JORN maintenance and support personnel operate a 10.2-hour day, 14 days on 7 days off roster, and are flown into Longreach and Laverton from Brisbane and Perth respectively.

$65 million JORN enhancement program approved by the Government in February 2004.[11] OTHRSPO intends to contract the JORN enhancements as a series of JORN modifications to be executed through a mix of Engineering Support Services contracts with RLM, and with other suppliers. The JFAS Maintenance and Support Contract (the JFAS Contract), contains a provision for additional engineering support.[12] OTHRSPO is using this provision to contract BAE SYSTEMS to undertake a series of upgrades to the JFAS radar. The total amount currently approved for JFAS upgrades is $18.45 million,[13] of which $7.47 million had been spent by September 2005.

Audit approach

1.14 The DMO manages some 240 major capital equipment projects, which have a total estimated cost in excess of $50 billion. The approved funding for the JORN and JFAS systems amount to less than two per cent of the estimated cost of DMO's major capital projects. This audit represents the third ANAO performance audit in 2005–06 on Defence's and DMO's management of major capital acquisition projects. The first two audits, *Management of the M113 Armoured Personnel Carrier Upgrade Project*,[14] and *Upgrade of the Orion Maritime Patrol Aircraft Fleet*,[15] examined the effectiveness of the management of these projects.

1.15 The audit scope covers key lessons learnt from the JORN Project's acquisition and acceptance phase, and JORN and JFAS maintenance and support. The audit objective is to assess the effectiveness of the DMO's JORN and JFAS maintenance and support arrangements.

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[11] The approved cost of the JORN enhancement program (Joint Project 2025 Phase 5) was $59 million in 2004. This amount has been escalated to $65 million in line with changes in the cost of labour and materials. As of September 2005, no expenditure had been made on this project.

[12] The additional engineering support provided by BAE SYSTEMS to OTHRSPO includes advice to OTHRSPO on engineering matters related to the radar and its support facilities, and the maintenance of a capacity to provide minimum of 14,550 hours JFAS software development, and a minimum of 5,680 hours JFAS hardware development per financial year.

[13] Minor Item Submission 899, *JFAS Radar Operational Upgrade*.

[14] ANAO Audit Report No.3 2005–06, *Management of the M113 Armoured Personnel Carrier Upgrade Project*, July 2005.

[15] ANAO Audit Report No.10 2005–06, *Upgrade of the Orion Maritime Patrol Aircraft Fleet*, September 2005.

1.16 The audit examined the maintenance and operation of the JORN and JFAS radars, and their facilities. Audit fieldwork was conducted between July and October 2005, at the OTHRSPO and at each of the OTHR installations. An issues paper and a discussion paper were provided to Defence and DMO for comment in September and October 2005, respectively. The proposed audit report was issued to Defence in November 2005, and at the same time extracts were provided to Telstra, RLM Management and BAE SYSTEMS.

1.17 The audit was conducted in accordance with ANAO auditing standards at a cost to the ANAO of $180 000.

Report structure

1.18 The remainder of the report is organised into three chapters. Chapter 2 outlines the JORN system's introduction into service and lessons learnt. The following chapters respectively discuss JORN and JFAS maintenance and support, and their future upgrades.

2. Jindalee Operational Radar Network Acceptance

This chapter outlines JORN's acceptance and lessons learnt from the Project's acquisition phase.

Background

2.1 The 1991 JORN Contract, specified the use of a Cost and Schedule Control System to provide data for managing and reporting JORN's development and construction. The Cost Variance line in Figure 2.1 tracks the difference between the actual cost of JORN work completed and the budgeted cost of that work. The negative trends prior to 1997, indicate JORN Project cost overruns despite frequent project replans and other management interventions.

2.2 The Schedule Variance line in Figure 2.1 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.

2.3 Schedule corrections in January 1992, July 1992 and March 1993 resulted from incomplete work being re-scheduled to later dates, and increasing amounts of concurrently scheduled work. A revised Performance Measurement Baseline was approved in 1997,[16] and it resulted in the February 1997 $100 million schedule performance variation and $80 million cost performance variation (see Figure 2.1).

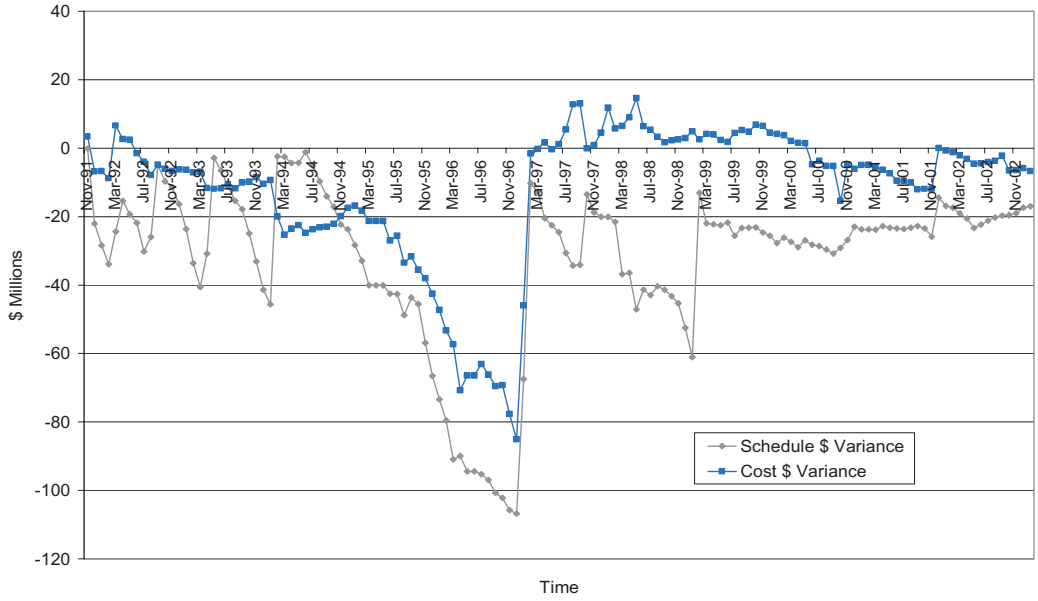
2.4 The JORN Project experienced greatly improved cost and schedule performance from 1999 (see Figure 2.1), following RLM's complete revision of JORN's development, in contracted work allocation and scheduling terms. JORN's development was completed in April 2003, at an overall cost to

[16] A Performance Measurement Baseline is used to assess and manage a project's organisational and task performance in terms of project costs and schedule. They are comprised of a cumulative graph of the planned value of work to be performed over a project's duration.

Defence of $1.05 billion.[17] This outcome was within the JORN Project's approved project cost, adjusted for escalation and foreign currency exchange rate variations.

Figure 2.1

JORN cumulative monthly project cost and schedule variance trends.



Source: Defence Materiel Organisation.

2.5 By JORN's Final Acceptance in May 2003, the JORN Contract's cumulative cost variance amounted to $8 million or less than one per cent, and its cumulative schedule variance was $20 million or two per cent. In elapsed time terms, Defence accepted JORN in May 2003, which was some 16 months late, according to the novated contract with RLM. Given the project's delays, Defence invoked the JORN Contract's liquidated damages provisions, and obtained from RLM an undertaking to do additional JORN development

[17] Portfolio Budget Statements 2003–04, *Defence Portfolio*, May 2003, p.136. This amount includes $1.02 billion in Specialist Military Equipment (the JORN system), $20.5 million in JORN facilities, and $11 million in maintenance and other non-capital expenses.

studies and logistics work to the value of $8 million, at no cost to Defence. This work was completed in September 2004.[18]

2.6 The original JORN Contract with Telstra scheduled JORN to be complete by June 1997, which is almost six years prior to the achieved Final Acceptance date.

JORN financial valuation

2.7 As at September 2005, the JORN system and its supporting infrastructure and communication systems were valued at $873.76 million, as recorded in Defence's financial management information system (ROMAN). The original cost to Defence in June 2003 was $1.02 billion. ROMAN records indicate JORN's value has been depreciated by $146 million since it entered service in 2003.

