STUDY INTO THE BUSINESS OF SUSTAINING AUSTRALIA'S STRATEGIC COLLINS CLASS SUBMARINE CAPABILITY

Beyond Benchmark - May 2016

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Contents

Foreword

This review, “Beyond Benchmark”, is the fifth such review of the Collins Class Sustainment Program I have undertaken for the Commonwealth since the Autumn of 2011. It has three parts: to measure the current level of performance; an assessment of the Commonwealth’s plans for sustaining the capability to deliver the required outputs until these submarines are withdrawn from service; and to review the opportunities for delivering an improvement on the “benchmark performance” whilst maintaining regional supremacy and reducing annual sustainment costs. Unlike my previous progress reviews, which were aimed at achieving benchmark performance, this one is more forward looking.

In the cacophony of business speak that surrounds performance management metrics it is all too easy to forget that the whole purpose of the Collins Class Transformation Program, (the 2012 Commonwealth plan to “take you from where you are to where you need to be”), was to generate and permanently maintain “two submarines to be consistently available”. This afternoon I attended the formal handover of HMAS *Farncomb* to the Royal Australian Navy, the first submarine to complete a modern Full Cycle Docking of two-years duration - it was completed on time. Once handed over, Collins submarines will be operating in the new 10+2 operating cycle. This will achieve five submarines base-ported from the Western Australia Naval Base, HMAS *Stirling* for the next decade and more. The Collins availability should reach or better the international benchmark availability as Materiel Ready Days are progressively accumulated during the next twelve months: a pattern repeated annually.

There are few including myself, who would have confidently predicted in 2012 that the performance now delivered by the Collins Class would graduate from mediocre to excellent in less than four years at almost level funding. In particular, the Submarine Enterprise ensured that “two submarines were consistently available” while conducting the first two-year Full Cycle Docking and at a time when two submarines were in long term planned maintenance in Adelaide and a third suffered from a debilitating fire and was temporarily out of service. For the Submarine Enterprise to reach this level of performance is a significant achievement that has not received the attention that it merits. If there were unit citation medals to be awarded, the Submarine Enterprise would surely qualify. A program once that was considered a “Project of Concern” should perhaps now be treated as an “Exemplar Project” if such a category existed. In short, the Collins now has a sustainment program arrangement that can deliver the required output with some built-in resilience that as a Strategic System it should have had when it entered service.

In Part A of this report the Review Team has assessed the performance attained by the Sustainment Program. The underlying metrics reviewed have shown steady improving trends in all areas, these include: schedule adherence; improved reliability (or reduction in Priority 1 defects); supply of spares; and much greater definition of materials before the start of planned maintenance. Based on the evidence the Review Team have seen, *there is a reasonable level of confidence that benchmark performance will be achieved or bettered during financial year 2016/17*. Benchmark performance has yet to be achieved but all the ingredients to do so are in play - confirmation occurs by July 2017 as Materiel Ready Days are accumulated during the financial year. In addition, there is now considerable resilience to deal with an unplanned major repair to one of the submarines of up to four months or so per year without a major disruption to the operational program.

In Part C of the Review the potential for going “beyond benchmark” is examined. My conclusion is that some improvement is certainly achievable, but there is no compelling evidence that this should be a priority. Greater focus on reducing unavailability due to defects would provide increased availability and also very importantly, reduce disruption to operational planning and training. The Review Team has recommended halving the allowance for unavailability due to defects. At this level, days lost to defects would be at or near that for strategic systems and appropriate for the strategic capability the Collins provides. Benchmark availability makes the assumption that some days will be lost to overruns during planned maintenance durations. Currently, overruns are at a very low level and a temptation to reduce the allowance is attractive. The Review Team does not recommend that action, but rather to use the allowance as an Enterprise regulating buffer to be used to best advantage by the Submarine Enterprise - an activity that this maturing Enterprise has already used. Part C also strongly recommends that the 10+2 UUC remains the bedrock of the sustainment program as it delivers stability and operating periods commensurate with military tasking requirements.

The net effect of the recommended changes - reduced unreliability and more intelligent use of an enterprise regulating buffer will require some adjustments to the current In-Service Support Contract. It will be necessary to more accurately reflect risks and reward in an enlightened enterprise culture without reducing the essential output performance focus of the contract that has changed the culture and performance of the Enterprise. While budgets have remained at nearly constant levels to support the transformation of the Enterprise the Review Team has recommended that there should now be a greater focus on cost reductions through new efficiency measures. Previous reports recommended that a bye be granted against cost reduction until benchmark performance was attained.

In Part B the Review Team has examined the ability of the Enterprise to sustain the required output until the withdrawal from service of the Collins and its replacement by the future submarines of the SEA1000 Program. The Review Team sought and was given a number of key assumptions about the future programs of both the Collins Class and the SEA1000 as these are and will be increasingly intertwined. I concluded that the challenges to be faced whilst sustaining the Collins are significant including: the competition for human resources; reallocation of the sustainment budget; the inevitable movement of sustainment activities to Western Australia in due course; and the uncertainties that will inevitably arise to meet the new submarine build program. These challenges are such that all or some will require a degree of coordination by the Submarine Enterprise in much the same way that enabled the successful Transformation of the Collins program. This coordination will further enshrine the Submarine Enterprise ethos. The Enterprise stakeholders had already come to that conclusion themselves by reforming as the Submarine Enterprise Board.

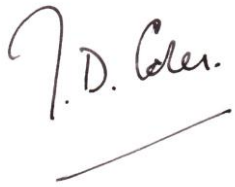
The reestablishment of a fit for purpose sustainment program for the Collins is almost complete. There are some immediate tasks that need addressing, the most significant being to ensure sufficient spares are available to support five submarines operating from HMAS *Stirling* to enable the rectification of defects. Unfortunately submarines in all Navies will from time to time suffer, without any warning, a more serious defect that would tax any sustainment organisation to comprehensively repair and return to operational service. The Enterprise has already risen to such a challenge demonstrating its capacity to cope with the

unexpected. The Enterprise has every right to celebrate these achievements, but I caution that the unexpected should be expected.

In my foreword I have deliberately avoided using superlatives, although it was tempting to do so since there is much to congratulate those engaged in delivering the performance in such a short time. I have also avoided naming those who helped to achieve this level of performance - there are many of them at every level and to name some might be an injustice to the others. It is not possible nor was it my task to understand how such a turnaround was achieved. However, I am personally a strong advocate of the Submarine Enterprise that seems to have successfully helped to achieve improvements for the Collins sustainment program.

Submarine sustainment will, I suggest, inevitably be based on non-competitive procurement from the private sector (or a Government Business Enterprise), a Government Owned Government Operated or Government Owned Commercially Operated. The essential characteristic is that of a monopsony/monopoly (one customer and one supplier) and these are most difficult to manage for both sides because both need each other and failure to perform in the relationship means everyone is a loser. This commercial construct is not a vehicle for resistance to change or to ignore efficiency as so clearly demonstrated to date, but it is an intrinsically unstable arrangement. Every effort will be needed by the key players to retain the central vision. As personalities change and the need for ever improving performance is demanded, any re-emergence of a blame culture when things go wrong, as they will, could undermine all that has been achieved.

Finally, it would be remiss of me not to thank Arthur Fisher and Paul Greenfield as fellow members of all previous reviews for supporting me over the last five years. The Commonwealth offered us the opportunity to make a difference and along with many in the Navy, Capability Acquisition and Sustainment Group, ASC and Finance, the Review Team are immensely proud to have contributed to a very successful outcome.



John Coles CB, FREng.

