SMART SUSTAINMENT
Redefining Smart Sustainment Solutions
Raytheon Australia has redefined how the defence industry can deliver smart sustainment solutions to the Australian Defence Force. With more than 14 years of investment in Australia, the company has carefully constructed the processes, tools and expertise necessary to develop a holistic, systems engineering approach to sustainment – resulting in increased capability and availability whilst reducing life cycle costs.
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EXECUTIVE SUMMARY

1. The Defence Materiel Organisation (DMO) is responsible for acquiring and sustaining the mission system and support system elements of defence capability approved by government. DMO manages and oversees the processes by which private sector firms design, manufacture and test mission systems and their support systems. This is conducted in accordance with function and performance requirements defined by Capability Development Group, the regulatory requirements defined by the services, and the ‘readiness’ and sustainability’ requirements directed by the Chief of the Defence Force (CDF). 1

2. The support systems that are developed and implemented through the acquisition phase for a platform or equipment will directly impact the operational capability and cost to sustain the platform or equipment through life. Therefore it is important that decisions made during the acquisition phase take into account a whole of life perspective. The support systems accepted by the services must be robust and capable, yet flexible enough to ensure that operational capability is optimised, and the required readiness and sustainability objectives can be achieved within the approved budgets.

3. The defence budget has been under increasing pressure over the past three years with a reduction in new capability investment funding and a drive to find $20b in savings in the defence portfolio under the Strategic Reform Program (SRP). The DMO implemented the SRP as a decade-long campaign of reform. It is intended to change and improve defence business processes to increase efficiency whilst driving down costs. Savings realised through SRP initiatives would be re-invested into Force 2030. 2

4. The single largest area of reform in the SRP sits within smart sustainment. It is focused on instituting deep and ongoing reforms that better sustain the ADF through safe, effective and affordable capability. The smart sustainment stream under SRP has achieved limited success to date through cost cutting and minor reform driven by piecemeal, top down budget pressure. There is a need to drive to ‘big R’ reform to ensure that long term sustainable change is implemented for the sustainment of defence assets. The ability to develop and deliver smart sustainment solutions will be required across industry and within defence in order to realise the desired level of future savings.

5. To achieve this outcome, it is important that a whole of life asset management approach is applied to defence capability procurements. This systems approach needs to be supported by smart sustainment solutions that integrate whole of life data management and analysis, as well as life cycle cost analysis. The ability to access accurate and timely data is essential to drive decision making during sustainment. Recent studies demonstrate the need for DMO to implement an asset management approach for the acquisition and sustainment of new platforms and equipment. 3 The asset management approach is equally applicable to existing in-service platforms to overcome the challenges of decreasing reliability and availability, and cost increases that are inherent in ageing platforms.

6. In order to devise smart sustainment solutions across Defence in the most efficient way, an innovative approach would need to be taken from an enterprise logistics solution perspective rather than an individual asset view. The development of smart sustainment solutions requires an investment in the integrated logistics capability, driven by effective collaboration between Defence and the defence industry.

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2 Strategic Reform Program – Delivering Force 2030, Department of Defence 2009.
7. To this end, this paper proposes the implementation of Raytheon Australia’s smart sustainment model as a consistent framework to inform sustainment practices for the management of defence asset reform. This model has been previously used by Raytheon Australia to design and implement smart sustainment solutions that have improved availability and capability whilst delivering savings to Defence. Raytheon’s smart sustainment model has a proven record of success, having been applied to various programs including the Royal Australian Navy’s Retention and Motivation Initiative, the Hobart class destroyer, Collins class submarine sustainment, and smaller programs such as the support of the APG-73 radar and Squirrel helicopters. When implemented in a consistent fashion, this model, will address the sustainment challenges on major assets whilst reducing the burden on the defence sustainment budget.

AIM

8. The aim of this paper is to detail how an integrated smart sustainment approach under a performance-based contract arrangement can deliver improvements in the availability and capability of ADF mission systems whilst also reducing sustainment costs.

BACKGROUND

9. The DMO will manage acquisition and sustainment contracts worth more than $115b during the next decade. Given the current environment and the fact there are more than 100 sustainment fleets, the DMO is concerned about costs and more importantly, trends in costs. As a result, the target stated by DMO in February 2012 was to reduce the cost of ownership by 10 per cent over the next three years and 20 per cent in real terms over the next decade.4 The application of a smart sustainment model to inform decisions made in the acquisition phase may have a significant impact on Life Cycle Costing (LCC).

10. The sustainment costs for major defence equipment is more than two thirds of the whole of life costs, however, it often receives the least attention early in a program and is the first to come under budgetary pressure during the acquisition phase.5 This is supported by recent studies in the US, UK and Australia on defence LCC which have found that the through-life costing data is often difficult to obtain and what is available is not often used to inform decisions.

11. The current DMO acquisition focus is on providing the initial three years of support as part of the acquisition phase, and not on establishing a whole-life smart sustainment solution. Further benefits of the increased focus on LCC data collection during the acquisition phase by DMO could be achieved through a deeper understanding of how logistics data is used in LCC during sustainment to optimise availability and capability at minimal cost.

12. Experience gained from the Collins class submarine program reinforces the need to ensure all efforts throughout the lifecycle of an asset are coordinated through a strategic Integrated Logistics Support (ILS) plan. This point is outlined more thoroughly in the below case study. Whilst the application of integrated logistics support for major programs has matured and improved since the mid 1980s when the Collins class project commenced, the case study highlights the criticality of applying integrated logistics skills throughout the lifecycle and the need for a sustainment strategy from the inception of such programs.

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4 Inside the Defence Materiel Organisation, DMO Publication, February 2012

5 For complex equipment, the benchmark cost for the operating and support phase of the acquisition lifecycle is 60 to 70 per cent of whole of life costs i.e. one third of whole of life costs is acquisition and approx two thirds is operating and support, and disposal. The operating and support / sustainment costs percentage may be even higher depending on platform complexity and service life.
### EXAMPLE: COLLINS CLASS SUBMARINES⁶,⁷

**RAND Corporation:**

“The current problems with the operational availability of the Collins class largely resulted from the lack of developing a thorough ILS plan during the design and construction of the submarines. Although ILS planning was included in the original contract with Australian Submarine Corporation, funding for the development of the plan was systematically reduced to address other issues that emerged during design and construction.

A strategic view of ILS early in the program was particularly needed because the RAN was thrust into the unfamiliar role of a parent navy with the Collins program. The original plan of “business as usual” failed to consider the unique requirements for maintaining the submarines and training the crews. Although logistics support occurs more than a decade from the initial design of the submarine, early planning for ILS must inform the design and construction of the submarines and the establishment of the facilities, contracts, and procedures to ensure the desired level of operational availability.”

Adopting an integrated sustainment model has been demonstrated to effectively address these challenges. Adoption of such a model has been proven in the Defence environment and is particularly effective under the construct of contemporary performance-based commercial contracting arrangements.”

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**Coles Review:**

The analysis conducted for the *Study into the Business of Sustaining Australia’s Strategic Collins Class Submarine Capability* identified 20 key issues that were believed to be driving the low level of sustainment performance for the Collins class submarines. These issues were traced back to five root causes of equal importance:

1) Unclear requirements;
2) Lack of a performance-based ethos;
3) Unclear lines of responsibility;
4) Poor planning; and
5) Lack of a single set of accurate information to inform decision making.

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⁷ *Study Into The Business of Sustaining Australia’s Strategic Collins Class Submarine Capability*, John Coles, November 2012
INTRODUCTION

13. This paper addresses the integrated logistics capability applied through Raytheon Australia’s smart sustainment model to design, plan, implement and maintain smart sustainment solutions. The company’s perspectives are informed by its current role as the combat systems system engineer (CSSE) on the Hobart class destroyer program and its role in support of the Collins class submarine combat system. Importantly, Raytheon Australia’s recommendations are bolstered by the company’s achievements on more than 20 current performance-based sustainment contracts across multiple domains supporting the Australian Defence Force (ADF).