2.8 The JORN Maintenance Management System is capable of storing the value of each item of JORN's logistics inventory.[19] However, as at October 2005, not all JORN inventory price records were complete and accurate, and the process of identifying the actual cost of the JORN inventory was still underway. In December 2005, Defence advised the ANAO that adjustments to its JORN inventory account records will be made once the inventory cost are known. The adjustments are expected to be made in April 2006.

Acceptance and transition into ADF service

System operational characteristics

2.9 For the Project's first five years, the JORN contractors found it difficult to determine fully what operational characteristics would be suitable for the JORN system's intended purpose. That was because, amongst other things, the Project did not have an Operational Concepts Document included as part of

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[18] This arrangement enabled RLM to maintain critical areas of JORN engineering design and development expertise during the interval between JORN Final Acceptance in May 2003, and the commencement of the JORN Engineering Support Services contract, which was signed in April 2005.

[19] The logistics inventory includes spare parts, maintenance documents and test equipment.

the System Specification.[20] To overcome that deficiency, Air Force's operational personnel and DSTO's OTHR research personnel interacted with contractor personnel to provide details of the desired JORN operational characteristics.

2.10 Defence now requires all DMO projects to develop Test Concept Documents and Operational Concept Documents, which complement each system acquisition contract's Function and Performance Specifications.[21] These three documents form Defence's mandated Concept Development Document suite.

2.11 In October 2005, Defence advised the ANAO that it agreed with the need to develop Operational Concepts Documents, Test Concept Documents and Function and Performance Specifications.[22] However, Defence stated these documents alone would not have solved the JORN Project's test and evaluation complexity, because the concept documents provide only high-level guidance, rather than addressing the difficult and detailed issues that complicated JORN's acceptance process.[23]

Test and evaluation teamwork

2.12 Defence advised the ANAO that the mix of complementary OTHR technology skills, held by DSTO, DMO and Air Force's operational personnel, made significant contributions to all technical aspects of the JORN design and test and evaluation program. They also assisted the JORN Project Director to negotiate and resolve with RLM complicated test and evaluation issues. In Defence's opinion, this mix of skills, and DSTO's contribution in particular, led to the JORN requirements being interpreted better, which in turn led to the JORN system meeting ADF operational needs. This lesson is particularly relevant to the JORN enhancement program.

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[20] The Operational Concept Document is the primary reference for determining fitness of purpose of the desired capability to be developed, and it compliments the capability's Function and Performance Specification and Test Concept Document.

[21] Department of Defence, *Defence Capability Development Manual 2005*, p.71.

[22] Function and Performance Specifications specify the requirements for the system and provides the basis for design and qualification testing of the system. In the JORN Project, the JORN Network System and Subsystem specification was required to encapsulate all the requirements that the Contractor had to formally meet, and the JORN system was to be tested against these specifications and their derived requirements.

[23] These issues included ionospheric variations, which had to be accounted for in JORN's design and in the JORN test and acceptance program.

2.13 JORN's transition into service was also assisted by DMO adopting the System Program Office (SPO) organisational structure concept in 2000. This structure removes the organisational divide between acquisition and in-service support, by holding SPO Directors responsible for managing the acquisition, through-life logistics support and disposal phases of Defence's capital equipment life-cycle.[24] The SPO's are also predominately located with the ADF Force Element Groups they support.

Acceptance Program Plan and Final Acceptance Report

2.14 The JORN Contract required RLM to produce a JORN Acceptance Program Plan, to be approved by Defence, which identified the physical entities presented for JORN's Final Acceptance; and detailed the processes, criteria and substantiation required to achieve Final Acceptance. DMO approved the Acceptance Program Plan in September 2000. RLM was also required to produce a Final Acceptance Report that provided the substantiation required to achieve JORN's Final Acceptance by DMO.

2.15 JORN's acceptance was based on DMO's approval of RLM's JORN Acceptance Program Plan and Final Acceptance Report, DMO's certification of RLM issued Supplies Release Notes (Form SG8) for both JORN Radars,[25] and DMO's certification of a Supplies Acceptance Certificate (Form SG1) for the JORN radars and their facilities and logistics support.[26] DMO's right to approve the JORN Program Acceptance Plan and the JORN Final Acceptance Report aligns with its responsibilities to ensure that RLM had satisfied its JORN contract obligations.

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[24] Prior to DMO adopting the SPO structure concept, equipment acquisition project managers were responsible for delivering into service prime equipment together with an initial logistics support package. Once equipment was accepted into service, the Services' logistics organisations then became responsible for the equipment's through life logistics support. OTHRSPO was formed in July 2001. It consolidation of its Canberra and Melbourne offices at Edinburgh by mid 2003.

[25] SG8s are used by Contractors to certify that supplies to be delivered to Defence have been inspected or otherwise quality controlled and, unless otherwise stated, conform with the order, drawings and specifications, in all respects, with the conditions and requirements of the Contract.

[26] SG1s are used by Contractors to seek Final Acceptance of supplies to be delivered to Defence from the Project Authority (in JORN'S case the OTHRSPO Director), and to certify that they conform in all respects to the conditions and requirements of the Contract.

Acceptance test procedures

2.16 JORN acceptance testing was conducted between 1998 and 2003. The JORN functional specification contained 2 445 individual requirements, which resulted in over 30 000 derived requirements that were implemented by 76 400 individual assemblies, software modules and ancillary equipment. The DMO, 1 RSU and DSTO verified RLM's satisfactory achievement of the JORN Contract's function and performance specifications through a combination of:

- inspections and tests of individual configuration items, subsystems, and systems;
- physical and functional configuration audits;
- confidence testing, system analysis and demonstration tests;
- logistics support implementation tests; and
- DMO's approval of some 28 categories of JORN documents.

2.17 RLM completed building both radars and their facilities in September 1999, finished testing the radars' performance in June 2002, and completed JORN's overall network testing in December 2002. The budgeted cost of RLM's JORN test program was $25.61 million (September 1997 prices).[27] The tests included regression testing, to verify successful resolution of warranty issues discovered during the radar build and test process; and confidence testing to confirm that previously verified functionality at one location was replicated at other locations.

2.18 RLM, DMO and DSTO placed emphasis on testing JORN's ability to detect and accurately track surface and air targets. The detection and tracking tests took RLM four weeks to complete, and involved an operational crew of 60 RLM and Air Force personnel and a test team comprising 20 RLM, DMO and DSTO personnel.

System Trouble Report resolution

2.19 When RLM offered JORN to OTHRSPO for Final Acceptance in April 2003, there were no high-priority System Problem Reports requiring

[27] This does not include DMO and DSTO costs.

resolution prior to Final Acceptance. However, there were some 280 lesser priority System Problem Reports, which DMO agreed could be resolved after Final Acceptance at RLM's expense in accordance with agreed Corrective Action Plans and the JORN Contract's warranty provisions.

2.20 These System Problem Reports were resolved by November 2004. This resulted in RLM being able to claim the final Earned Value progress payments, and in Defence agreeing to the cancellation of the last of two $1 million Bank Guarantees that were held pending the resolution of any warranty claims and the System Problem Reports.

Management lessons learnt

2.21 Steps taken by RLM and Defence to resolve the JORN Project's problems may be grouped into three major themes:

- organisational structure improvements;
- engineering process and systems integration improvements; and
- project monitoring improvements.

Organisation structural improvements

2.22 Even though in the Project's formative years, the JORN Contractor teams understood the contracted systems engineering process, they were unable to address adequately important engineering problems in a timely fashion. In addressing that issue, RLM introduced into the JORN Project a co-located Integrated Product Teams (IPTs) structure, made up of representatives from systems, software and hardware development, test engineering and cost and schedule control. IPT Managers had the authority and responsibility for their team's cost, schedule and performance, and for achieving cost effective outcomes in production and in-service support.[28]

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[28] 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 to agreed limits to make commitments for the organisation or functional area they represent.

2.23 The IPTs included DMO, DSTO and Air Force personnel, and where applicable RLM's major sub-contractors. The IPTs fostered an open relationship between these personnel,[29] which allowed implementation of improved operations that focused on innovation and schedule performance. The improvements included JORN development issues being resolved predominately via collaborative teamwork, rather than by protracted written correspondence, and improved motivation for gaining mutual understanding and timely resolution of wide-ranging JORN Project issues. The IPT structure also allowed effective isolation of key contractual issues that were best resolved at the Senior Management levels within the contractors and Defence.