May 2016

Acknowledgements:

My thanks and gratitude to Paul Greenfield, Michael Spark and Heather Savage who were members of my Review Team together with Arthur Fisher. Special thanks to Deloitte (Australia) including Doug Lampe for undertaking much of the supply chain analysis and to Jesse Sherwood who led the Red Team review. Jonathan Woodman and Siobhan Giles from BMT Design & Technology and Bob Platfoot from Covaris provided excellent support throughout. I could not have carried out my Review without the co-operation of the many Commonwealth and ASC staff at HMAS *Stirling*, ASC in SA and WA, and the CASG staff at all sites.

Executive Summary

This "Beyond Benchmark" review revisits the Collins submarine sustainment environment two years on from the March 2014 progress review.

This report covers three areas:

- Part A - Current Collins Class sustainment performance
- Part B - Sustaining performance during transition to the Future Submarine
- Part C - Improving beyond the benchmark.

Part A assesses Collins performance to date, whereas Parts B and C are forward looking.

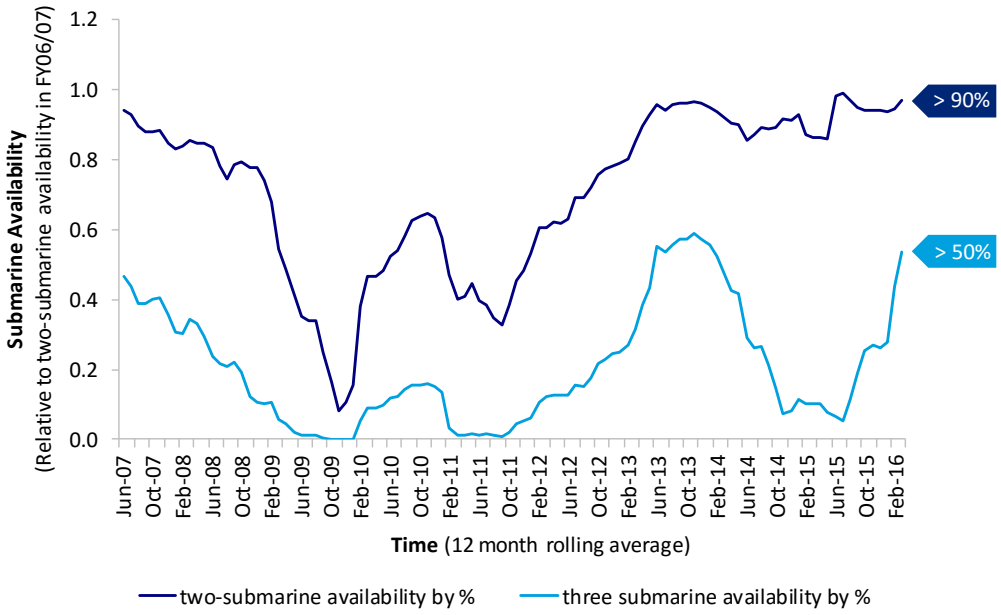
In Part A, the Review Team has noted a remarkable improvement in the capability to successfully manage the sustainment of the Collins submarines. The establishment of a collegiate, collaborative and well-functioning Enterprise has been foundational to rectifying legacy Collins sustainment issues. The performance achieved is approaching that required for a strategic system. In arriving at this conclusion, the Review Team undertook interviews with, and detailed analysis of evidence provided by, the Royal Australian Navy (Navy), the Capability Acquisition and Sustainment Group (CASG), ASC and the Department of Finance (Finance).

Enterprise sustainment performance has effectively supported the delivery of the Navy Requirement (CN10 Product Statement) to have:

> *"two deployable submarines consistently available, with four submarines available to the Fleet Commander and of these four, three submarines consistently available for tasking with one in shorter term maintenance and two submarines in long term maintenance and upgrade"*

The steady improvement in two submarine availability to 90% is plotted in Figure 1. This is an essential precurser to meeting the Navy requirement.

Figure 1 - Performance against Navy Requirement



Three submarine availability was steadily rising until HMAS *Waller* was withdrawn from service due to a debilitating fire. Now the submarine is back in service, three submarine availability is steeply rising.

Figure 2 shows the dramatic reduction in P1 Urgent Defects (URDEFs) which can cause the loss of availability and may limit the Fleet Commander's opportunity to raise, train and sustain the submarine force.