14. Over the past 14 years, Raytheon Australia has invested heavily in building an ILS capability to include process maturity, toolsets, and the professionalisation of our ILS practitioners across all disciplines. The company’s in-country expertise has identified and proven that the key to successful implementation of smart sustainment solutions lies within the integration of engineering, maintenance and supply through a common source data base.

15. At the heart of Raytheon Australia’s systems approach to sustainment is the collection of timely and accurate data from engineering, maintenance and supply support transactional systems – all driving towards a sole source of truth for sustainment performance. The company’s proven processes, tools, in-country expertise and integrated logistics capability are also applied to analyse and optimise sustainment solutions.

16. By consistently applying this approach, Raytheon Australia has delivered significant benefits to the Commonwealth through the implementation of smart sustainment solutions through both the acquisition and sustainment phases across all system types and domains. This approach provides improved availability, enables capability growth, and decreases the whole of life costs – ultimately delivering enhanced preparedness for the customer.

17. The company’s approach to developing and delivering smart sustainment solutions is represented in Figure 1, which demonstrates the connection between sustainment inputs, process and outputs, all working in conjunction with associated feedback loops.
1. One practical example of Raytheon Australia’s success in using this process to design and implement a smart sustainment solution during a project acquisition phase is the Royal Australian Navy’s Retention and Motivation Initiative. This is detailed in the following case study.

RAYTHEON AUSTRALIA EXAMPLE – NAVY RETENTION & MOTIVATION INITIATIVE

The Retention and Motivation Initiative (RMI) project provides the Royal Australian Navy with Raytheon Australia owned and maintained aircraft online under a performance-based contract to enable junior qualified aircrew training to consolidate and enhance their skills prior to flying operational helicopters.

The RMI project provides live training environment assets with the necessary contractor support organisation (program management, maintenance, engineering, training, and supply support) to sustain the designated flying rate of effort under a performance-based contract. The RMI project is required to:

- Provide three Bell 429 helicopters on line twice per day from a fleet of three;
- Support live training environment operations by full flight line servicing and deeper maintenance support;
- Maintain helicopters on the state register;
- Develop, deliver and maintain a mission equipment list endorsed by CASA; and
- Maintain AEO / AMO status for the duration of the contract.

To meet the functional performance requirements in the Request for Tender, Raytheon Australia developed the mission and support systems architecture in parallel. Raytheon also conducted extensive trade studies that incorporated whole-of-life cost analysis, identified an RMI solution based on the Bell 429 would offer the Royal Australian Navy significant benefits.
The trade study process was effective in identifying that the Bell 429 platform that was ‘designed for support’. The support system was suitable and adaptable to the ADF requirements thereby ensuring that the availability requirements could be achieved. The Bell 429 is the first helicopter designed with a focus on reliability-centred maintenance (in particular the Maintenance Steering Group-3 Process) for enhanced maintenance efficiency and safety. It requires 35 per cent less maintenance man hours per flying hour versus other comparable aircraft.

The established aircrew and technician training instructors, courseware and devices for the Bell 429 were considered as part of the trade study to ensure that it was suitable for the intended configuration, role and environment. When combined with Bell’s worldwide network of support facilities and infrastructure, the Bell 429 solution clearly provided the most effective capability for RMI at the lowest total cost of ownership.

This project demonstrates Raytheon Australia’s ability to architect, design and implement a support system on a commercial-off-the-shelf (COTS) and military-off-the-shelf (MOTS) acquisition, working with an OEM under a performance-based contract to effectively integrate:

- organisation;
- people;
- processes;
- tools; and
- facilities.

Retention and Motivation Initiative. Royal Australian Navy Training Program
AN INTEGRATED WHOLE OF LIFE APPROACH

INTRODUCTION

2. The development of smart sustainment solutions for defence assets must commence early in the acquisition phase of a program. A whole of life perspective is required through the concurrent development of the mission system and the support system in order to realise significant benefits through life. This approach enables the following:

   a. The selection of products that have been designed for supportability; and
   b. The design of a support system that:
      i. Can sustain the products through its planned life, and
      ii. Can be continually optimised post-transition to achieve availability and cost requirements of Defence.

3. This approach is the aspiration of all defence programs. Unfortunately a shorter term view, which considers only the first three years of support, is often taken when considering the support system. The support system is rarely architected – it is often just considered an adjunct that lags (in some form) behind the mission system.

ASSET MANAGEMENT APPROACH

19. The ADF and the Government can realise significant potential benefits by modelling the management of their assets on the approach taken by commercial organisations. Commercial organisations take a far more cost-based approach to product turnover, and seldom create orphaned solutions. They also apply a strong asset management approach to their systems. The maintenance costs of assets are managed closely with minimal modifications being made to products, in an effort to drive down additional costs that are often added to sustainment. In most cases organisations will alter operations to reduce the lifecycle cost of sustainment. The asset management approach results in long term planning around withdrawal dates based on the relative return on investment for the replacement.8

20. Although the equipment replacement approach used by Defence is driven by a capability assurance approach and constrained by the Government’s accounting approach, Defence could realise many benefits by adopting an asset management approach. Such benefits would rely on disciplined, proactive decisions and early investment to prolong equipment life, grow equipment capability, and reduce sustainment costs. Such an approach must be underpinned by a data management philosophy that will inform service life extension and capability growth decisions.

21. The Rizzo Report’s ‘Plan to Reform Support Ship Repair and Management Practices’ highlighted the need for adopting an asset management model for the delivery of in-service sustainment of naval capabilities. Chapter four of the Rizzo Report argues the clear need for an asset management methodology to be implemented for the RAN’s capability and for more sophisticated sustainment planning to enable decisions to be made from a whole of life perspective. The Rizzo Report recommended seven strategic actions with two directly related to asset management:

   a. Strategic Action 1: “RAN and DMO should jointly establish practical methodologies for integrated through life asset and sustainment management”; and

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8 The Helmsman Sustainment Complexity Review, Helmsman International Pty Ltd, dated July 2010
b. Strategic Action 2: “Defence and DMO should ensure that decisions made during acquisition fully consider whole of life costs and capability, through a rigorous and formalised asset management process.”

22. The Australian Asset Management Council (AMC) Asset Management Technologies model, detailed in Figure 2, is considered a suitable basis for development of an asset management model. The asset management model is a proven approach that will be applicable on Defence programs with some adaptation. It can be applied regardless of whether the program is developmental, COTS / MOTS, or an FMS acquisition. The adaptation and use of the asset management methodology is currently being explored by Defence through follow up projects that are implementing the Rizzo Report recommendations and other initiatives.
23. While the model in Figure 2 is generic and requires minor modification for application in the defence environment, integrated support is an essential sub-component of asset management and a constant regardless of the model adopted. The feedback loop shown in Figure 2 as ‘Continuous Improvement’ is the key to optimising the integrated support of an asset. It enables the sharing of data between the transactional ‘Integrated Support’ environment and the design/engineering environment within an overarching configuration management methodology. The configuration control and management of data is at the core of the capability required to achieve improved whole of life management of assets. The cycle of continuous improvement means there is an iterative improvement of the sustainment arrangements through the life of type of an asset – this is where the efficiencies are gained.

24. All organisations require a business framework that identifies the processes, procedures, and governance mechanisms required for the successful and repeatable delivery of projects. To enable the development of smart sustainment solutions, all supportability aspects must be considered in that framework during the acquisition phase of a program, and a strategic ILS plan incorporating the overarching sustainment concept should be developed at the earliest opportunity.