2.24 The initial lack of an IPT structure up until late 1997, prevented satisfactory visibility and Senior Management follow-up of all aspects of the JORN development process. It was apparent that Senior Management, within the Contractor and Defence organisations, needed to be involved in the development process, and remain active in risk management rather than just monitoring the processes.

Engineering process and system integration improvements

2.25 Until at least 1996, the JORN system engineering process was in difficulty in following areas:

- the JORN Contract's specified requirements were not fully taken up by the systems engineering process;
- the JORN sub-systems were over-engineered and complex;
- the interface specifications between each JORN sub-system were inadequately defined; and
- JORN sub-system production was progressing ahead of design approvals.

2.26 In 1997, RLM took action to correct these problems by performing a requirements review and establishing a design baseline for all JORN sub-systems and their interfaces. RLM then decreased the amount of system

[29] RLM granted the JORN Project Office unfettered access to its proprietary JORN design and development environment, covering requirements management, configuration control and software engineering.

complexity to a level that met contracted requirements and allowed the effective application of an integration and test methodology. RLM repeated the JORN system and sub-system Preliminary Design Reviews and Critical Design Reviews process, to gain Defence's agreement on the revised JORN designs, and to gain improved assurance that the JORN systems and subsystems RLM was developing would be fit for Defence's purposes.

2.27 RLM also focused on improving the JORN system integration process. The original JORN development method had JORN software and hardware being developed independently without a satisfactory way of integrating and testing them prior to their installation at the Longreach and Laverton sites. This left the Project without a common set of tools, an agreed integration plan, or a JORN acceptance strategy.

2.28 RLM addressed these issues by establishing a Configuration Management Team, responsible for all JORN hardware, software and documentation. RLM also established a Software Development Environment containing a standardised set of development tools and procedures under the control of the Configuration Management Team. JORN development personnel received training in the proper use of the development tools and procedures, in order to achieve a consistent approach to the JORN system development process. This meant that JORN development problems were repeatable and traceable, and therefore effort was generally only required once to fix a problem.

2.29 RLM also established an integration facility in Melbourne, which housed 350 IPT engineers and laboratory space for seven versions of JORN computer hardware and software elements. This allowed RLM to simultaneously develop, integrate and test JORN computing system configuration items, sub-systems and systems. The integration facility was fully instrumented by software applications and Test Support Items, which allowed complete visibility into the JORN's evolving functions and performance. It also had direct communications to the remote sites, which enabled RLM access and control of the remote radars during the integration and test phase.

2.30 The need to finalise JORN's integration and test phase at the Longreach and Laverton, required RLM to duplicate the integration facility tool sets at these sites, and to also place them under Configuration Management control.

2.31 The JORN system's remote facilities provided challenges for maintaining fully motivated teams of software and integration engineers for the years it took RLM to develop JORN. This required RLM to adopt the fly-in and fly-out model, employed by firms in the mining industry, and to develop overlapping work schedules to ensure continuous progress on JORN's final integration and performance tests and evaluations.

Project monitoring and verification improvements

2.32 Major DMO capital equipment projects, such as JORN, often have many diverse project elements such as interfaces with other DMO projects and Defence facility management and personnel training. These elements need to be coordinated with contractor deliverables and activities. This raises a need for an automated project element monitoring system to provide information on all project elements in terms of progress status, risk trends and potential difficulties.

2.33 Prior to 2000, such a system was not available to DMO's JORN Project Office. In 2001, DMO began developing its Improve Project Scheduling and Status Reporting (IPSSR) System, which aims to achieve, within each DMO project, a properly maintained and monitored cost and schedule system based on approved Project Work Breakdown Structures. IPSSR is to cover the project's entire scope, not just the work allocated to contractors. OTHRSPO has implemented IPSSR on the JORN enhancement program.

2.34 OTHRSPO's formation in July 2001, and the consolidation of its Canberra and Melbourne offices at Edinburgh by mid 2003, resulted in a complete changeover of DMO's JORN Project personnel.[30] This required the SPO to develop a new project team of 45 personnel with highly specialised knowledge of the JORN system. OTHR specialists from DSTO, Air Force and Contractors, already located at Edinburgh, assisted OTHRSPO to develop that knowledge. Since then, these personnel have maintained the collaborative approach needed for the continuing support and development of the ADF's OTHR capability. This is particularly relevant to the JORN enhancement program.

[30] Immediately prior to the formation of the OTHRSPO in July 2001, the JORN Project had 62 personnel located in Canberra and Melbourne, and the then 1 RSU Detachment A had seven personnel located in Edinburgh.

3. Jindalee Operational Radar Network Maintenance and Support

This chapter outlines the JORN maintenance and support arrangements.

Background

3.1 The JORN Contract's maintenance and support provisions hold RLM responsible for all JORN system maintenance and logistics support, including the operation and maintenance of JORN's Longreach and Laverton facilities, during the 46-month initial support period.

3.2 In February 2004, the Government agreed to a $59 million JORN enhancement program,[31] which will enable a raft of OTHR capability enhancements to be integrated into JORN. Many of the enhancements were developed by DSTO, in cooperation with industry, and tested and evaluated using the JFAS radar.

3.3 In 2005, OTHRSPO commenced strategic planning for JORN's logistic support post February 2007. That period will see the continued implementation of the JORN enhancement program, which involves a rolling program of changes to JORN's software and hardware configurations.

3.4 In order to manage the risks associated with enhancing JORN and simultaneously maintaining its operational availability, OTHRSPO intends to adopt the evolutionary acquisition technique,[32] and IPT structures.

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[31] By October 2005, this amount has been escalated to $65 million in line with changes in the cost of labour and materials. As of October 2005, no expenditure had been made on this project.

[32] The evolutionary acquisition project management technique seeks to evolve new systems through incremental specification, design, implementation, testing, delivery, and release into service. Each incremental release increases the overall capability of the system until it satisfies its approved function and performance specification. This technique provides system users with early access to the system, and encourages them to provide feedback on the system's design and performance features. The feedback is used in subsequent increments to shape system development until it evolves to its final form.

Technical integrity

3.5 OTHRSPO is required to maintain JORN system logistics support arrangements that comply with the ADF's technical regulation management requirements. OTHRSPO has adopted the ADF's Technical Airworthiness Management Manual as the basis for its technical integrity governance and compliance mechanisms.[33] This is to enable the SPO to provide assurances regarding JORNs continuing technical and operational integrity.

3.6 Technical integrity for JORN's maintenance and logistics support is to be assured by RLM being certified as an Authorised Maintenance Organisation by ADF's Director-General Technical Airworthiness (DGTA), on the successful completion of a formal audit carried out by DGTA's Project Regulation Staff. As at October 2005, DGTA was involved in higher priority audits, and the indications were that RLM would be audited in the third quarter of 2006.

3.7 RLM is maintaining and supporting JORN in accordance with the JORN Contract and is using a quality management system that complies with ISO 9001:2000.[34] As at October 2005, OTHRSPO had not issued RLM with any contractual non-conformance reports.

3.8 The technical integrity of JORN design changes is assured by OTHRSPO certifying RLM as an Authorised Engineering Service Provider. OTHRSPO is permitted by DGTA to provide RLM with that certification, given that it has been certified as complying with the quality management provisions of ISO 9001:2000, and has achieved Authorised Engineering Organisation certification by DGTA.[35] In October 2005, RLM was preparing for an audit of its design change management processes by OTHRSPO as part of the Authorised Engineering Service Provider certification process. OTHRSPO has scheduled a review of RLM's Authorised Engineering Service Provider preparations for December 2005.

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[33] The Technical Airworthiness Management Manual has requirements regarding the 'Off Aircraft No Interface' framework for design regulation, of the kind relevant to ground-based non-aircraft related systems such as JORN and JFAS.

[34] International Organization of Standardization, 9001:2000, *Quality management systems-Requirements*.

[35] These certifications were achieved on 16 December 2004 and 10 May 2005 respectively.