Figure 2 - P1 URDEFS

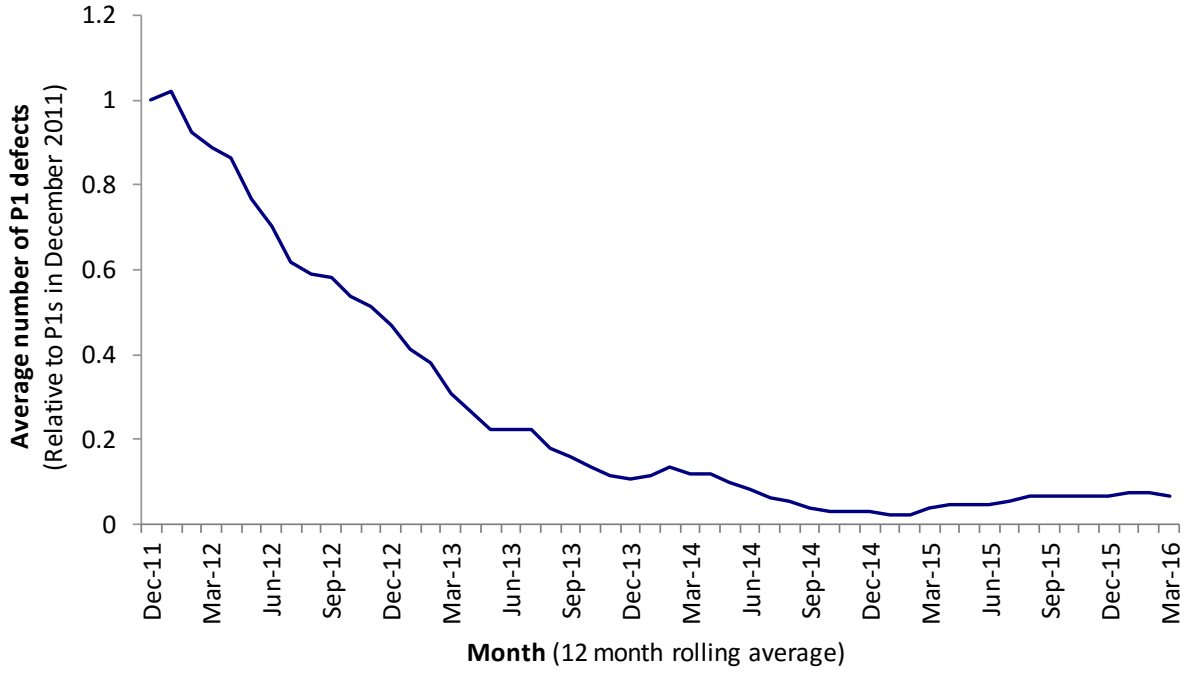


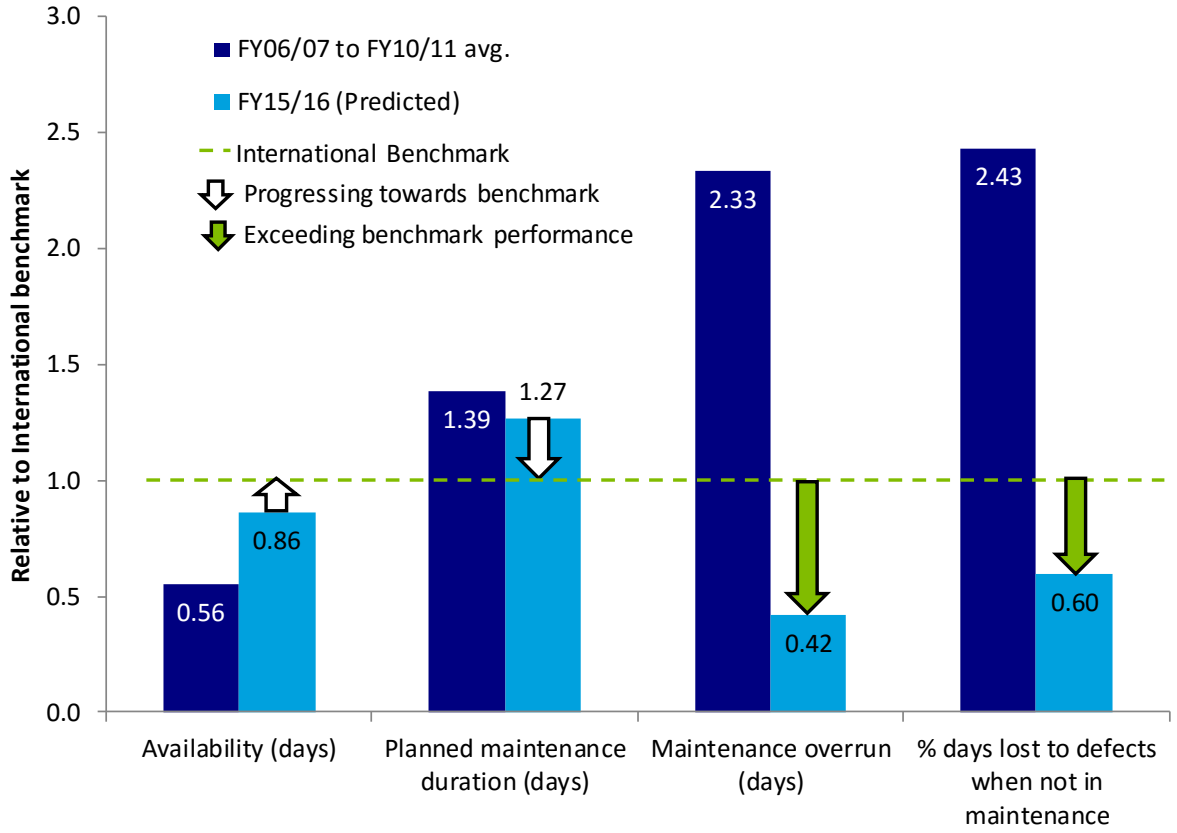
Figure 3 demonstrates the significant improvement from baseline (FY06/07 to FY10/11 average) to current (FY15/16) performance. Areas of note are:

- Improvements in submarine availability, which is now nearing the international benchmark
- Significant reductions in maintenance overruns, now better than the international benchmark
- Significant reductions in days lost to defects, now better than the international benchmark.

The Review Team has observed improvements to planning, productivity, inventory investment, and performance monitoring. These have contributed significantly to the reduction in maintenance time necessary to achieve the two-year Full Cycle Docking (FCD) required under the new 10+2 Usage and Upkeep Cycle (UUC). Planned maintenance durations will move to benchmark levels under the 10+2 UUC.

These performance improvements have put the Enterprise in the position to achieve benchmark performance by mid-2017.

Figure 3 - Collins performance compared to international benchmarks



This report also contains an assessment of progress against the 25 recommendations identified in the November 2012 report. The Review Team has found that significant progress has been made on the majority with some work still required to fully complete the intent of a few.

In Part B, the Review Team assessed the Enterprise's capability to sustain this benchmark performance through to the Collins end-of-life, including the transition to future submarines. The Review Team undertook the following:

- Defined what good looks like
- Compared current performance and future requirements
- Made recommendations for improvement.

The Team developed a hypothesis tree to support the review. The tree provides an overarching hypothesis statement of what good looks like:

> *"The Enterprise has the established capability to deliver the materiel availability of the Collins Class Submarine beyond the international benchmark, whilst maintaining regional superiority and reducing sustainment costs"*

The ‘branches’ outline the key areas the Enterprise must demonstrate competence in order to achieve future sustainment:

1. Enterprise goals exist and reflect the necessary elements to achieve current and future required availability
2. Enterprise strategy articulates how sustainment goals will be achieved through life and is underpinned by appropriate planning artefacts and processes
3. The Enterprise encourages continuous improvement
4. Appropriate structures are in place to support Enterprise improvements until the planned withdrawal date for the Collins Class.

The Review Team assessed the Enterprise’s performance in each of these four areas and sufficient evidence was collected to demonstrate that currently the overarching hypothesis statement is true. However, the challenge for the Enterprise is to maintain this competence as there are a number of future milestones and decision points that will test the Enterprise’s capability to do so.

Sufficient evidence was collected to demonstrate that the overarching hypothesis statement is true

To prepare for the transition to future submarines the Enterprise will need to develop a clear strategy for sustaining the Collins until withdrawal from service. The recent decision to establish the Submarine Enterprise Board provides the perfect opportunity for this new entity to develop and drive this strategy and related plans. It also presents the opportunity to foster a collegiate environment of self-monitoring and continuous improvement to further strengthen the Enterprise’s ability to sustain performance as it transitions to the future submarines.

A Submarine Enterprise Board provides the perfect opportunity to develop and drive strategy and related plans

In Part C the Review Team examined the potential for the Enterprise to go beyond the benchmark. As mentioned, the Enterprise is forecast to achieve benchmark performance in mid-2017, principally due to the reduction in planned maintenance (in moving to the 10+2 UUC) but also due to contributions from a reduction in maintenance overruns and unreliability. The Review Team makes the following recommendations:

Maintain the 10+2 UUC	There is a convincing argument to maintain the 10+2 UUC and the Review Team cites “stability - for the conduct of operations, planning for the installations upgrades; adequate time to conduct upkeep and update; providing a level of consistency of output” This argument applies equally to a fleet of 12 submarines

Use maintenance overrun allowance intelligently	The allowance for overruns should not be reduced to avoid the inclination to rush the completion of maintenance periods at the expense of safety or quality as well as allowing for extra time to potentially accommodate reliability fixes or capability insertions The Review Team recommends leaving the allowance for maintenance overruns at benchmark target as an “enterprise regulating buffer”
Focus on reliability	Reduce the allowance for days lost to defects by half
Focus on efficiency and cost reduction	Attaining benchmark performance was a higher priority than efficiency. With benchmark availability on the verge of being achieved, the focus should now be on efficiency improvements and cost reductions across the sustainment program Such cost reductions may be required to re-invest into inventory, obsolescence remedies, new infrastructure to manage an ageing fleet and the transition to future submarines The achievement of this should be greatly enhanced by the application of the cost model
Renegotiate the ISSC	As the In-Service Support Contract enters its third performance period, the opportunity should be taken to renegotiate terms, conditions and incentives under the increasingly collegiate Enterprise culture

1 Part A - Current Collins Class sustainment performance

1.1 Availability performance

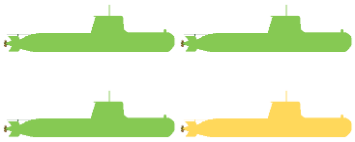
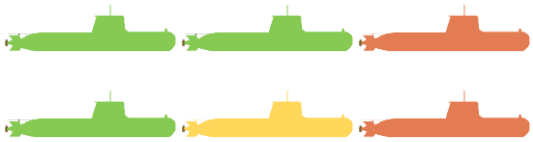
1.1.1 Meeting the Navy Requirement

The Navy Requirement (CN10 Product Statement) for the Collins Class submarine is to have:

> *"two deployable submarines consistently available, with four submarines available to the Fleet Commander and of these four, three submarines consistently available for tasking with one in shorter term maintenance and two submarines in long term maintenance and upgrade".*

This is illustrated in Figure 4.