RAYTHEON’S INTEGRATED PRODUCT DEVELOPMENT SYSTEM

25. The Raytheon Integrated Product Development System (IPDS) approach ensures that support considerations are engineered into the system design, and significantly, the support system itself is engineered to ensure that it will perform as required. This is a powerful discriminator – the combination of using systems engineering to ensure correct requirements, definition and traceability, the use of logistics support analysis to optimise equipment and support system design, and a systemic approach to training design.

26. The IPDS is particularly well-suited to large and technologically advanced projects as it describes logically ordered process components that provide for repeatable and reliable project outcomes of the highest quality. The IPDS has been applied successfully to a number of complex programs in Australia, including the Collins class submarine and Hobart class destroyer projects, both of which have included significant and complex design and development aspects. Raytheon Australia’s example below outlines how ILS is integrated into the business framework across the lifecycle.
EXAMPLE – RAYTHEON AUSTRALIA’S ILS AND IPDS RELATIONSHIP

Raytheon Australia develops systems using the company’s Integrated Product Development System (IPDS) approach which enables the concurrent development of a mission system and a support system. The IPDS spans the entire system continuum, from the first emergence of a business opportunity through system design, development, verification, validation, encompassing production, operations, support, and terminating at project completion and shutdown. IPDS ensures that all supportability aspects are considered and resolved during the product development cycle and the resultant outcomes transitioned to support system development and subsequently the operations and support phase. The system has evolved over many years and, based on experience in both Australia and the US, it provides a comprehensive suite of tools and processes specifically aimed at managing the design, development and sustainment aspects of complex defence programs.

Figure 3. Raytheon Australia’s ILS and IPDS Relationship
27. It should be noted that having an offshore parent with industry best practices in engineering and integrated logistics does not mean this capability can be transferred to the Australia landed company, as it fails to account for the local culture, discipline and behaviours. Recognising this aspect, Raytheon Australia has adopted the high level IPDS Life Cycle Model as mandated by Raytheon Company policy, and over the last decade developed and tuned the local processes, taking into account the unique attributes of delivering projects in Australia.

28. The following sections of this paper outline Raytheon Australia’s smart sustainment model and the integrated logistics capability required to support the design, implementation and management of smart sustainment solutions.

SMART SUSTAINMENT OF DEFENCE ASSETS

INTRODUCTION

29. As previously mentioned, smart sustainment is the single largest area of reform in the SRP. The initiative is focused on instituting deep and ongoing reforms that provide ongoing assurance of capability at a lower cost. While incremental improvements have been made in sustainment of defence assets largely through internal Lean and Six Sigma activities, a step change in efficiency and effectiveness will require fundamental reforms that consider support at the enterprise level as well as the individual system level.

30. Building an ILS capability that delivers significant benefit through enabling the design, development and ongoing support of smart sustainment solutions for defence assets goes beyond adherence to Military or Defence standards and instructions and the use of ‘off the shelf’ software tools. Raytheon Australia delivers these benefits through optimising mission system supportability, development of smart sustainment solutions, and defining efficient support products using the smart sustainment methodology. The Raytheon Australia smart sustainment methodology is underpinned by an integrated logistics capability which includes:

a. tools capable of maintaining data integrity and providing enhanced logistics support analysis and decisions;

b. an ILS process governance framework tailored for the Australian defence environment; and

c. qualified, trained and experienced ILS, sustainment engineering, and sustainment management personnel.

RAYTHEON AUSTRALIA’S SMART SUSTAINMENT MODEL

31. Raytheon Australia’s smart sustainment model uses a systems approach to logistics. This approach combines systems engineering, logistics analysis and training within a single integrated process framework, leading to the development of a more efficient and effective capability acquisition and sustainment model for Defence. The result is enhanced customer force preparedness through improved availability and capability growth while driving down the total cost of ownership.

32. The smart sustainment model is based on contemporary ILS concepts and techniques and promotes the integration of support functions through the use of integrated processes, strong governance, trained and experienced personnel, and common logistic data and cost models. At the core of this model is the data - trusted data underpins through-life decision making. It is the application of accurate, current and timely data from the ILS toolset that enables this model to deliver industry best practice outcomes in sustainment refer to the Smart Sustainment Data Management Model (Figure 4).
33. The ILS systems, tools and processes that Raytheon Australia has developed enable the continual optimisation of the support system through life by linking the transactional level maintenance and supply support data with the engineering and life cycle costing data held in its logistic engineering and analysis toolset. This feedback loop is essential to ensure informed decisions on sustainment investment are based on logistics analysis data. This smart sustainment model is used by Raytheon Australia as part of designing, implementing and the ongoing management and optimisation of smart sustainment solutions. This model has been informed through Raytheon’s experience on both major acquisition programs and performance based sustainment contracts, and can be directly applied to defence asset sustainment.

![Figure 4. Raytheon Australia’s Smart Sustainment Data Management Model](image)

34. From a Defence perspective, the real value of the smart sustainment model is realised when established within a performance-based framework linked to capability outcomes. This will effectively drive the right behaviours and the integration between functions to achieve the desired results in terms of cost, availability and capability.

35. Importantly, this smart sustainment model is flexible enough to adjust to meet Defence’s needs and aspirations for the support system. In some instances the Defence focus may be on minimising total ownership cost by contracting out the entire support function. Alternatively, Defence may require an organic capability in order to ‘self support’ some key aspects, or whilst deployed. In all cases the smart sustainment model, implemented within an ILS framework, can be used to design smart sustainment solutions, while ensuring that operational and support concepts are a key input into that process.
The APG-73 radar provides an example of developing a smart sustainment solution within a performance-based framework to deliver availability to the RAAF at a reduced whole of life cost.

In 2003, the Commonwealth procured and installed the APG-73 radar on the F/A-18 aircraft as a replacement for the APG-65 radar. Prior to the commencement of the Raytheon contract, unserviceable Weapon Repairable Assemblies (WRAs) were returned to the Avionics repair shop, tested on the CASS Station to find the failed Shop Repairable Assessable (SRA), and failed SRA’s were sent either via FMS or direct to the OEM for repair. Approximately 60 per cent of the SRAs sent to OEM were no fault found (NFF). As a result it was determined that an in-country repair facility would reduce the costs associated with the NFF radar components.

Since 2007, Raytheon Australia has supported the APG-73 Radar system by developing a performance-based logistics arrangement for deeper maintenance (DM) functions. The Raytheon Australia team provides an agreed range of DM Services and the Commonwealth provides operational maintenance support. Raytheon Australia’s contracted primary task (primary KPI) is to ensure 71 APG-73 Radar Systems are available every calendar day. To aid in achieving this outcome Raytheon Australia invested in an APG-73 test bench to enable the conduct of the majority of deeper level maintenance in-country.

The primary KPI of system availability for the in-service support for the APG-73 system is achieved by providing:

- Engineering support including, maintaining an Authorised Engineering Organisation status, obsolescence management, and development of support equipment to improve testing capability;
- Supply support including spares and repairable item management;
- Maintenance support including maintaining Authorised Maintenance Organisation status and the conduct of deeper level maintenance;
- Provision and support of enabling resources, including management and maintenance of technical data and publications, support and test equipment as well as facilities; and
- Drawing upon global expertise directly from Raytheon Space and Airborne Systems (OEM).

Engineering, logistics, and maintenance services provided to the RAAF enable Raytheon to support 75 aircraft. Since Raytheon Australia began supporting the APG-73 in 2007, availability has increased to 75 systems. Additionally, the time to make a WRA serviceable has decreased from an average of approximately 90 days to approximately five days.

This outcome has been achieved through investment in a significant asset (APG-73 test bench), and the use of a common source database linking engineering, supply support and maintenance data to provide accurate and timely data to inform sustainment decisions.