3.9 OTHRSPO is responsible for ensuring JORN's design changes are approved and accepted in accordance with acceptable engineering practice. To that end, OTHRSPO has a Configuration Manager who monitors the status of JORN design changes, including the outcomes of tests and evaluations of JORN engineering changes. Any significant engineering design changes, such as those that affect JORN's performance, need the approval of RLM's Senior Design Engineer and the acceptance by OTHRSPO's Senior Design Engineer.

3.10 RLM's JORN Project Technical Director manages the JORN system change process and chairs the JORN Technical Review Board. This board assesses system change options and approves temporary changes to JORN for test and evaluation purposes. RLM also has a Change Control Board, which reviews the outcomes of temporary changes and approves the incorporation of changes to JORN's design.[36] Both these Boards have OTHRSPO representatives.

3.11 As at October 2005, 85 JORN System Problem Reports were under investigation,[37] 15 temporary changes to JORN were undergoing test and evaluation, 54 hardware changes were approved for incorporation, and 70 software changes had been approved for inclusion in the JORN Software Baseline Release scheduled for February 2006.

Operational availability 2003 to 2005

3.12 Figure 3.1 shows for the period May 2003 to September 2005, JORN's overall operational availability had not fallen below 99 per cent, thus exceeding the contractual requirement of a minimum of 96 per cent.

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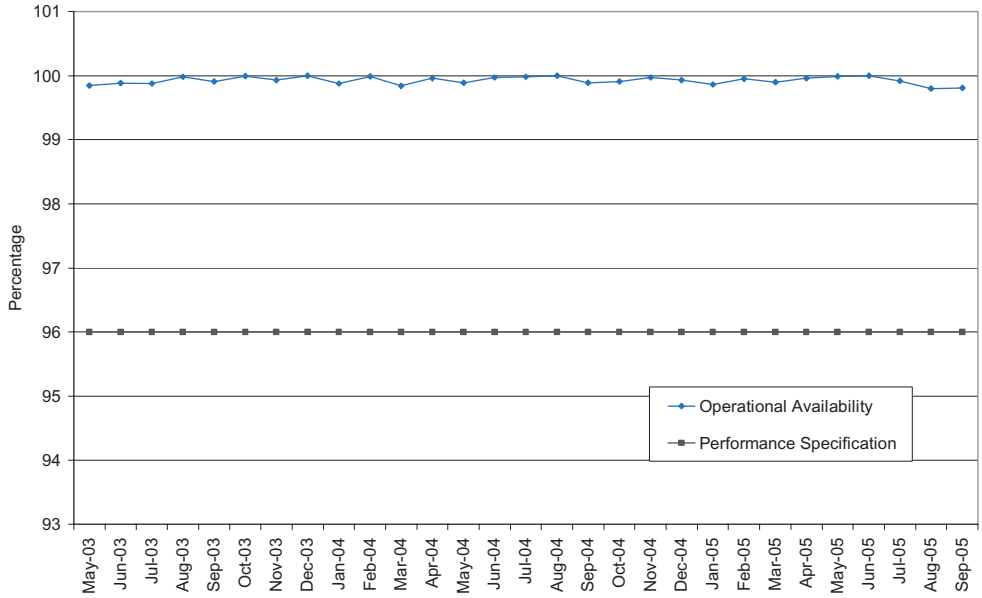
[36] The JORN system's engineering change records management system is called Eaglespeed, and it contains JORN's configuration status and engineering records covering all JORN design change decisions.

[37] JORN System Problem Reports are generated by a mix of operator and maintenance personnel comments and suggestions. These reports, and the subsequent change management process, enable well-managed incremental refinements of the radars' capability.

Figure 3.1

JORN Operational Availability: May 2003 to September 2005.



Source: Defence Materiel Organisation.

3.13 From May 2003 to September 2005, the JORN system's average time between critical equipment failures was 45.6 hours, and the average time taken by RLM to repair those failures and to return JORN to operations was 28 minutes. The JORN items experiencing most failures were the JORN transmitter amplifiers and JORN front-end receivers. RLM is required to institute a Failure Reporting, Analysis and Corrective Action System to report equipment failures, determine their cause, and to advise on the corrective action taken. This system has been applied to the JORN transmitter and receiver failures, and has resulted in changes to JORN Maintenance Management System Work Orders, and maintenance procedures.

3.14 The JORN system contains extensive built-in performance diagnostics and performance monitoring hardware and software, designed to detect any instances where JORN's performance drifts from its design limits. The diagnostics are exercised at each JORN radar installation at the start of each day, to provide assurance that JORN system is serviceable, fit for purpose and may be handed to 1 RSU for its OTHR operations. Once the radar is in operation, built-in performance monitors check critical areas of the radar and

report performance results to maintenance consoles at the radar transmitter and receiver sites.

3.15 ANAO observations of JORN's performance diagnostics and performance monitors, indicate both JORN radars are maintained as intended and are operating within their design parameters.[38]

Maintenance and support costs

3.16 The original estimated cost of maintaining and supporting JORN, during the 46-month initial support period, was $145.5 million (June 2005 prices).[39] This price was based on cost plus incentive fee model, with JORN being operated for 40 hours per week.[40]

3.17 In order to arrive at more accurate estimates, the JORN Contract requires RLM to submit annual revised estimates of JORN's maintenance and support. This is to be accompanied by full costing data and details of the index numbers and method to be used to escalate the initial cost estimates.[41]

3.18 The 2005 revised cost estimate for 46 months of JORN maintenance and support amounted to $121.4 million (January 2005 prices), based on maintenance cost trends.[42] On that basis, JORN will be some $24.1 million less costly to maintain than first estimated over the initial support period. RLM's JORN logistics engineering and in-service support program is achieving the

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[38] For example in September 2005, out of a total population of 1,502 operational receiver elements within both JORN radars, only one was not performing to its specifications. Also, out of a total population of 3 904 400 watt radar transmitter elements, none were unserviceable.

[39] The original initial cost estimate for the maintaining and supporting JORN for four years was $99.6 million (April 1991 prices).

[40] The cost plus incentive fee excludes warranty work and correction of latent defects The JORN Contract specifies that the warranty period begins at the commencement of the Phase 2 Operational Maintenance and Support Period and ends six months after Final Acceptance (in November 2003). The warranty provisions included the rectification of any failures of JORN Software or Hardware to comply with the Specifications. The Latent Defect period commenced on termination of the Warranty Period and ends in March 2007, some 46 months after JORN's Operational Release. As at September 2005, there had been no latent defects experienced.

[41] RLM's estimate was also to be accompanied by a certificate certifying that the estimate and the accompanying costing data are, to the best of RLM's knowledge, complete, accurate and current.

[42] The cost trends may change in line with the aging of the JORN system.

specified JORN system operational availability, at significantly reduced costs. This has mainly been achieved through JORN's better than estimated reliability.

Cost performance incentive

3.19 The profit margin allowed for in the maintenance and support element of the JORN Contract takes into consideration any maintenance and support savings, or cost overruns, annually on an actual cost basis. All savings are shared evenly between RLM and DMO. If actual maintenance and support costs exceed the initial cost estimate of $145.5 million (June 2005 prices), then additional costs are shared 60 per cent RLM and 40 per cent DMO. In the event that maintenance and support costs exceed $163.5 million (June 2005 prices) all subsequent cost overruns are borne by RLM.[43]

3.20 The revised JORN system maintenance and support cost estimate is below the initial estimate by $24.1 million. If this trend continues, DMO expects its share of the JORN initial support cost savings will exceed $12 million, over the 46-month initial JORN maintenance and support period.

3.21 In October 2005, Defence advised the ANAO that its Chief Financial Officer is aware of the changed cost profile for maintaining the JORN system, and is working with DMO to adjust the funding allocations accordingly. Defence advised that it will annually review the total cost of maintaining and supporting those systems, and that this review will be factored into the Defence Management and Finance Plan process.

Unsatisfactory performance penalties

3.22 RLM receives monthly payments from DMO for maintenance and support of the JORN system and facilities. The contract contains a performance penalty, in the form of 2.5 per cent of each monthly payment amount being withheld from RLM, and later paid to RLM in whole or part, governed by JORN's achieved operational availability.