Figure 4 - The Navy Requirement

 Assured by…	Two deployable submarines consistently available.
 Underpinned by…	Four submarines in-service with the Fleet Commander. Three submarines consistently available for tasking, with one in shorter-term maintenance.
	Six submarines in the fleet. Two in long-term maintenance and upgrade.

In the March 2014 progress review, two and three submarine availability for the period June 2007 to December 2013, was plotted as a rolling annual average. For this review the plot has been extended to incorporate availability performance up to the base date for the assessment, 31 March 2016, for which performance data has been made available. The plot is shown in Figure 5.

Figure 5 - Performance against Navy Requirement

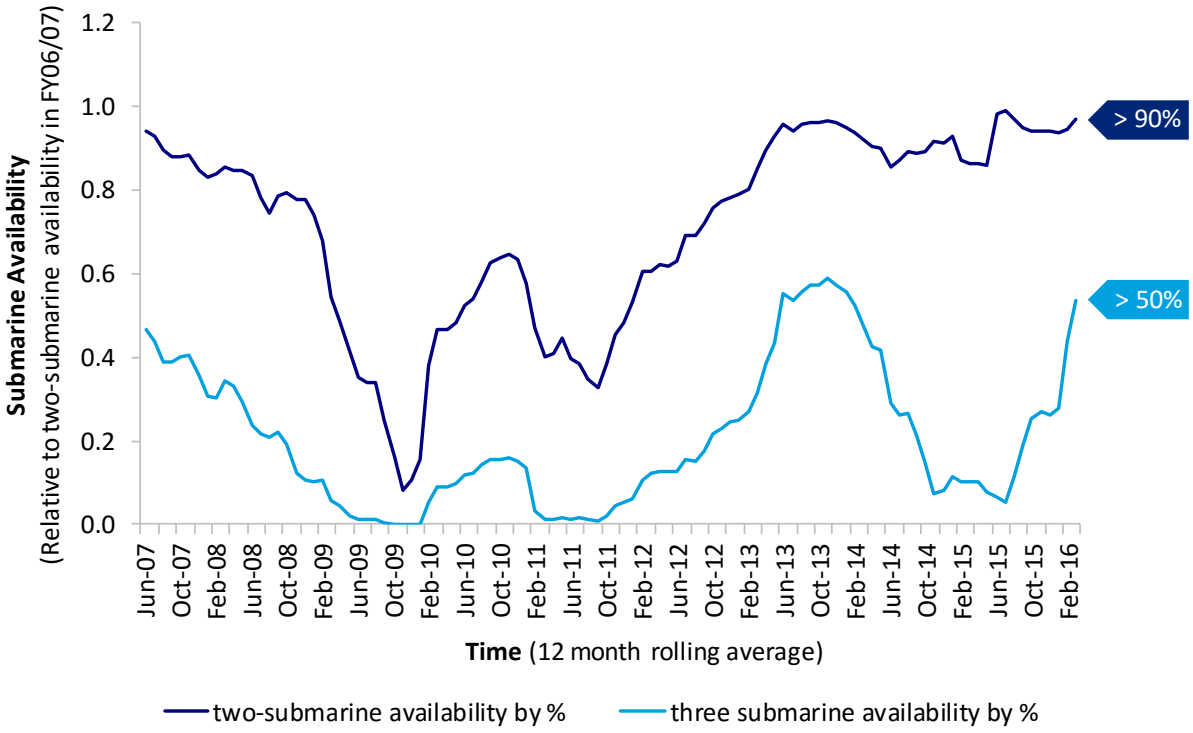


Figure 5 shows that between February 2014 and July 2015, three submarine availability declined from around 60% to approximately 10%. This trend corresponds to the period in which HMAS *Waller* suffered fire damage and was subsequently effectively withdrawn from service. Having two submarines available during this time was also affected, averaging just under 90%.

That this did not decrease further is a significant achievement. It demonstrates the Enterprise's ability to collaboratively manage an unforeseen event and still deliver two submarine availability. While two submarine availability remained well above that achieved between 2009 and 2011, it shows the need to have three submarines, and sometimes four, materially available to achieve two deployable submarines on an enduring basis without requiring unreasonable changes to the Integrated Master Schedule (IMS).

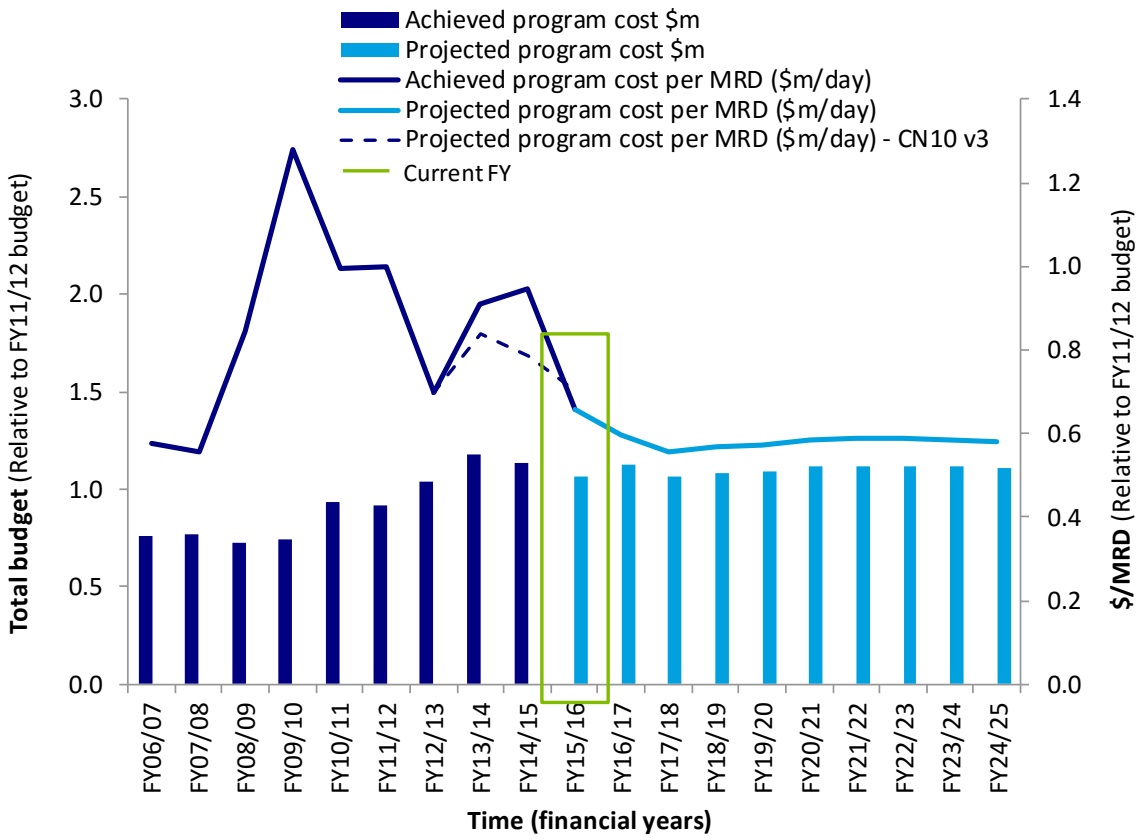
With the recent commencement of trials and certification for HMAS *Waller* post fire repairs (mid-January 2016) three submarine availability has recovered above 50%, and two submarine availability has increased above 90%. These upward trends and the completion of HMAS *Farncomb*'s FCD give a reasonable level of confidence that three or sometimes four submarine materiel availability should occur by the end of FY16/17, as the single-stream FCD period has been established.