![Figure 5. Raytheon Australia’s Monthly Average Repair Times](image-url)
36. Raytheon Australia’s smart sustainment model is highly applicable to the sustainment of defence assets. The current challenges in defence sustainment are the result of a lack of integration between logistic elements and the absence of accurate, current and timely data that is required to make informed decisions. Raytheon Australia’s model is underpinned by the company’s enterprise-wide ILS capability, including integrated processes, strong governance, trained and experienced personnel, and common logistic database and toolset.

INTEGRATED LOGISTICS CAPABILITY

INTRODUCTION

37. As outlined above and shown in Figure 5, providing a smart sustainment solution for defence asset support using the smart sustainment model as the framework requires the following attributes:

a. Qualified, trained and experienced personnel;

b. Processes for monitoring, analysing and optimising sustainment within a broader ILS framework that integrates engineering, ILS, and training activities within a configuration controlled environment;

c. ILS tools for access to, and management of, logistic data (both internal to Defence and OEM) that provides data integrity; and

d. An established in-country support network.

QUALIFIED, TRAINED AND EXPERIENCED PERSONNEL

38. Industry’s ability to develop and maintain a workforce of appropriately skilled ILS personnel is essential for future major projects and for the ongoing smart sustainment of existing assets. This involves the development of a workforce with the breadth of skills required to perform all aspects of the ILS function from front end logistics concept development and analysis, through support system architecture and design, and into development and management of smart sustainment solutions.
39. Within Raytheon Australia, the ILS function has been formed to maintain the enterprise wide integrated logistics capability and to ensure that all 10 elements of ILS are effectively combined and implemented to develop smart sustainment solutions. The ILS functional workforce of 159 personnel is engaged within eight discipline areas as outlined in Figure 6. This approach enables a workforce structure and planning that is aligned to and supports Raytheon's IPDS approach which combines systems engineering, logistics analysis and training within a single integrated framework.

![Figure 6. Integrated Logistics Functional Workforce by Discipline Area](image)

40. The training and development of the ILS workforce in Australia relies on a mix of internal company development programs, as well as training provided by industry consulting bodies. Universities offer some graduate programs in specialty engineering areas and systems support engineering, but only at senior levels. The use of structured, on the job training and logistics traineeships is also being used by Raytheon Australia to provide ILS training to address the shortage of commercially available training in the application of ILS in the defence environment. Raytheon Australia prefers to conduct its own internal training as it also teaches internal processes that will be used in the delivery of projects, aligning the skills and knowledge required to deliver smart sustainment solutions for Defence projects.

41. Raytheon is continually refining internal company ILS development programs to ensure alignment with the smart sustainment model and to ensure the ILS workforce has the necessary knowledge to develop and adapt smart sustainment solutions for complex equipment. Following the recent completion of an internal training needs analysis (TNA) for our ILS workforce, one of the outcomes was the identification of a need to further expand the depth of internal integrated logistics courses. As a result, a systems approach to ILS course is being developed for delivery in the second quarter of 2013.

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*Note that the Synthetic Training Device Discipline is included in Training, and Logistics Management includes LCC and Sustainment Management. Additional Sustainment Engineering is included as part of the company’s engineering function.*
Raytheon Australia’s logistic professionalism continuum has been developed following the conduct of an internal training needs analysis of the ILS workforce. One of the outcomes of the training needs analysis is the development of career roadmaps which are aligned to our company organisational training activities. Such roadmaps highlight potential career progression within an Integrated Logistics discipline area, and learning and development opportunities encompassing both generic and specific training and development courses. The example roadmap below details how a logistics engineer may progress through a career following completion of a traineeship.

**LOGISTICS ENGINEERING CAREER ROADMAP**

**DEVELOPMENT**

<table>
<thead>
<tr>
<th>0-3 YRS EXPERIENCE</th>
<th>5-7 YRS EXPERIENCE</th>
<th>7-10 YRS EXPERIENCE</th>
<th>&gt;10 YRS EXPERIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEVELOPING PRACTITIONER</td>
<td>PRACTITIONER</td>
<td>TEAM LEADER</td>
<td>MANAGER</td>
</tr>
<tr>
<td>RAM ENGINEER</td>
<td>RAM ANALYST</td>
<td>RAM LEAD</td>
<td>PROGRAM LOGISTICS ENGINEERING MANAGER</td>
</tr>
<tr>
<td>LSA ANALYST</td>
<td>LSA LEAD</td>
<td>MANAGEMENT</td>
<td>PROGRAM SUPPORT MANAGER</td>
</tr>
<tr>
<td>SUPPLY SUPPORT ANALYST</td>
<td>SUPPLY SUPPORT LEAD</td>
<td>LOGISTICS ENGINEERING FUNCTIONAL MANAGER</td>
<td></td>
</tr>
<tr>
<td>LCC/DECISION SUPPORT ANALYST</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEMONSTRATED LOGISTICIAN (SOLE)</td>
<td>DEMONSTRATED SENIOR LOGISTICIAN (SOLE)</td>
<td>DEMONSTRATED MASTER LOGISTICIAN (SOLE)</td>
<td></td>
</tr>
<tr>
<td>ROLE ROTATION INTO OTHER LOG ENG AREAS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPPP</td>
<td>CPPM</td>
<td>CPFD</td>
<td></td>
</tr>
</tbody>
</table>

**EXPERIENCE**

<table>
<thead>
<tr>
<th>0-3 YRS EXPERIENCE</th>
<th>5-7 YRS EXPERIENCE</th>
<th>7-10 YRS EXPERIENCE</th>
<th>&gt;10 YRS EXPERIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEVELOPED RIDS &amp; RAM ANALYSIS</td>
<td>PLANNED &amp; EXECUTED RAM/LSA/SUPPLY SPT PROGRAM</td>
<td>PARTICIPATED IN BID TEAM (ARCHITECT DISCIPLINE SOLUTIONS)</td>
<td></td>
</tr>
<tr>
<td>CONDUCTED LOG ENG ANALYSES</td>
<td>PLANNED &amp; EXECUTED LCC PROGRAM</td>
<td>MANAGED RAM/LSA/SS TEAM</td>
<td>MANAGED PROJECT INTEGRATED SUPPORT TEAM</td>
</tr>
<tr>
<td>PERFORMED PROCUREMENT &amp; INVENTORY MANAGEMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEARNING**

<table>
<thead>
<tr>
<th>0-3 YRS EXPERIENCE</th>
<th>5-7 YRS EXPERIENCE</th>
<th>7-10 YRS EXPERIENCE</th>
<th>&gt;10 YRS EXPERIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIALIST LOG ENG QUAL</td>
<td>DEVS</td>
<td>PERTL</td>
<td>OTHER MASTERS (E.G. MBA, PM)</td>
</tr>
<tr>
<td>SPECIALIST LOG ENG QUAL</td>
<td>CERT IV PROJECT MANAGEMENT</td>
<td>DIPLOMA IN PM</td>
<td></td>
</tr>
<tr>
<td>PROCESS TRAINING</td>
<td>CERT IV FRONT LINE LEADERSHIP</td>
<td>FRONT LINE LEADERSHIP</td>
<td>MEP</td>
</tr>
<tr>
<td></td>
<td>LOG ENG OR RAM GRAD CERTIFICATE TO MASTER</td>
<td></td>
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</tbody>
</table>

**Figure 7. Raytheon Australia ILS Professionalism Roadmap**
ILS PROCESSES AND GOVERNANCE FRAMEWORK

42. Raytheon Australia’s ILS process governance framework underpins the support system aspects of IPDS (refer to paragraphs 17 – 20) and has been implemented using the CMMI® as a reference model. The CMMI® framework, namely CMMI® for development and CMMI® for services, is ideally suited for the defence industry. Not only does the CMMI® framework assess an organisation’s capability in systems engineering, it also addresses the capabilities associated with all aspects of the mission systems integrator / mission support role. That is it addresses all the key areas, namely, process management, project management, engineering (systems engineering, software engineering, hardware engineering) and services / support.