3.23 By August 2005, all six-monthly maintenance and support funds had been paid to RLM, as the JORN system achieved both its specified operational

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[43] Only the initial cost estimate is escalated according to agreed formulae. This ensures calculation of cost saving or cost overruns remain accurate.

availability and none of JORN's maintenance down times had exceeded six hours.

Supplementary maintenance arrangements

3.24 The JORN Contract requires RLM to perform supplementary maintenance of the systems and facilities that directly support the JORN. This includes Government Furnished Equipment such as JORN's secure communication systems, and the JORN facility operation and maintenance. The current fixed cost of the JORN systems supplementary maintenance is $11.9 million (December 2005 prices), which covers the period from May 2003 to February 2007. This price is adjusted for variations agreed in the JORN Contract.

3.25 By September 2005, expenses incurred by RLM for JORN facilities maintenance totalled $2.65 million. The ANAO's inspection of the JORN facilities showed the facilities to be maintained as intended.

Maintenance and support structure

3.26 OTHRSPO approved a hierarchy of JORN system maintenance and support policy and plans, as part of the suite of documents produced by RLM under the JORN Contract. They are maintained by RLM in printed form, are stored electronically and are linked to RLM's Maintenance Management System.

3.27 RLM is responsible for establishing a management structure for the efficient control and co-ordination of all contractor and sub-contractor integrated logistics support tasks. This is to ensure JORN can perform its missions and, in the event an equipment failure, the system is restored to full capability as soon as possible. This is achieved through the following maintenance and support structure:

- Operating Level Maintenance. This is JORN's first line of maintenance support and it occurs at the JORN equipment bays. It includes equipment performance diagnostics, preventative maintenance, and

equipment repairs involving replacing faulty Line Replaceable Units (LRUs) with serviceable ones.[44]

- Intermediate Level Maintenance. This occurs in the JORN facility workshops and involves LRU fault diagnosis and repair at the circuit card or mechanical component level. It aims to restore LRUs to serviceable status for return to serviceable stock.

- Depot Level Maintenance. This occurs in manufacturer or supplier workshops, and involves repair or overhaul of LRUs using general purpose and special to type test equipment.

3.28 JORN's first 30 months of operation (May 2003 to October 2005) indicated that its maintenance and support structure is sound.

Maintenance management system

3.29 The JORN Contract requires RLM to implement a Maintenance Management System in order to record JORN's maintenance history. The Contract also requires RLM to develop an inventory control system that identifies and controls JORN test and support equipment, break-down spares and repairable items. RLM has satisfied both these requirements by developing a Maintenance Management System,[45] which has the following functions:

- Inventory stock level monitoring, automated stock re-ordering against actual usage, and recording of stock transaction history. RLM uses these functions to create, process and monitor purchase orders for JORN parts, materials or services;

- Work Order generation and tracking, initiated by reported failure codes within the JORN Preventative Maintenance Determination system, from observed failure symptoms, or from Scheduled Maintenance

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[44] LRUs are the lowest appropriate level of repairable item that can be readily diagnosed and replaced at the equipment site. They include electronic items such as circuit cards, modules and assemblies and mechanical items such as pumps, valves, motors, and alternators.

[45] RLM's Maintenance Management System is based on the Maximo® asset and service management software produced by MRO Software, Inc. of the USA.

Plans.[46] The Work Orders authorise and control maintenance staff and contractor work activity, and provide a detailed list of maintenance processes and resources necessary to perform specified JORN maintenance activities. The Work Orders also provide a failure and maintenance history of all JORN equipment;

- Labour specification, planning and analysis of actual labour used in JORN maintenance and support;

- Equipment Monitoring, in terms of equipment location, failure history, configuration history and status. This provides an asset register containing all JORN individual assemblies, software modules test equipment and ancillary equipment, as well as providing a maintenance cost monitor;

- Job Planning and Specification of each maintenance task and the resources necessary to complete each tasks. The job specifications are linked to JORN Scheduled Maintenance records and are included in auto-generated scheduled Work Orders; and

- Maintenance Management Report generation of standard or user defined reports.

3.30 The ANAO observed the Maintenance Management System's use and found it provided a rigorous structure for RLM's JORN maintenance and support tasks. It also provided an extensive maintenance analysis capability covering the entire JORN system.

3.31 In August 2005, the Maintenance Management System reported that JORN consisted of 76 400 individual assemblies, software modules and ancillary equipment, of which approximately 61 100 were LRUs, 1 036 were test equipment units and 456 were Government Furnished Equipment (GFE). Of those items, 233 were undergoing depot level repair or calibration.

3.32 The LRUs requiring most depot level support were the JORN transmitter amplifier and power supply modules. In August 2005, some 120 of these modules were undergoing depot level repair, leaving 130 serviceable

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[46] Scheduled Maintenance master records are used to generate Work Orders where the maintenance action is based on elapsed time, service hours or mileage criteria.

spares in the JORN workshops and stores.[47] Experience to-date indicates that there are sufficient stocks of serviceable transmitter modules, for RLM to continue achieving its contracted JORN system operational availability.

Software support

3.33 In August 2005, JORN contained some 1.3 million lines of code, of which 97 per cent is in the Ada programming language. This software is maintained within a software development and support environment located within the OTHRSPO building at DSTO Edinburgh.

3.34 The OTHRSPO building contains facilities for performing pre-site integration and test of software prior to operational roll-out. RLM's internal procedures cover configuration management, control and approval of changes, test and acceptance by the OTHRSPO. RLM utilises the JORN system outside operational hours to perform system testing of software releases. The technical regulation applied to JORN's software is identical to that which is applied to the remainder of the system.

3.35 By September 2005, RLM had delivered two releases of the JORN operational software, which addressed minor warranty issues and interim capability enhancements.

Repairable items, spares, test equipment and documentation

3.36 The JORN Contract requires RLM to deliver to Defence the full range of repairable items,[48] break-down spares,[49] test equipment, jigs and fixtures and repair documentation required to maintain and support the JORN system and its facilities. RLM is responsible for procuring these items in numbers determined by logistics support analysis, as being sufficient to support the JORN for three years.

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[47] These items have a sub-contracted 28-day maximum repair turn around rate.

[48] Repairable items comprise system assembly or other components, which are determined to be economic to repair after failure, rather than to be discarded and replaced with new items.

[49] Break-down spares comprise individual parts, components, kits or non-repairable assemblies, required to complete or maintain a system or end item of equipment. However, they do not include consumable items.

3.37 These items were delivered to Defence and are used by RLM for JORN system maintenance and support. When they are consumed, and stock levels fall below predetermined minimums, RLM replenishes the stockholdings through direct purchases from its suppliers. OTHRSPO plans to validate the JORN stockholdings via a stores inventory data quality audit in November 2005. Once validated, the value of JORN's stockholdings will be recorded as JORN general stores inventory in the assets account within Defence's corporate Financial Management Information system, which is known by the acronym ROMAN.[50]

3.38 RLM is responsible for regularly reviewing the range and quantity of break-down spares held as JORN maintenance experience is gathered, and to make recommendations to OTHRSPO regarding appropriate adjustments to stockholding and procurement policies for break-down spares. In August 2005, the JORN Maintenance Management System indicated that there were adequate stocks of serviceable Line Replaceable Units, subject to RLM's sub-contractors achieving their depot level repair outcomes.

3.39 RLM is responsible for providing all documentation required to fully specify and maintain JORN radar. These include specifications, engineering drawings, test specifications and test reports, maintenance manuals and servicing schedules, and operator manuals. These documents were delivered to Defence for approval under the requirements of the JORN Contract. Changes to these documents require the approval of RLM's Senior Design Engineer, and may also require acceptance by the OTHRSPO's Senior Design Engineer, depending on the OTHRSPO's Requirements Review Board's assessment of the criticality of an individual document. The ANAO reviewed a sample of the printed JORN maintenance manuals at each JORN radar site, and found them to be maintained as intended.

3.40 RLM is also responsible for ensuring all JORN test equipment is maintained and calibrated in accordance with specified standards. RLM has subcontracted its test equipment calibration responsibilities to a firm accredited by National Association of Testing Authorities as complying with the relevant standards. The ANAO inspection of JORN test equipment calibration labels and records indicated this process was working as intended.