While not shown in Figure 5, four submarine availability has only been achieved in short periods since January 2014. Significant periods of four submarine availability could not occur until completion of HMAS *Farncomb*'s FCD.

1.1.2 Cost Effectiveness

Figure 6 tracks both the total sustainment budget (CN10) and the sustainment cost effectiveness, measured as cost per Materiel Ready Day (MRD). The chart includes performance from FY06/07 to FY14/15, year-to-date performance for FY15/16, and projected performance based on the current CN10 (V4.0 June 2015).

Figure 6 - Cost effectiveness[1]



The chart shows an increase in the cost per MRD (i.e. a decrease in cost effectiveness) between FY13/14 and FY15/16 in excess of the projected performance as documented in the March 2014 progress review (projected in CN10 v3). The HMAS *Waller* fire contributed to this, which had the following impacts:

- Additional funds were required to allow repairs to be completed such that the total sustainment cost increased for this period
- HMAS *Waller* did not deliver forecast MRDs as it was effectively withdrawn from service; fleet wide MRD was below target levels for this period.

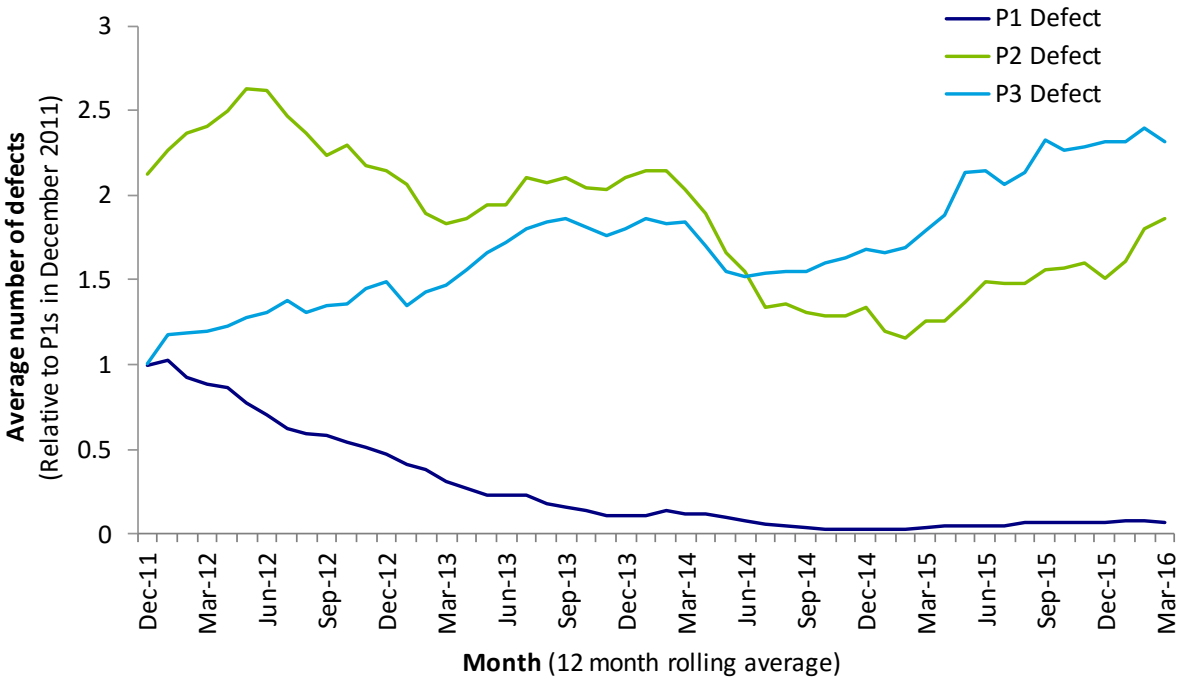
Despite this, the cost per MRD has remained below FY11/12 levels and is expected to further decrease in FY16/17 with the achievement of benchmark availability.

[1] Cost values have been normalised against $FY11/12

1.1.3 Reliability performance

Figure 7 shows the 12 month rolling average per submarine of URDEFs raised since December 2011.

Figure 7 - P1, P2, P3 URDEFs raised[2]



Since December 2011, the number of P1 URDEFs arising has reduced and remained low. The continuing reduction in the number of P1s is a significant achievement, reflecting an improved Enterprise focus on alleviating, through maintenance and reliability improvements, defects which could cause the loss of MRDs.

The number of arising P2 and P3 URDEFs has increased since June 2014. This may be attributed to:

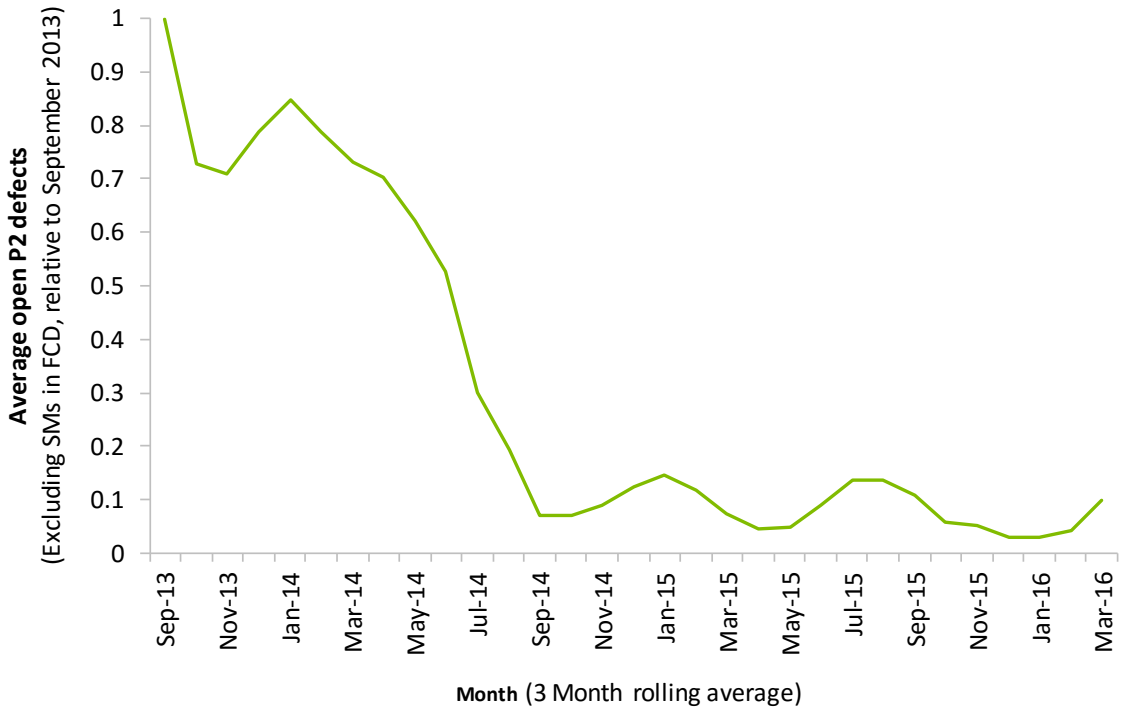
- Increased submarine usage
- Greater focus by ships staff on reporting the material condition of their submarines
- Increased focus on completion of Pre-Availability Condition Assessments (PACAs).

An increase in the number of P2 and P3 URDEFs, if left to accumulate, may increase the risk that P1 URDEFs arise. A continued focus on the reliability program will be required to ensure these trends are not reflective of emerging unreliability.

For comparison, Figure 8 shows the average number of open (i.e. not rectified) P2 URDEFs for each submarine not in FCD.