43. Raytheon Australia’s success has been built upon Raytheon Company’s IPDS, which is a CMMI® level 5 capable structure. With more than 8,000 active projects, Raytheon has used the processes within the CMMI® framework to fine tune the IPDS such that it now represents best practice for industry and the customer. Over the last decade Raytheon Australia has continually tailored and improved its IPDS based upon a decade of experience delivering large, complex projects to the Australian defence customer.

44. Raytheon Australia obtained independent accreditation of its IPDS to CMMI® Maturity Level 3 in 2009, and was re-accredited in 2011 for a second three-year period. Raytheon Australia has used the IPDS in the Australian context of a combat system systems engineer as well as for development of support systems. The pedigree of the IPDS and the tailoring of the IPDS has allowed Raytheon Australia to improve its performance whilst meeting and integrating with DMO’s industry targets for development and sustainment projects.

45. To implement the support system aspects of IPDS, the scope and level of ILS activities need to be documented through a defined process architecture which includes company policy, company-wide plans, project specific documents, and a supporting array of standard procedures, manuals and templates that are deployed effectively across the enterprise. Raytheon Australia has integrated its company-wide ILS standard procedures with systems engineering/sustainment engineering/maintenance/supply chain management procedures. The application of the ILS standard procedures allows for tailoring within defined guidelines to meet specific defence contract or service requirements.

46. Raytheon Australia’s high level ILS process architecture is shown at Figure 8. The company’s ILS capability combines systems engineering, logistics analysis, logistics modelling, and training within a single integrated process framework. ILS processes are involved with all phases of the asset lifecycle. The scope and level of ILS activities will depend on the customer or contractual requirement, and the entry point within the product or system life cycle. Several key elements of the ILS activities conducted within Raytheon Australia are undertaken by specialised technical staff within the development and sustainment engineering framework. The outputs of this engineering functional activity represent key inputs for the majority of ILS processes, and this relationship is shown within the ILS continuum in Figure 7 for context.

10 CMMI® is a model based process improvement framework that supports organisational process maturation. CMMI® is built from a collection of global best practices. When laid over existing technology processes and systems, CMMI® highlights strengths and weaknesses against its global baseline, and thus creates a catalyst for continuous improvement initiatives. CMMI® is not, on its own, an improvement process. Rather it is a diagnostic model which provides a globally tested benchmark for measuring and defining an organisation’s process maturity.
47. Raytheon Australia’s qualified, trained and experienced workforce operates within the enterprise wide ILS process framework to ensure the consistent application of our smart sustainment model for the development of smart sustainment solutions.
48. Another key requirement in the development of smart sustainment solutions is a common ILS toolset that enables configuration management and sharing of data across a program, programs, or enterprise. A common-source database in a configuration controlled environment provides accurate, current and timely data for informed decision making. The Helmsman Sustainment Complexity Review of July 2010 identified the importance of systems, tools and data in the management of complex Defence assets: “In most of the SPOs (especially those with more complex platforms), there is a substantial need for IT systems, data, and data quality to support the cost effective and low risk management of sustainment activities.”

49. It is essential that the ILS toolset architecture implemented for sustainment of assets enables the integration of data and the maintenance of data integrity, providing a “single source of the truth” that can be used by all functions to effectively manage, review, analyse and optimise the asset through life.

50. The ILS toolset architect should be defined early in the asset lifecycle and tailored to meet unique Defence or program requirements including any requirement to incorporate existing or legacy defence tools into the architecture. Figure 9 provides a Raytheon Australia example ILS toolset architecture showing some system interfaces and data flows that may be implemented for a smart sustainment solution on a program.

51. The ILS toolset architecture may also be applied to an existing in-service asset as part of implementing a smart sustainment solution. Through understanding the data requirements, data locations and flow of data between systems, the architecture can be adapted using a service bus or similar to interface to existing defence tools and configuration records. Raytheon Australia has successfully applied this methodology as part of smart sustainment solutions.
DATA MANAGEMENT

52. Data is at the core of the Raytheon Smart Sustainment Data Management Model in Figure 4. The importance of data management throughout an asset’s lifecycle cannot be understated. Establishment of the toolset architecture along with common processes and trained people will enable the sustainment program to harness new knowledge from data which supports superior decisions. In effect, knowledge will increase over time as data is updated within the right toolset, enabling enhanced decision making to improve availability and affordability.
53. The establishment of a logistics data record within a common-source database early in an asset's lifecycle is essential to implementing and executing affordable smart sustainment solutions. The common-source database should be at the core of the ILS toolset architecture and have the ability to share data between systems and tools. While tools may not always be able to be integrated or have automated interfaces, it is critical that there is a detailed understanding of where data is coming from and its accuracy and how it is shared between systems. This data management approach requires the implementation of the right ILS toolset, supporting processes, and trained personnel with the ability to analyse data and develop solutions.

54. The recently published Coles Review identified data management as one of the five root causes of the current problems with Collins class sustainment performance. It also outlined under its best practice methods for information technology that given the shared responsibilities during the lifecycle of submarine sustainment and the importance of maintaining data quality during this process, it is reasonable to expect close collaboration and agreed governance between the IT departments at the RAN, DMO and Industry.11 This ‘enterprise’ approach to IT and data management needs to be considered early when developing the toolset architecture for a major program to enable the sharing of accurate, current and timely data.

55. Complex systems are plagued by increasing cost and decreasing performance, often characterised as the ‘bath tub’ curve.12 Smart sustainment solutions which are developed through the use of a smart sustainment model are best positioned to overcome the bathtub curve effect. By linking the transactional level maintenance and supply support data with the engineering and life cycle costing data held in Raytheon Australia’s logistic engineering and analysis tools, the outcome is robust data to inform decision making for service life extension and technology refresh. This feedback loop is essential to ensure informed decisions on sustainment investment are based on accurate data analysis and a program is well positioned to understand where to ‘spend to save’ money in future. It enables the sustainment organisation to deal with emergence in an informed environment.

56. A more proactive approach is needed for asset management to address the bathtub curve effect early. A proactive approach will drive an outcome where capability levels can be increased or maintained and availability is increased whilst affordability is also increased and cost is reduced. New materials, processes, and technology will drive a shift from repair to redesign and over a life of type of an asset redesign increases the affordability of the system. This approach is reliant on good data integrity and the ability to share data between systems and conduct the required logistics and engineering analysis. However this also needs to be balanced with the need to stay in ‘lockstep’ with OEM’s development cycles so that ‘orphaned’ systems are not created. This is particularly the case for air assets where OFP changes require considerable development as well as a verification and validation effort.

57. With the increase in the acquisition of COTS / MOTS and FMS assets, there is an increased requirement to establish good data management practices as early in the lifecycle as possible. Having the ILS toolset architecture mapped and established early in the project facilitates this. However the application of the smart sustainment model to implement smart sustainment solutions is not limited to new acquisition programs. It may also be applied with great effect to existing systems with legacy sustainment solutions already in place. The methodology can generate significant savings on current sustainment programs, particularly where complex platforms still have a reasonable time period until current, or potentially an extended, life of type date. The case study below is an example of applying the smart sustainment model to an in-service platform.