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[50] ROMAN (Resource Output Management Accounting Network), contains a General Ledger, Cost Centre Accounting, Profit Centre Accounting, and Funds Management modules. Defence's assets are accounted for within ROMAN'S Profit Centre Accounting module.

Stocktaking of equipment and logistics support items

3.41 RLM is responsible for conducting a stocktake audit of JORN inventory and equipment, including GFE at each site at least once every financial year. The audit is to detail any surpluses or deficiencies and to be forwarded by the site maintenance staff to RLM's Logistics Support Manager. Defence personnel are invited to participate in these audits and are provided with a report of the results within one month of completion of the audit.

3.42 RLM's site maintenance staff conduct continuous cyclic stocktakes to account for JORN LRUs, break-down repair parts, test equipment and JORN assemblies. These are subject to an annual 100 per cent stocktake by both RLM and OTHRSPO. In August 2004, OTHRSPO conducted a stocktake of Defence owned equipment and general stores inventory, held or managed by RLM as part of the JORN Contract. OTHRSPO's logistics auditors reported that errors detected during the stocktake amounted to less than one per cent, and the value of all discrepancies totalled less than $500. RLM is addressing the errors and discrepancies through cyclic stocktakes, Maintenance Management System data verification, and additional personnel training and supervision.

4. Jindalee Facility Alice Springs Maintenance and Support

This chapter outlines the JFAS maintenance and support arrangements.

Background

4.1 JFAS began as series of DSTO OTHR experiments that commenced in the 1950s, and from the 1970s, evolved through successive DSTO research and development tasks and minor Defence acquisition projects. Consequently, JFAS has not benefited from a system-wide formal logistics support analysis. However, some logistics support analysis was conducted on upgraded JFAS sub-systems. JFAS engineering specifications and design, development and maintenance documentation varies according to the genesis of each system segment.[51]

4.2 Until early 1987, JFAS was an experimental unit largely the responsibility of DSTO. Following the completion of an upgrade in 1992, JFAS became an operational unit of the Air Force.

4.3 Following the completion of the JORN Coordination Centre at Edinburgh Air Force Base, and delays in the delivery of the JORN system, the relocation of 1 RSU's Alice Springs personnel to the JORN Control Centre at Edinburgh, was approved at a cost of $4.67 million. This relocation provided DSTO with a successful prototype of remotely controlling the JFAS radar, which led further developed to operational level by software and hardware engineers at the OTHRSPO.

4.4 The relocation project also provided the JORN Coordination Centre with an OTHR operations training facility, which allowed simultaneous OTHR operations and training. This capability was required to ensure adequate numbers of trained personnel were available for the introduction of JORN. Other complete JFAS projects included a $4.98 million project, covering the development of improved software and radar signal processing.

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[51] In January 1993, JFAS became an operational element of the ADF, and an 1 RSU Detachment, known as Detachment A, was given overall management responsibility for JFAS acquisition and support. In July 2001, this responsibility was taken over by DMO when OTHRSPO was formed.

4.5 In October 2005, a $18.45 million JFAS upgrade project was still underway. It involved technological advances found to be cost effective through ongoing OTHR test and evaluations, and to address equipment obsolescence.

4.6 Audit fieldwork at the JFAS radar revealed that parts of the Jindalee radar receiver and receiver antenna array dated back to 1980. Given the advances in OTHR technology, it would be timely for Defence to consider the cost and benefits of replacing these components.

Asset management

4.7 During most of JFAS's development, project expenditure was subject to Defence's cash accounting policy, which had no requirements to account for asset valuations. At the same time JFAS was essentially a DSTO OTHR technology research and demonstration program, and therefore lacked certainty as to the value of all research and development products.

4.8 During the mid 1990s, Defence's accounting policy changed from cash accounting to accrual accounting. This raised the need for Defence's corporate accounting system, ROMAN, to contain an asset register that accounted for all Defence assets. JFAS is not included in ROMAN, except for its Frequency Management System, which was the subject of a $15 million capital equipment upgrade project in the mid 1990s.

4.9 As of October 2005, DMO was attempting to correctly account for JFAS assets in Defence's ROMAN asset register. DMO has encountered difficulties in locating pricing information for JFAS, and in collating and analysing JFAS asset valuations.

4.10 BAE SYSTEMS is responsible for maintaining records of all JFAS Repairable Items and break-down spares issued, or subsequently procured. It is also responsible for conducting an annual 100 per cent stocktake of all JFAS Repairable Items, test equipment and break-down spares, and for providing OTHRSPO with a detailed report within thirty days of completing the stocktake.

4.11 The stocktakes of JFAS Repairable Items are hampered by difficulties caused by the evolved nature of the Jindalee Radar. Repairable Items that comprise the radar system have not been consistently assigned asset numbers

or opening financial values. For example, some software and hardware modules embedded in the radar remain largely unaccounted for, in terms of asset identification numbers and value. It is also difficult to perform a stocktake of these items whilst the radar is operating.

4.12 In October 2005, Defence advised the ANAO that OTHRSPO analysis to date of the JFAS stocktake report has resulted in a discrepancy rate of 4.73 per cent in asset accountability. The analysis continues and this percentage is expected to decrease as the asset database is purged of items that have been incorrectly assessed and are part of inventory (consumables) and not repairable items.

4.13 Defence also advised the ANAO that, as with all Defence assets and inventories management processes, JORN and JFAS's assets and inventories will be reviewed and any anomalies corrected as part of the Defence Financial Controls Framework. This framework includes investigations of all current asset and inventory management business practices, and involves remediation action when required. Defence advised this activity is a high priority for the Secretary and Chief of the Defence Force, and the Minister for Defence.

4.14 OTHRSPO is not required to record JFAS assets in the Standard Defence Supply System (SDSS), other than as a single line item. This policy stems from JFAS items being managed and repaired by BAE SYSTEMS, as well as there being no codification requirements being set for JFAS by Defence technical regulations or operational authorities. Also, OTHRSPO has Air Force's agreement that allows it to codify the entire JFAS radar as a single item, given JFAS is a non-deployable asset.

4.15 However, OTHRSPO is required to account for JFAS in the ROMAN asset register according to the value of all major JFAS sub-systems. In October 2005, Defence advised the ANAO that OTHRSPO and DMO were working through the process of establishing JFAS as an 'Item First Found'. Part of this process is to assign meaningful values to the asset and its components, a task that is complex as portions of the radar were installed during its tenure as a DSTO concept technology demonstrator. Hence, it will take some time to complete.

Technical integrity

4.16 Technical integrity for JFAS maintenance and logistics support is assured through BAE SYSTEMS being certified as an Authorised Maintenance Organisation. To achieve that certification, BAE SYSTEMS will need to successfully complete a formal audit carried out by the ADF's Director-General Technical Airworthiness (DGTA) Project Regulation staff. As at October 2005, DGTA was carrying out higher priority audits, and the indications were that BAE SYSTEMS would be audited in the first quarter of 2006. In the meantime, JFAS is being maintained in accordance with approved maintenance and engineering support procedures, which were accepted by DMO, and its predecessors, as part of the successive JFAS upgrade projects and maintenance and engineering support contracts.

4.17 The technical integrity of JFAS design changes is assured by BAE SYSTEMS maintaining an Authorised Engineering Service Provider certification status. In October 2005, BAE SYSTEMS was preparing for an audit of its design change management processes by OTHRSPO as part of the Authorised Engineering Service Provider certification process.[52] OTHRSPO has scheduled a review of BAE SYSTEMS Authorised Engineering Service Provider preparations for November 2005.

4.18 OTHRSPO is responsible for ensuring JFAS's design changes are approved and accepted in accordance with acceptable engineering practice. In accordance with the ADF's technical regulatory framework, all significant design and logistic support changes need to be approved by BAE SYSTEMS Senior Design Engineer and accepted by the OTHRSPO's Senior Design Engineer. The JFAS engineering change process is similar to the JORN design change process discussed in Chapter 3.