[2] Based on SIMS URDEF records for the period from January 2011 to March 2016.

Figure 8 - Open P2 URDEFs[3]



The average number of open P2 defects has decreased significantly, and from September 2014, has averaged around 10% of the levels seen in September 2013 with small oscillations around the mean. This is a positive outcome and demonstrates that the sustainment system is effective in this area.

The Review Team believes a submarine withdrawn from service should have outstanding URDEFs discounted from the statistics to avoid giving a misleading picture of reliability

1.1.4 Performance against international benchmarks

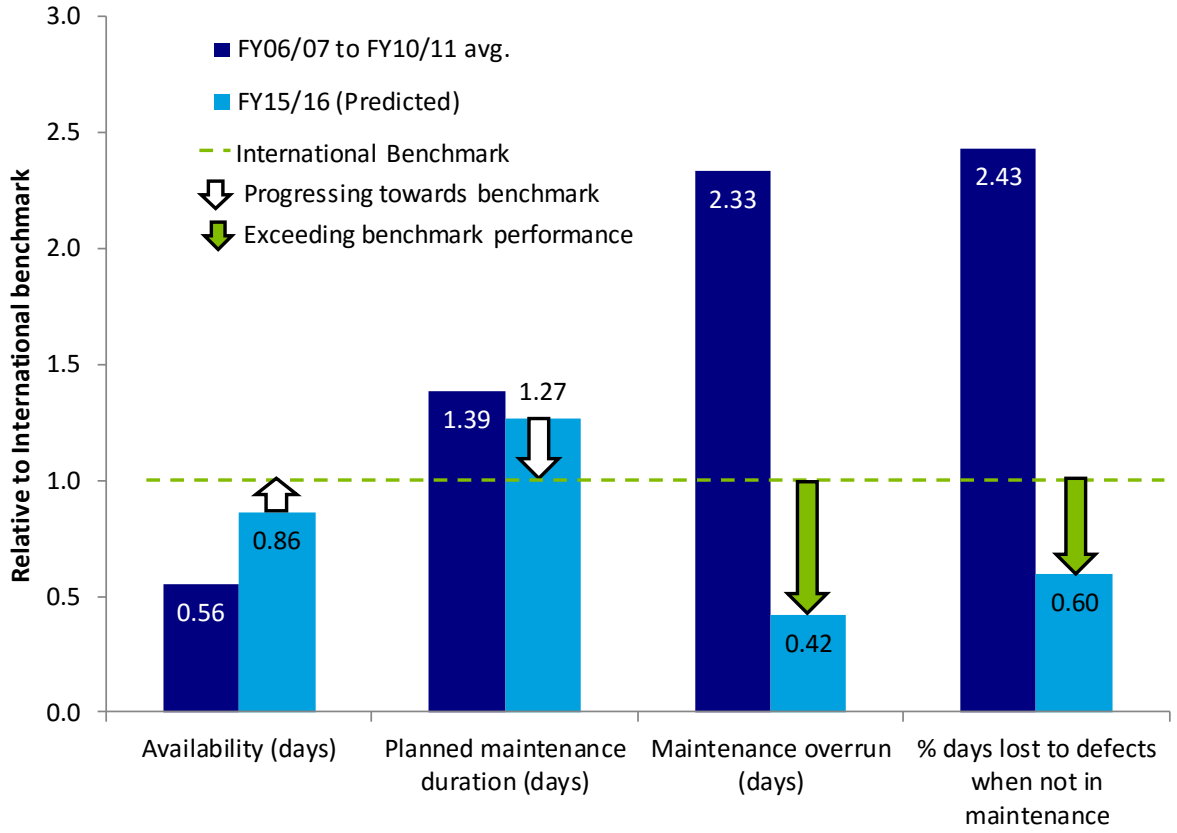
The November 2012 report identified four international benchmarks against which the Collins sustainability performance could be compared:

- Availability (days)
- Planned maintenance duration (days)
- Maintenance overrun (days)
- Days lost as a percentage of MRDs achieved when not in maintenance (%).

The Review Team compared the average FY06/07 to FY10/11 performance for the Collins to the average performance of each comparator submarine fleet in the international benchmark assessment. For this review, the comparison has been updated to include the predicted FY15/16 Collins performance, which is shown in Figure 9.

[3] Based on SIMS URDEF records for the period from January 2011 to March 2016.

Figure 9 - Collins performance compared to international benchmarks



The chart shows that from FY06/07 to FY10/11, the average Collins availability was slightly over half of that achieved by the international comparators with planned maintenance about one third greater, and maintenance overruns and days lost to defects more than twice that of the other navies assessed.

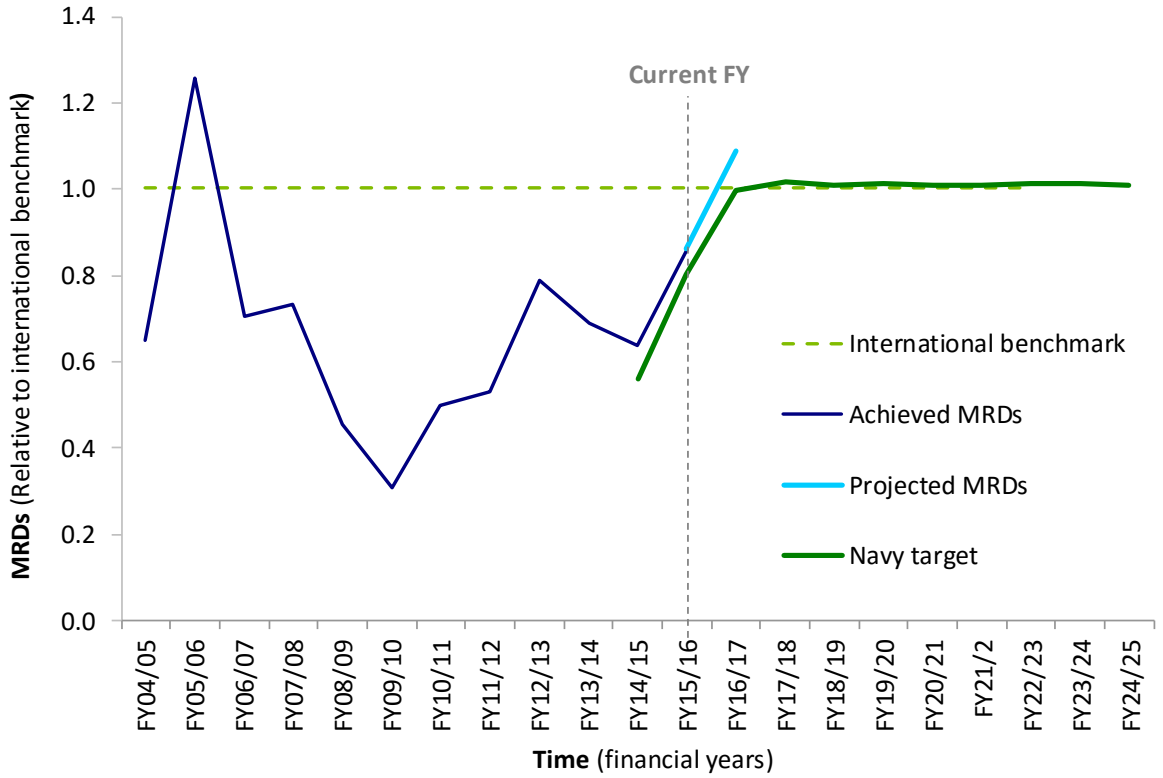
By comparison, the predicted FY15/16 performance shows a significant performance improvement: availability is over 85% of the international benchmark and while planned maintenance durations have slightly improved, significant reductions in maintenance overrun and days lost to defects have occurred and are now well below international benchmark levels. This is an impressive increase in performance.