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11 Study Into The Business of Sustaining Australia’s Strategic Collins Class Submarine Capability, John Coles, November 2012 p.VII.
12 The traditional bathtub curve is based on a model of minimal investment through life where early “infant mortality” failures increase cost and decrease availability, followed by a long steady state, until wear out failures increase and again drive up cost and impact availability (further detail at Annex A). It should be noted for modern systems which are heavily reliant on software; the bath-tub curve may also be overcome through the progressive and managed upgrade of software.
RAYTHEON AUSTRALIA EXAMPLE – AVBU SUPPORT

Raytheon Australia’s Avionics Business Unit (AvBU) project commenced in 2003 and ended in February 2011. The purpose of Raytheon’s contracted project was to maintain, engineer and logistically support all the avionics instruments and equipment (e.g. radars, digital flight computers, laser guided weapons, gyros, altimeters etc) on the Royal Australian Air Force (RAAF) F-111 fighter bomber strike aircraft until the platform’s decommissioning in December 2010. The contract required support to be provided under a strict governance and quality regime.

A Performance Award Fee (PAF) mechanism existed to promote and encourage the delivery of achievements that provided the Commonwealth with value-for-money outcomes that were over & above contracted requirements.

The primary objective of the AvBU project was to ensure the availability of serviceable avionics instruments and equipment at a level that would meet the Prime Minister and Cabinet’s defined level of capability and the Chief of the Defence Force’s operational level of capability for the F-111 strategic weapon system. This required Raytheon to maintain the avionics suite within the F-111 strike capability until 2010 by ensuring a certain number of aircraft were available at all times, supporting an annual number of flying hours for the platform and sustaining specialised mission profiles such as strike, reconnaissance and electronic warfare within Australia and overseas. These objectives were measured through the Key Performance Indicators (KPIs) detailed below.

KPI 1 - Operational Performance
- F-111 Aircraft availability & flying rate of effort
- Availability of Avionics instruments & equipment
- Availability of Avionics piece parts

KPI 2 - Governance
- Sub-contract management
- Quality management

KPI 3 - Innovation
- Project management
- Customer satisfaction

The outstanding success of the project can be measured in improvements made to F-111 avionics availability, platform sustainability, and innovation in project management that ultimately generated savings for Raytheon Australia’s defence customer of approximately $20m. Performance is summarised in the extract f the DMO Scorecard in Figure 10. Further detail on the KPIs and achievements are provided in Annex C. In 2011 this project won both the Queensland and Australian Institute of Project Management National Awards in the Defence/Aerospace category.

Figure 10. Raytheon Australia’s DMO Scorecard for AvBU Amberley Support Contract

Extract: Letter to Raytheon from Officer Commanding 82 Wing (F-111 Squadrons)
“Despite 22 years association with the F-111 weapon system, I find it hard to remember when the F-111 aircraft availability was better.”
NETWORK OF IN-COUNTRY CAPABILITY

58. The smart sustainment model outlined in Figure 4 is used by Raytheon Australia for the design, implementation and the ongoing management and optimisation of smart sustainment solutions. It integrates the organisation, people, process, data and ILS toolset required to implement smart sustainment solutions for defence assets. On large defence programs it is likely that each of the capability components required will not be co-located but will need to operate as part of a hub and node network of in-country capability.

59. One of the critical elements of the design and implementation of smart sustainment solutions is the physical infrastructure which is required for establishment of the sustainment capability to enable the conduct of maintenance, training, engineering and supply support services. The ILS capability elements of trained, experienced personnel operating within the common process framework, with a common toolset and data source, with the required infrastructure, come together to form a network of in-country capability which is able to be utilised across many programs.

60. The establishment of an in-country network of capability hubs and nodes required to deliver smart sustainment solutions for complex defence assets requires significant investment. This capability is not resident in any one facility as quite often the economies of scale render it impractical for the majority of sustainment programs due to the fixed costs associated with establishing and maintaining the infrastructure. An alternate approach is to create a network of sustainment capabilities built around a hub and node that is accessible to all programs. This model facilitates centralisation of specialist skills where practical, creates economies of scale for equipment maintenance, enables surge requirements to be managed across a network, and puts data and commonality at the forefront of decision making.

61. Raytheon Australia’s approach in utilising an in-country network has been to co-locate the core services required on a case by case basis close to the customer and end users, and then utilise, and where necessary build on, the established capability to meet the availability requirements for each customer. The utilisation of Raytheon Australia’s established capability and capacity planning allows additional work to be added to the network at a marginal cost. This enables the development of smart sustainment solutions in which transition risk is greatly reduced, an established efficient and effective network is in place, and each program is able to leverage off nodes of subject matter experts and the associated knowledge database. Figure 11 provides a summary view of expanse of Raytheon Australia’s ILS hubs (Brisbane, Adelaide, Amberley) and nodes in our smart sustainment network.
62. The DMO currently manages more than 100 fleets for the ADF and is concerned about sustainment costs and more importantly, trends in costs. The DMO’s stated aim (February 2012) is to reduce the cost of ownership by 10 per cent over the next three years and 20 per cent in real terms over the next decade. Recent reviews into sustainment of Defence assets have identified a number of common themes which must be addressed to achieve even the current availability and cost requirements. A fundamental change in the way DMO establishes support systems and manages ongoing sustainment of assets is required.

63. The Raytheon Australia smart sustainment model has been applied to both new acquisition programs as well as existing sustainment programs within a performance based framework. This section outlines how the model may be applied for the sustainment of defence assets in order to assist in achieving the DMO stated cost of ownership reductions.
64. When designing and implementing smart sustainment solutions there is a need to look beyond a single asset class and consider the ILS impacts across the broader fundamental inputs to capability i.e. the support system design for a major asset should not be done in isolation of other assets or existing sustainment systems. Consideration must be given to the broader in-service sustainment capability and what elements of the existing capability need to be modified, the business model required to effect sustainment management and data management, and the required performance management framework articulated and aligned to the customer’s availability requirements. These requirements are fundamental inputs to designing and optimising the support system.

65. The Rand\textsuperscript{13} study into the Collins class submarines identified the need to look beyond a single asset class. It noted; “Consider ILS from a navy-wide rather than program perspective. Program managers must recognize that there will be demands on maintenance and training resources from other submarines as well as RAN surface ships. This is especially important for limited maintenance facilities, such as the dry-docks that are used across several ship classes.” The Rizzo Review also identified a number of support services where a single class approach results in sub-optimal solutions being developed for the RAN.

66. There is a need to establish an enterprise logistics framework that enables the consolidation of multiple asset classes within each defence service. This would provide both a broader “fleet” view for reporting availability, capability growth opportunities and cost of ownership, and also allow for smarter sustainment solutions to be implemented that leverage off established support system capabilities at marginal additional cost. Implementation of an enterprise logistics framework requires the establishment of the appropriate business model and enterprise toolset architecture that enables the sharing of common source data. An enterprise logistics framework reported at the appropriate level would provide a valuable decision support tool in the allocation of limited resources, both personnel and funding.

\textsuperscript{13} Learning From Experience Vol IV - Lessons From Australia’s Collins Submarine Program, RAND Corporation, 2011
INDUSTRY INVOLVEMENT

67. The challenges that face the DMO in sustainment can be addressed by the increased use of defence industry. Whilst in-country support for defence assets has traditionally been managed by the DMO through a predominantly Commonwealth Systems Program Office (SPO) construct, it is possible to use Industry to manage, and be responsible for all aspects of sustainment within a SPO, with DMO providing the appropriate level of governance.