4.19 As at October 2005, 251 design changes had been approved for incorporation into JFAS. Of these, 218 were software changes approved for inclusion in the annual JFAS Software Baseline update scheduled for October 2006. The remaining 33 design changes related to JFAS hardware.

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[52] OTHRSPO will conduct the audit in its capacity as an Authorised Engineering Organisation.

Maintenance and support costs

4.20 JFAS maintenance and support costs are fixed in the JFAS Contract at $87.7 million (June 2004 prices) for the period 1 February 2000 to 17 February 2007.[53] From October 1999 to July 2005, the JFAS Contract had undergone 19 contract changes, which are categorised in Table 4.1.

Table 4.1

JFAS Maintenance and Support contract changes: July 2005

Reason for contract change	Number of changes	Change in contract value $ millions	Total contract value $ millions
Original contract as at October 1999			$47.619
Change of scope[54]	4	$ 1.728	
Increase in radar operating hours	4	$ 2.926	
Incorporation of GST	1	$ 4.348	
Price Escalation Annual adjustments	5	$ 5.405	
Contract Extension of 2 years 17 days	1	$25.675	
Nil cost administrative changes	4		
Total value		$40.082	$87.701

Source: Defence Materiel Organisation.

Operational availability 2000 to 2005

4.21 Figure 4.1 shows that, for the period March 2000 to September 2005, the JFAS radar's overall operational availability exceeded the contractual requirement of 96 per cent, and that the radar availability had not fallen below 99 per cent since September 2001.

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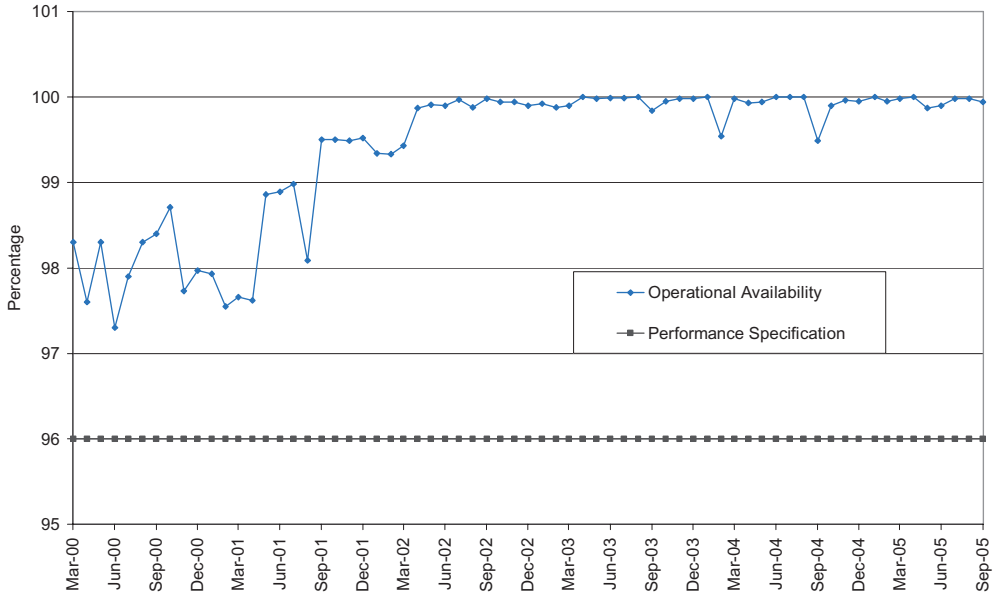
[53] The JFAS Contract allows for price reviews based on Australian Bureau of Statistics labour price indexes, and provides for monthly payments based on an agreed payment schedule.

[54] Contract scope changes included increased cleaning, additional computing support required by increased systems incorporated into the radar, increased support requirement at OTHRSPO, and the introduction of Earned Value reporting for JFAS development activities.

Figure 4.1

JFAS Radar Operational Availability: March 2000 to September 2005.



Source: Defence Materiel Organisation.

Unsatisfactory performance penalties

4.22 BAE SYSTEMS is required to demonstrate on a monthly basis that each JFAS System Segment has achieved a minimum Operational Availability of 96 per cent, over a six month moving average for radar operations.

4.23 Since early 2000, the JFAS Contract specified Operational Availability of 96 per cent has been continuously exceeded. For the period May 2003 to May 2005, the JFAS's average time between critical equipment failures was 47 hours, and the average time taken by BAE SYSTEMS to repair those failures and to return JFAS to operations, was 13 minutes. Since early 2000, there was only one occasion where the contractual limit of four continuous hours of downtime limit was exceeded, and this was by 10 minutes in February 2004.[55]

[55] If any JFAS System Segments fail to achieve the minimum availability, or has experienced more than four continuous hours of downtime, the monthly contract payment may, at the discretion of OTHRSPO, be reduced by two per cent for each System Segment that failed, up to a maximum combined total of six per cent. The Contract specifies that BAE SYSTEMS is considered to have failed to achieve the minimum availability requirement for the month if any failure results in the radar being unusable for its programmed mission for a period greater than four continuous hours.

In October 2005, Defence advised the ANAO that this downtime resulted from faulty Government Furnished Equipment, which was beyond the scope of the JFAS Support contract with BAE SYSTEMS. Consequently, as at October 2005, no payments to BAE SYSTEMS under the JFAS Contract had been withheld by OTHRSPO.

Maintenance reports

4.24 BAE SYSTEMS provides OTHRSPO with a wide range of reports, which provide evidence that JFAS is being maintained in accordance with the JFAS Contract. The key reports include:

- Weekly Maintenance Status Reports provided to OTHRSPO, DSTO and 1 RSU. These reports are initiated by 1 RSU operator personnel, and are transcribed by BAE SYSTEMS personnel into the JFAS logistics management system.[56] Equipment defects are identified by asset number, which facilitates repair tracking, repair work logging, and fault analysis;[57]

- Condition Report and Disposal Authority. This report is initiated by BAE SYSTEMS and provided to OTHRSPO, to permit timely decisions on the economic repairability and continued maintainability of high-cost or difficult to obtain JFAS items.[58] This report may seek the SPO's approval for JFAS item disposal or repair. It may also seek approval for JFAS item replacement through the JFAS Contract's additional engineering services provisions;

- Technical Investigation Reports are raised by BAE SYSTEMS maintenance and support personnel in cases where equipment faults justify further investigations;

- Technical Task Reports are raised by BAE SYSTEMS to provide advice to OTHRSPO on the nature, estimates and scheduling of work associated with tasks it has received;

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[56] The JFAS logistics management system was developed by BAE Systems and DMO, and is based on an Oracle® product.

[57] Software defects are assigned a defacto asset number.

[58] In some instances, these include studies into areas of JFAS threatened by repair parts obsolescence.

- System Trouble Reports may be raised by BAE SYSTEMS and forwarded to the OTHR Requirements Review Board comprised by representatives from 1 RSU, DSTO, OTHRSPO, and BAE SYSTEMS. In cases where these trouble reports lead to system changes, final decisions on the changes are the responsibility of OTHRSPO and are subject to the SPO's technical regulatory requirements; and

- Configuration Status Reports that detail the current approved system configuration and the status of all outstanding approved configuration changes.[59] BAE SYSTEMS, in conjunction with OTHRSPO conduct Configuration Audits and Radar System Level Test and System Confidence Tests[60] to verify JFAS is being maintained to a configuration consistent with its documentation, and in accordance with the contract.[61]

4.25 The ANAO reviewed a wide selection of these reports and found they indicated BAE SYSTEMS was satisfying its contractual reporting requirements.

Software support

4.26 In October 2005, the JFAS radar contained some two million source lines of code, comprising a mix of FORTRAN, Pascal, C, C++, Coral 66, and various other software codes. This software is maintained within a software development and support environment located within the OTHRSPO.

4.27 The OTHRSPO secure local area network provides BAE SYSTEMS with a facility for performing pre-site integration and test of software prior to operational roll-out. BAE SYSTEMS internal procedures cover configuration management, control and approval of changes, test and acceptance by the OTHRSPO. BAE SYSTEMS utilises the JFAS system outside operational hours to perform system testing of software releases. The technical regulation applied to JFAS's software is identical to that which is applied to the remainder of the system.