Since the March 2014 progress review there has been steady and consistent progress towards, and in some areas exceeding, the international benchmark

The trends for each of the four benchmark categories are assessed in the proceeding paragraphs.

Availability is measured in MRDs, which are days that a submarine is not conducting planned maintenance or encumbered by defects that prevent it from proceeding to sea. Figure 10 shows the MRDs achieved by the Collins fleet between FY04/05 and FY14/15, the predicted MRDs for FY15/16 and the forecast MRDs from FY16/17 onwards. Also imposed are the Navy target MRDs and the international benchmark.

Figure 10 - MRD performance and targets[4]



The chart shows a noticeable dip in the achieved MRDs for FY13/14 and FY14/15, attributable to the HMAS *Waller* fire. However, with HMAS *Waller* generating MRDs from mid-January 2016, MRD performance has improved and is predicted to exceed the Navy's CN10 target for FY15/16. Similar improvement and attainment of international benchmark availability is expected to occur in FY16/17.

Figure 11, Figure 12 and Figure 13 show performance against the international benchmarks for planned maintenance, maintenance overrun and percentage days lost to defects when not in maintenance. These incorporate the assessment from the March 2014 progress review (including average performance for FY06/07 to FY10/11), recent performance and projected performance based on the CN10 Product Statement.

Figure 11 shows that days in planned maintenance periods for FY14/15 exceeded Navy targets, the result of changes to the IMS to accommodate repair time for HMAS *Waller*. Strictly speaking, the repair time for HMAS *Waller* was unplanned and should not count towards planned maintenance duration. FY15/16 performance is predicted to meet Navy target levels.

[4] FY16 performance is the sum of the MRDs achieved to-date plus the MRDs planned, based on the Collins Class Program MRD prediction at 31 March 2016.

Figure 11 - Performance against international benchmark for planned maintenance[5]

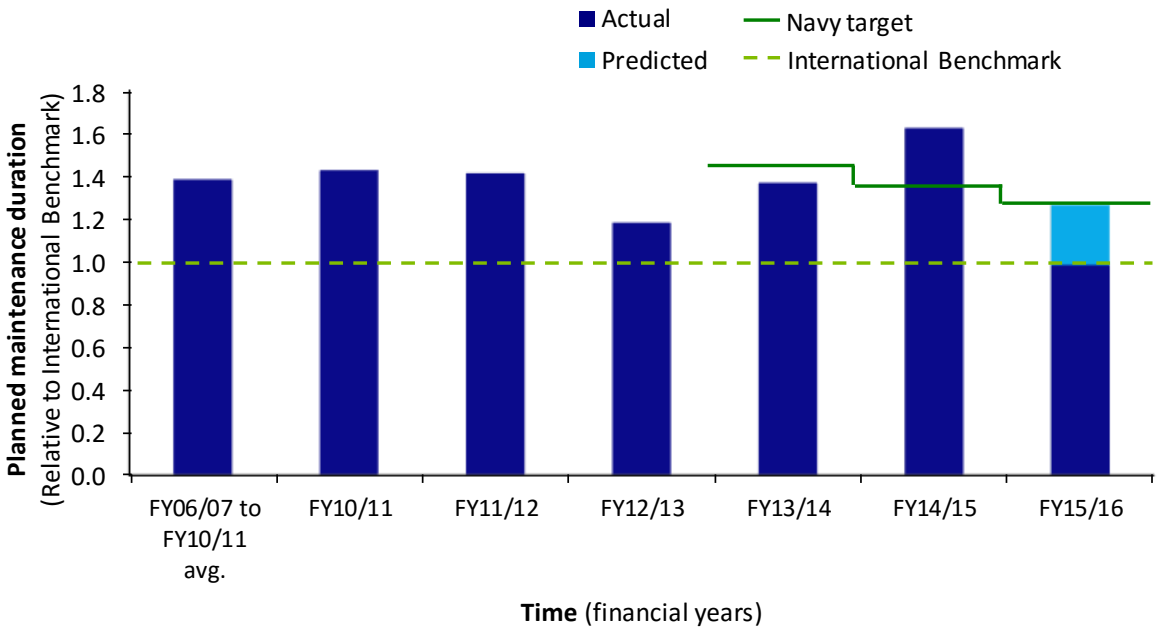
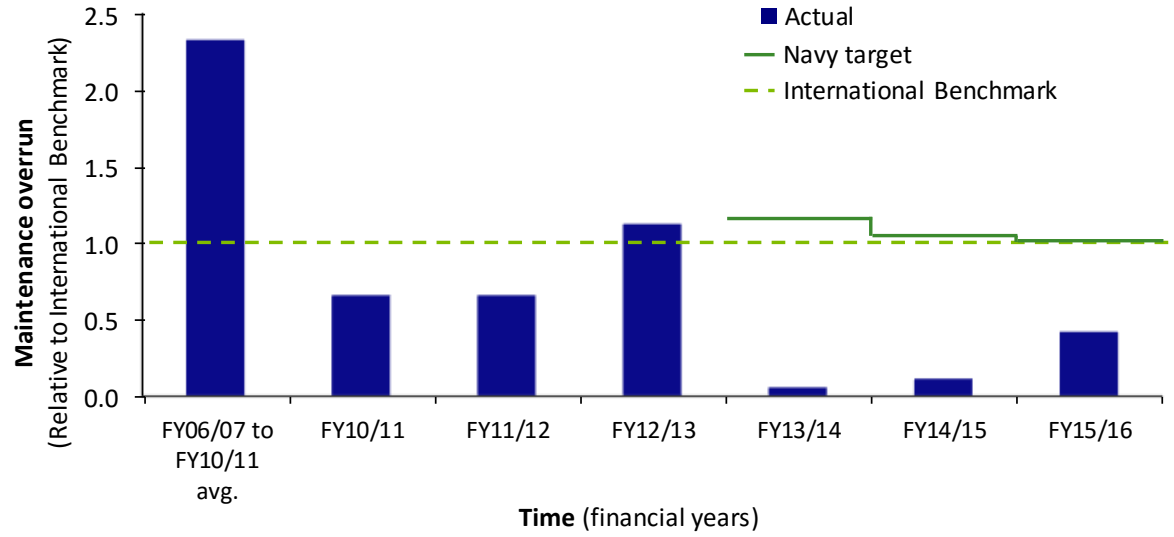


Figure 12 shows that the days lost to maintenance overrun has bettered Navy targets and the international benchmark in FY13/14 and FY14/15 with a similar achievement predicted in FY15/16.