68. The engagement of industry at a higher level for asset management, and across all aspects of the sustainment ‘value chain’ within a SPO construct provides significant benefits to both the DMO and Defence. These benefits can be summarised as follows:

   a. Expertise in the design, implementation and delivery of smart sustainment solution;
   b. Flexibility in the size, composition, and employment of the workforce;
   c. Established ILS capability including standard processes with a governance framework that integrates engineering, supply, and maintenance activities;
   d. ILS tools for access to, and management of, logistic data that can be interfaced with existing defence ILS tools to provide accurate, current and timely data for decision making;
   e. Experience and expertise gained from other sustainment contracts in Australia and overseas;
   f. Qualified, trained and experienced logistics personnel and sustainment managers;
   g. Ability to drive capability outcomes and innovation through performance based contracts;
   h. Greater predictability in sustainment costs and robust cost modelling capability to support make / buy decisions through life;
   i. Specialist training and support services; and
   j. Continuous improvement processes such as CMMI®.

69. The cumulative effect of these benefits is greater productivity (reflected in availability and capability) for a lower cost base. Defence has experienced that these benefits are more readily realised under performance-based contractual arrangements. As a result, in order to gain efficiencies for the SRP, DMO is pursuing a reform initiative for sustainment contracts using “Performance-Based Contracts to achieve two key objectives, namely:

   a. enhancing the ability to meet Capability Preparedness requirements; and
   b. reducing the total cost of ownership (TCO).”

PERFORMANCE-BASED CONTRACTING

70. “A performance-based contract is defined ‘as a contract that is structured to motivate the supplier to achieve particular outcomes, rather than on the performance of individual activities. Key characteristics of Performance-Based Contracts are:

   a. a focus on outcomes, outputs and quality, rather than how the work is performed;
   b. the use of measurable performance standards that are tied to the required outcomes;
   c. clear accountability for contract outcomes through appropriate allocation of risk (i.e., the supplier should have control over the processes to deliver goods and/or services);

   "Next Generation Performance-Based Support Contracts – Achieving the Outcomes that Defence Requires paper of 5 Feb 2010
d. the inclusion of a range/combination of monetary and non-monetary contractual incentives and disincentives (rewards and remedies), which are specifically aimed at motivating contractor performance towards achievement of the required outcomes while also providing an appropriate governance framework for the contract; and

71. These objectives directly relate to the current challenges being experienced in sustainment of a number of Defence assets. The use of performance-based contracting mechanisms has become more common-place in defence support contracts in the past, and there is currently a focus on all future sustainment contracts to ensure that performance-based measures are put in place in order to drive efficiency and reduce costs. Performance-based contracts incentivise Industry to be efficient and productive, which encourages continuous improvement, strong governance, and innovation. It also drives collaboration between support functions – a key requirement for the smart sustainment model.

72. The effectiveness of performance-based contracts is enhanced when the performance management framework is targeted at achieving availability and other performance outcomes at the highest level possible. Performance-based contracts also rely on access to accurate data and data integrity to enact effectively. Additionally, the investment required to establish smart sustainment solutions for new assets may be substantial and it is imperative that the contract period takes consideration of the capital outlay that may be required by the defence industry. Performance based contracts may also be applied effectively to the outsourcing of existing defence sustainment arrangements.

15 ibid
RAYTHEON EXAMPLE – SQUIRREL THROUGH LIFE SUPPORT

Raytheon Australia is supporting the RAN’s fleet of 13 AS350BA Squirrel basic helicopter training aircraft in HMAS ALBATROSS, Nowra under a performance-based contract. Raytheon Australia is providing the contractor support organisation to sustain the designated flying rate of effort. Raytheon Australia provides support services to 13 AS350BA Squirrel Helicopters such that Navy can meet their training day and other operational needs. The contractor support organisation provides:

- Management Services – Program management of the Squirrel in-service support program;
- Engineering Services – Authorised Engineering Organisation for the Squirrel mission and support system, including configuration management;
- Maintenance Services – Authorised Maintenance Organisation for Squirrel repairable items, ground support and special test equipment. Raytheon is also responsible for on aircraft deeper maintenance; and
- Supply Support Services – Includes inventory management, warehousing, obsolesce management and procurement and distribution of repairable items and breakdown spares.

Raytheon has met or exceeded all customer performance requirements under an outcome focussed performance based contract at platform level, with platform availability meeting the RAN’s training requirement. Raytheon has achieved KPIs for nine out of nine review periods in the key result areas of:

- Availability (maintenance release), and
- Reliability (90 per cent) of aircraft missions to be successfully completed without a material failure of the aircraft or its systems.

The success of the Squirrel through life support contract highlights the significant benefits that can be gained by implementing smart sustainment solutions under a performance management framework.

| AS350BA Squirrel |
SMART SUSTAINMENT SOLUTIONS

INTRODUCTION

73. The development of smart sustainment solutions will realise the greatest benefits when commenced early in the equipment acquisition lifecycle. This early engagement with industry during the design phase for Defence assets will ensure design decisions consider the whole of life cost of ownership and that the support system is architected alongside the mission system.

74. To successfully implement smart sustainment solutions it is necessary to:
   a. Understand the support system architecture as part of designing the overall support system;
   b. Plan and execute the transition to sustainment; and
   c. Manage (including monitor, optimise, analyse) a smart sustainment solution under a performance based framework.

ARCHITECTING THE SUPPORT SYSTEM

75. The implementation of ILS activities early in the development life cycle of an asset is critical to influence and provide information to the design solution to ensure that the most cost effective, supportable solution is provided to Defence. Projects should identify the ILS scope of work early in the design phase and document this scope in the applicable plan e.g. ILS strategy / concept document or ILS management plan.

76. The costs of operating and supporting platforms or equipment and the increasing trend towards procurement of COTS / MOTS technology will drive a need for the continued evolution of ILS to ensure reliability, sustainability and affordability for defence assets. With a move to procurement of more ‘off-the-shelf’ assets there is a tendency for the focus to be predominantly on the mission system. However, balance of focus is needed on both the mission system segment and support system segment to ensure systems are implemented to enable the assets availability, growth and affordability requirements to be achieved through life.

77. ILS in consultation with engineering will have a greater role in developing the overall system solution and in the identification and selection of system components in the COTS / MOTS environment. For example, in supporting the conduct of trade studies it is important to ensure selected COTS / MOTS products have been designed for support and fit into the overall support system design.

78. To achieve this outcome ILS will need active engagement early in the acquisition phase to design and architect the support system, regardless of procurement method. For COTS / MOTS there is little or no chance to influence the equipment design (i.e. design for support), so it is more often “design of support” for the support system. More importantly the architecture needs to be understood as the new support system products will need to be integrated with the established defence sustainment business model and framework. The architecting of the support system may be applied to develop smart sustainment solutions equally to new capability as well as to existing in-service platforms as they move to system / platform level outcome based contracts.
79. Figure 12 above, provides an example high level support system architecture. Once the architecture is developed and baseline, trade studies can be conducted with a detailed understanding of how the ILS components integrate into the overall support system. One outcome of the trade study process may be the identification of a fully COTS solution that can be made available under an accelerated acquisition. Alternatively, the fully COTS solution would be subject to potential obsolescence issues within a limited number of years. The sustainment solution may then require a planned technical refresh or spiral upgrade program to be designed in. The earlier the engagement, the sooner the most suitable support system philosophy can be selected, whole of life costs considered, and the smart sustainment solution designed.

80. There has been a tendency in the past for particular mission system solutions to be identified and selected as a COTS / MOTS or FMS procurement activity prior to any detailed analysis of the support system and its suitability for the ADF. Early engagement with Industry for COTS / MOTS and FMS acquisition of assets will assist in ensuring smart sustainment solutions are designed and implemented that take into consideration the ADF’s unique configuration, role and environment requirements. Without this up front investment in support system architecture and design it is probable that DMO may be locked into a sustainment solution that is not sustainable for the life of the asset and drives up the cost of ownership.
TRANSITION TO SUSTAINMENT

81. The implementation of smart sustainment solutions must be supported by a continuum of support service activities, products, processes and data from the acquisition phase through to the in-service support phase (or from the current sustainment provider to a new sustainment organisation). Detailed transition planning ensures the integration of these activities is done with minimal risk via utilisation of shared systems, processes and personnel where practical from the acquisition phase or existing service arrangements.