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[59] The configuration records include the JFAS Software Product Library.

[60] System Confidence Tests involve the total operation of the radar, and are designed to provide assurance that the radar is performing in accordance with contracted requirements.

[61] The Configuration Audits comprise annual 100 per cent Physical Configuration Audits and Functional Configuration Audits.

4.28 BAE SYSTEMS delivers one configured software baseline per year, which provides incremental advances in JFAS capability. Each quarter, BAE SYSTEMS makes available a consolidated set of updates in an operational baseline, and also makes available new OTHR software features for testing during OTHR operations, with the agreement of 1 RSU.

Equipment repairs and facility maintenance

4.29 The JFAS radar system contains built in performance diagnostic hardware and software, which analyse the radar's performance and report the results to maintenance consoles at the radar receiver site. BAE SYSTEMS personnel exercise these diagnostics at the beginning of each day's radar operations in order to check the radar's performance. They also conduct a preventative maintenance program designed to ensure no part of the radar drifts out of its design tolerance.[62]

4.30 When the radar diagnostics or preventative maintenance routines indicate the radar is not performing within designed limits, or when BAE SYSTEMS receives notification that JFAS is not performing to expectations, BAE SYSTEMS technical personnel raise a fault report within the JFAS logistics management system. This report contains a fault identification number, the asset number of the faulty Repairable Item, and a fault description. The Repairable Item is assessed for criticality and assigned a repair priority. In due course, repairs are made and the fault report is updated with the Repairable Item's repair and test details.

4.31 Any spares used to restore the Repairable Item's serviceability, are requisitioned and tracked by the logistics management system using the fault identification number.

Test equipment and documentation

4.32 BAE SYSTEMS is responsible for ensuring all JFAS system test equipment is maintained and calibrated in accordance with specified standards. BAE SYSTEMS has sub-contracted its test equipment calibration responsibilities to two firms accredited by the National Association of Testing Authorities as complying with the relevant standards. The ANAO inspection

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[62] These routines scheduled to be completed daily, weekly, monthly, quarterly, six monthly and yearly, depending on the nature of particular radar assemblies.

of JFAS test equipment calibration records indicated this process was working as intended.

4.33 BAE SYSTEMS is responsible for providing all documentation required to fully specify and maintain the JFAS radar. This includes specifications, engineering drawings, test specifications and test reports, maintenance manuals and servicing schedules, and operator manuals. These documents are approved by BAE SYSTEMS' JFAS Principle Engineer, and may also require acceptance by the OTHRSPO's Senior Design Engineer, depending on the OTHRSPO's Requirements Review Board's assessment of the criticality of the individual document.[63]

4.34 The ANAO found the JFAS documentation to be managed as intended. The ANAO's inspection of a large sample of JFAS documentation, indicated the documentation contained the necessary BAE SYSTEMS Principal Engineer approvals and OTHRSPO Senior Design Engineer's acceptance.

Repairable item management

4.35 BAE SYSTEMS is responsible for recommending for approval by OTHRSPO the range and quantity of repairable items required to meet all the JFAS Operational Availability requirements, and to determine the range and quantity of break-down spares and consumable spares required to meet its contractual obligations.[64]

4.36 Some JFAS repairable items contain highly specialised components, which justify purchase of sufficient quantities of spares to last the life of the OTHR system. Since 2000, such life-of-type spares purchases have occurred on three occasions at a total cost of $0.28 million.

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[63] Criticality is based on the financial cost of the documented system, and its importance to the overall performance of the radar.

[64] Defence provided the initial range of JFAS Repairable Items, and BAE SYSTEMS later justified the purchase of additional Repairable Items by Defence, which were valued at $0.9 million.

4.37 In the event that substitute components are available, BAE SYSTEMS may apply for the OTHRSPO Materiel Review Board's[65] permission to use the substitute detailed in its submission. In August 2005, BAE SYSTEMS was performing an obsolescence study into the radar's repairable item maintenance and repair. BAE SYSTEMS envisages placing a submission to the OTHRSPO's Material Review Board that addresses any obsolescent components it identifies.

4.38 The ANAO inspection of the JFAS workshops indicated the JFAS repairable item management process was working as intended, in that there did not appear to be an excessive number of unserviceable line replaceable units in the JFAS stores. However, BAE SYSTEMS and the OTHRSPO have recognised there would be benefits in improving the JFAS logistics management system, even though it remains fully functional in terms of its current performance specification.

Facilities maintenance

4.39 Unlike the JORN Contract, which places responsibility for facilities maintenance with RLM, Defence's Corporate Services and Infrastructure Group is responsible for maintaining the JFAS facilities.

4.40 The ANAO inspection of the JFAS facilities indicated a need for improved facility maintenance. There appears to be justification for including within the JFAS Contract, the JORN policy of including facility maintenance as part of the contractor's total system responsibility. This would give clearer lines of responsibility and accountability for managing JFAS facility maintenance tasks, and would align better with DMO's strategy of holding the OTHR maintenance and support contractors responsible for all aspects of radar Operational Availability.

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[65] This Board comprises OTRHSPO, and the Contractor's Technical and Logistics personnel.

Recommendation No.1

4.41 The ANAO recommends that Defence and DMO consider the cost and benefits of:

(a) replacing the JFAS logistics management system with a Maintenance Management System having similar functionality to that used to maintain JORN; and

(b) including facilities maintenance in the request for tender for the new JFAS Maintenance and Support Contract.

Defence response:

4.42 Agreed.

Ian McPhee
Auditor-General

Canberra ACT
23 January 2006

Appendix

Appendix 1: Agency Response

Australian Government
Department of Defence
Inspector-General Group

2005/1017834/1
IG 571/05

20 December 2005

Mr Colin Cronin 22/12/05
Executive Director
Performance Audit Services
Australian National Audit Office
GPO Box 707
Canberra ACT 2601

Dear Mr Cronin,

ANAO PERFORMANCE AUDIT ON THE ACCEPTANCE, MAINTENANCE AND SUPPORT OF THE JORN SYSTEM

1. On 24 November 2005 you sought a Defence response to the section 19 draft report on the Acceptance, Maintenance and Support of the JORN System. I now provide you with the Defence response to the draft report, including a summary to be used in preparation for the brochure (see Annex A).

2. Also attached at Annex B is a list of textual amendments.

3. My point of contact in this matter is Miss Erin Rinaldi (Tel: (02) 6266 4192, Fax: (02) 6266 4592 or email: erin.rinaldi@defence.gov.au).

Yours sincerely,

C Neumann

Claude Neumann
Inspector General

Annex:
A. Defence comment and response to Recommendations.
B. Amendments to the Section 19 Draft Report on the Acceptance, Maintenance and Support of the JORN System.

Defending Australia and its National Interest

DEFENCE RESPONSE TO THE ANAO REPORT ON THE ACCEPTANCE, MAINTENANCE AND SUPPORT MANAGEMENT OF THE JORN SYSTEM

The Jindalee Operational Radar Network (JORN) Project (JP 2025) has achieved a remarkable turnaround since the 1996 ANAO Audit. Since then, the project has delivered, in May 2003, arguably the world's leading over-the-horizon radar capability.

The JORN successes have continued; with the system delivering a highly reliable, well maintained wide area surveillance capability for the Australian Defence Force (ADF). An achieved Operational Availability of 99% has continually exceeded the contracted requirements. The project is on target to complete the acquisition and initial sustainment phase (of 46 months duration) under budget.

A key factor in the successful transition of JORN into service and also for the future of JORN development is the effective partnership between Defence Science and Technology Organisation (DSTO), Defence Material Organisation (DMO) and the Royal Australian Air Force (RAAF). This partnership, working in conjunction with the industry alliance involving RLM Management Pty Ltd and BAE SYSTEMS Australia Limited, will enable the ADF to realise the full potential of the JORN System through an evolutionary development program.

Recommendation No. 1	The ANAO *recommends* that Defence and DMO consider the cost and benefits of: a. Replacing the JFAS logisitics management system with a Maintenance Management System having a similar functionality to that used to maintain JORN; and b. Including facilities maintenance in the request for tender for the new JFAS Maintenance and Support Contract.
	Defence Agrees.

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