82. The support system should be incrementally developed and verified in time to provide support services to the mission system elements during production and as they are accepted into Service. The transition phase can extend over a number of years on large acquisition programs through a ramp-up, Figure 13, and transition planning should commence as early as the support system detailed design review. Interim support arrangements need to be in place during production, test and activation, and trials for new Defence assets and phase in activities to steady state in-service support needs to commence well in advance. The objectives of phase-in may include:

a. Support of the Piloting and Mature Phases;

b. Smooth transition of resources from the Contract (Acquisition) Interim Support to Contract (Support);

c. The continued ramp up of the support system to achieve Operative Date; and

d. Establish, validate and confirm the accuracy, processes and data of the contract (support) KPIs are appropriate, measurable and reportable during any Performance Implementation Period.

Figure 13. Transition Phase

83. Transition may be performed under any resultant contract to ensure a coordinated ramp-up of the required services to be provided by the successful tenderer and a smooth transition from the outgoing support contractor / service provider or acquisition contractor (as applicable). The transition phase should not just be viewed as a means from moving from one phase of the acquisition lifecycle of an asset to the next. Transition planning may be used effectively on both new and existing programs to reduce risk during production, test and activation and verification and validation activities, or to ensure continuity of services and achievement of availability targets during transition of services.
POTENTIAL SMART SUSTAINMENT BUSINESS MODEL

84. Smart sustainment solutions achieve the best for Defence outcomes when they are implemented under a contractual arrangement that focuses on outcomes, outputs and quality, using measureable performance standards that are tied to the required outcomes. To achieve this it is imperative that there is clear accountability for contract outcomes through appropriate allocation of risk i.e. the service provider should have control over all the elements that contribute to the materiel state of the capability. This philosophy should be reflected in any proposed contracting methodology that empowers the contracting entity to manage those aspects that directly affect its ability to produce the desired outcome, and enable the DMO to manage the contract at a higher level - governance in lieu of hands on management.

85. To achieve this requires DMO to adopt a sustainment model that aligns performance outputs with areas of responsibility and service delivery, providing a single point of accountability for materiel sustainment and therefore delivery of Material Sustainment Agreement (MSA) obligations. This proposed sustainment approach is based on the philosophy of a single point of accountability. This approach should incorporate performance measures into the contract that are aligned with the DMO’s MSA requirements.

86. Performance measures will vary depending on the asset to be supported the performance management framework should cover operational performance, governance, and innovation. Measuring KPIs accurately / easily / consistently requires control and management of data. Potential KPIs could be as follows:

a. KPI 1 – Operational Performance
   i. Availability. Contractor’s achieved performance of ensuring a defined number or percentage of systems / assets (as defined under the contract) are available at any point in time;
   ii. Capability. Contractor’s achieved performance in ensuring the assets remain up to date, including the conduct of periodic software updates; and
   iii. Demand Satisfaction Rate. Contractor’s achieved performance against overdue for supply of spares, completion of repairs, provision of quotations for Survey and Quote (S&Q) services, and completion of S&Q services within the forecast timeframe.

b. KPI 2 – Governance
   i. Sub-contract management. This KPI is for the demonstration of effective management of sub-contractors and suppliers; and
   ii. Quality Management. This KPI is for the establishment and maintenance of a number of international and Defence specific quality standards.

c. KPI 3 – Innovation. This KPI provides an opportunity to exceed the requirements of the contract and to deliver exceptional performance through innovation. As in the case of the AvBU support example, encouragement can be achieved through making available a performance award fee.

87. An example sustainment arrangement that would support these KPIs is provided in Figure 14.
Figure 14. Potential Sustainment High Level Business Model
CONCLUSION

88. The DMO will manage billions of dollars of sustainment contracts over the next decade. With more than 100 sustainment fleets, the DMO is concerned about costs and more importantly, trends in costs. As a result the target stated by the DMO in February 2012 was to reduce the cost of ownership by 10 per cent over the next three years and 20 per cent in real terms over the next decade. The saving targets will be difficult to achieve and are challenged further due to the trend by the DMO towards an increase in the number of equipment acquisition strategies that are recommending FMS procurement and in some cases are locking the DMO into unsustainable and unaffordable longer term FMS sustainment arrangements.

89. The DMO has further stated that savings will be made in areas such as more streamlined supply chains, more thoughtful pre-ordering and demand forecasting of supplies and a more commercial approach for the DMO’s interaction with industry suppliers who are expected to do their part to improve productivity to support the ADF. The increased collaboration between the DMO and industry will be critical in realising the desired savings. Industry continues to make significant investment in the capabilities required to implement smart sustainment solutions. The utilisation of industry and its mature integrated logistic capabilities has been demonstrated to deliver effective and cost efficient sustainment outcomes for Defence, especially under performance-based contracts.

90. Advances in contemporary ILS concepts and techniques provide the DMO with a significant opportunity to improve efficiency and reduce the costs associated with sustainment of new and current fleets. Adopting a data-informed integrated sustainment approach, especially under an outcome-focussed contracting arrangement, can realise cost savings in the order of 20 per cent, whilst simultaneously improving system availability and enabling capability growth.

91. Complex systems are plagued by increasing cost and decreasing performance, the ‘bath tub’ curve. Smart sustainment solutions which are developed through the use of smart sustainment model and supported by a network of established in-country capability are best positioned to overcome the cost increase and performance decrease from the bathtub curve. The linking of the transactional level maintenance and supply support data with the engineering and life cycle costing data held in our logistic engineering and analysis tools provides robust data to support the decision process for service life extension and technology refresh. This feedback loop is essential to ensure informed decisions on sustainment investment are based on accurate, current and timely logistics analysis data and a program is well positioned to understand where to ‘spend to save’ money in future and refresh capability in order to ‘bend the bathtub curve’.

92. The adoption of Raytheon Australia’s smart sustainment model and use of our established in-country network enables the optimisation of sustainment funding by determining the appropriate levels of engineering, maintenance and supply support within defined parameters and constraints of availability, capability and cost. This is an iterative process driven by feedback between the functions and underpinned by common source logistic data and a detailed cost model. This approach enables smart sustainment solutions and the greatest return on sustainment investment.
ANNEX – THE BATHTUB CURVE

1. The traditional bathtub curve is based on a model of minimal investment through life where early “infant mortality” failures increase cost and decrease availability, followed by a long steady state, until wear out failures increase and again drive up cost and impact availability, Figure 15. This could be viewed as a non-investment life-cycle. This lifecycle is generally the current defence approach to asset management i.e. it is more of a reactive investment approach where service life extension programs or upgrades are undertaken late in the life of type of an asset often when the asset is already experiencing increased wear out failures or obsolescence issues.

2. A more proactive approach is needed by DMO where capability levels can be increased or maintained and availability is increased while at the same time increasing affordability / decreasing cost. New materials, processes, and technology are starting to drive a shift from repair to redesign and over a life of type of an asset redesign can be used effectively to increase the affordability and capability of the system. This approach is reliant on good data integrity and the ability to share data between systems and conduct the required logistics and engineering analysis to inform decision making. However, this also needs to be balanced with the need to stay in ‘lockstep’ with OEM’s development cycles so that ‘orphaned’ systems are not created. This is particularly the case for air assets where OFP changes require considerable development and Valuation and Verification effort.

Figure 15. Bending the Bath Tub Curve

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**Architecting for Life Cycle Affordability**, Presentation by Dr W. Randall and Dr D. Nowicki, University of North Texas, p.32, 19 Sep 2012.
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