Figure 12 - Performance against international benchmark for maintenance overrun



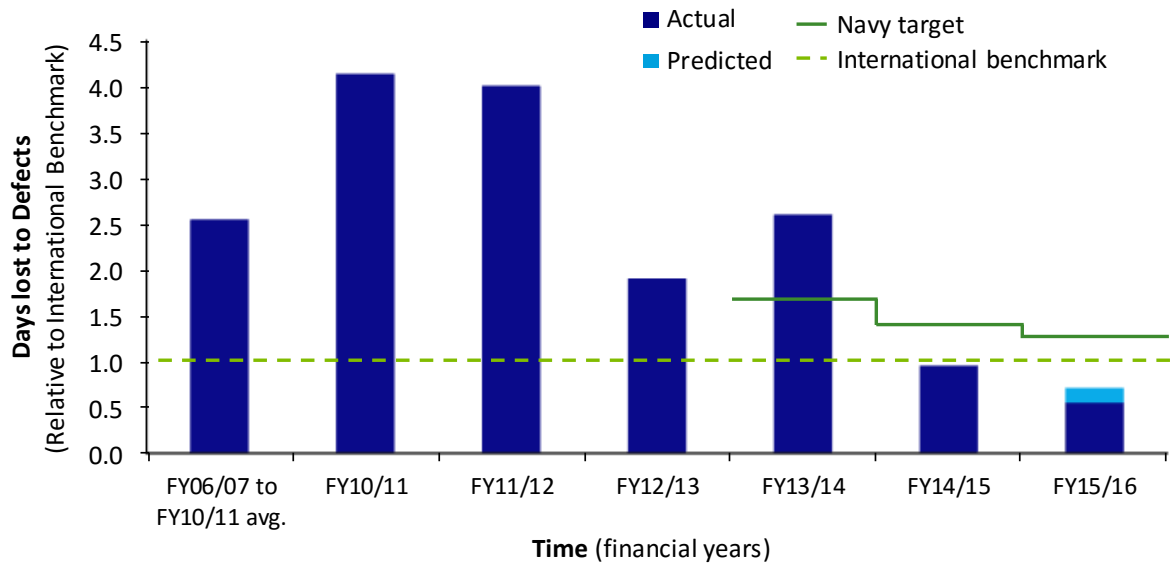
[5] Navy targets for FY13/14 and FY14/15 based on CN10 Product Statement for FY14 to FY23, dated 27 June 2013 as applied in the March 2014 progress review.

Overall, the ability to achieve timely maintenance completion since FY12/13 has improved noticeably. This is a significant achievement, demonstrating that the effective compression of maintenance period activities under the 10+2 UUC has not resulted in an increase in maintenance overruns, as may have been predicted. In addition, Enterprise members have demonstrated good collaborative behaviour (effective use of the "enterprise regulating buffer"), with 'within benchmark' overruns on HMAS *Sheean* and HMAS *Waller* negotiated in the pursuit of the best interests of the Enterprise rather than just one of the parties.

Use of the "enterprise regulating buffer" is an excellent example of the "Enterprise at work"

The Coles review established sea-time lost to defects as a measure of reliability - the number of days lost to defects expressed as a percentage of the time not in maintenance (i.e. MRDs plus days lost to defects) for the fleet, calculated retrospectively[6]. Figure 13 shows the achieved and target performance in this regard.

Figure 13 - Performance against International Benchmark for percentage days lost to defects when not in maintenance[7]



In FY13/14, the spike in days lost is primarily due to the HMAS *Waller* fire. However, if HMAS *Waller* is removed from the FY13/14 calculation the performance for the remainder of the fleet is approximately 1.3 times benchmark, i.e. still greater than the benchmark reliability target. Since this period a significant reduction in the percentage days lost to defect is evident, commensurate with the reduction in number of P1 URDEFs and the corresponding reduction in time to repair these.

[6] Percentage days lost to defects = days lost to defects/(days lost to defects + achieved MRDs) x 100

[7] FY16 prediction is calculated at benchmark % of planned MRDs for April to June 2016

1.2 The 25 Recommendations

In 2012, the Review Team identified 25 recommendations to resolve a range of root cause issues impacting the performance of the Collins sustainment program. As part of the March 2014 progress review, progress against the recommendations was assessed and the Review Team reported that there were nine Green, eleven Amber, four Red[8] and one recommendation Not Accepted.

The Review Team has again assessed each of the 25 recommendations and note that significant progress has been made with the majority of recommendations achieved. The Review Team's assessment differs from that of the Enterprise for eight recommendations. In one instance the Review Team have assessed the Enterprise ahead of its own assessment (recommendation 21) and in eight instances the Team have rated the Enterprise as still progressing (recommendations 3, 7, 8, 12, 15, 22, 24 and 25).

With regard to Recommendation 25, the Review Team has found that while a cost model was developed it is currently not in use and without a clear owner. The cost model should be used to proactively manage costs across the Enterprise and to provide a single, complete source of truth for Enterprise costs.

Overall, the Review Team feels that with continued focus the Enterprise should be able to complete all the recommendations. Outlined in Table 1 is a comparison of the assessments of the 25 recommendations by the Review Team in 2014, the Enterprise's assessment in 2016 and the Review Team assessment in 2016. More details are outlined in Annex A.

[8] Green - Implementation of the recommendation has been **completed** and the objective achieved

Amber - Implementation of the recommendation is **still underway**

Red - Implementation of the recommendation is **at risk** because the intent of the recommendation has been misinterpreted; or implementation is too slow or has not commenced.

Table 1 - Progress of the 25 recommendations

Recommendation	Coles 2014	Submarine Enterprise 2016	Coles 2016
R1 - Set a realistic target for the DMO to deliver MRDs and incorporate in the MSA	Green	Green	Green
R2 - Define a clear (unclassified) requirement for the sustainment program	Green	Green	Green
R3 - Implement the ISSC to encourage performance-based behaviour	Amber	Green	Amber
R4 - Finance to strengthen and broaden the accountability framework for the oversight of ASC	Green	Green	Green
R5 - Strengthen the RAN as the Intelligent Customer for sustainment	Green	Green	Green
R6 - A forum to bring together all suppliers within the CCSP	Amber	Green	Green
R7 - Co-ordinate existing initiatives, accept recommendations from the Phase 3 Report and co-ordinate implementation according to the Implementation Strategy	Red	Amber	Amber
R8 - Develop and implement a contracting strategy	Amber	Green	Amber
R9 - Create a collaborative framework known as the 'Enterprise' without diluting the individual responsibilities of the participants	Green	Green	Green
R10 - Improve leadership skills, knowledge and experience	Amber	Green	Green
R11 - Defer HMAS *Collins* Full Cycle Docking (FCD) and improve maintenance planning	Amber	Green	Green
R12 - Develop an Asset Management Strategy for sustainment	Amber	Green	Amber
R13 - Availability requirements in the MSA should be derived from the IMS and a working level plan generated	Green	Green	Green
R14 - Develop a through-life Capability Management Plan reflecting the updated requirement	Green	Green	Green
R15 - Define and endorse an Asset Management Plan	Amber	Green	Amber

Recommendation	Coles 2014	Submarine Enterprise 2016	Coles 2016
R16 - Implement and complete a fully-integrated sourcing and materials supply support program under the ISSC	Amber	Green	Green
R17 - Treat defects occurring prior to the completion of Sea Acceptance Trials (SATs) as part of the contracted maintenance period	Original recommendation not accepted		
R18 - Review and where necessary improve procedures to audit O-level maintenance and records	Amber	Green	Green
R19 - Create a Head of the Submarine Profession	Green	Green	Green
R20 - Develop a clear line of authority for maintenance of the design intent	Green	Green	Green
R21 - Develop and implement a workforce strategy to specifically address skills shortages at the management level	Red	Amber	Green
R22 - Develop and implement a plan to resolve loss of Naval Engineering skills	Amber	Green	Amber
R23 - Improve adequacy of the Ships Information System and implement the use of on-board portable technology to aid in maintenance efficiency	Amber	Green	Green
R24 - Develop an Enterprise-wide IT strategy and information management strategy	Red	Green	Amber
R25 - Develop a cost baseline/model and supporting processes for the sustainment program	Red	Green	Amber

1.3 Significant milestone achievement

The Enterprise has achieved two significant milestones since the March 2014 progress review. HMAS *Rankin*'s very long (3.3 year) FCD was achieved on time with the submarine released in June 2014, and HMAS *Farncomb* was inducted into the first two-year FCD in July 2014 and will be released to program in May 2016. HMAS *Collins* is currently in a pre-FCD period, having been used to provide spares for HMAS *Farncomb*'s two-year FCD.

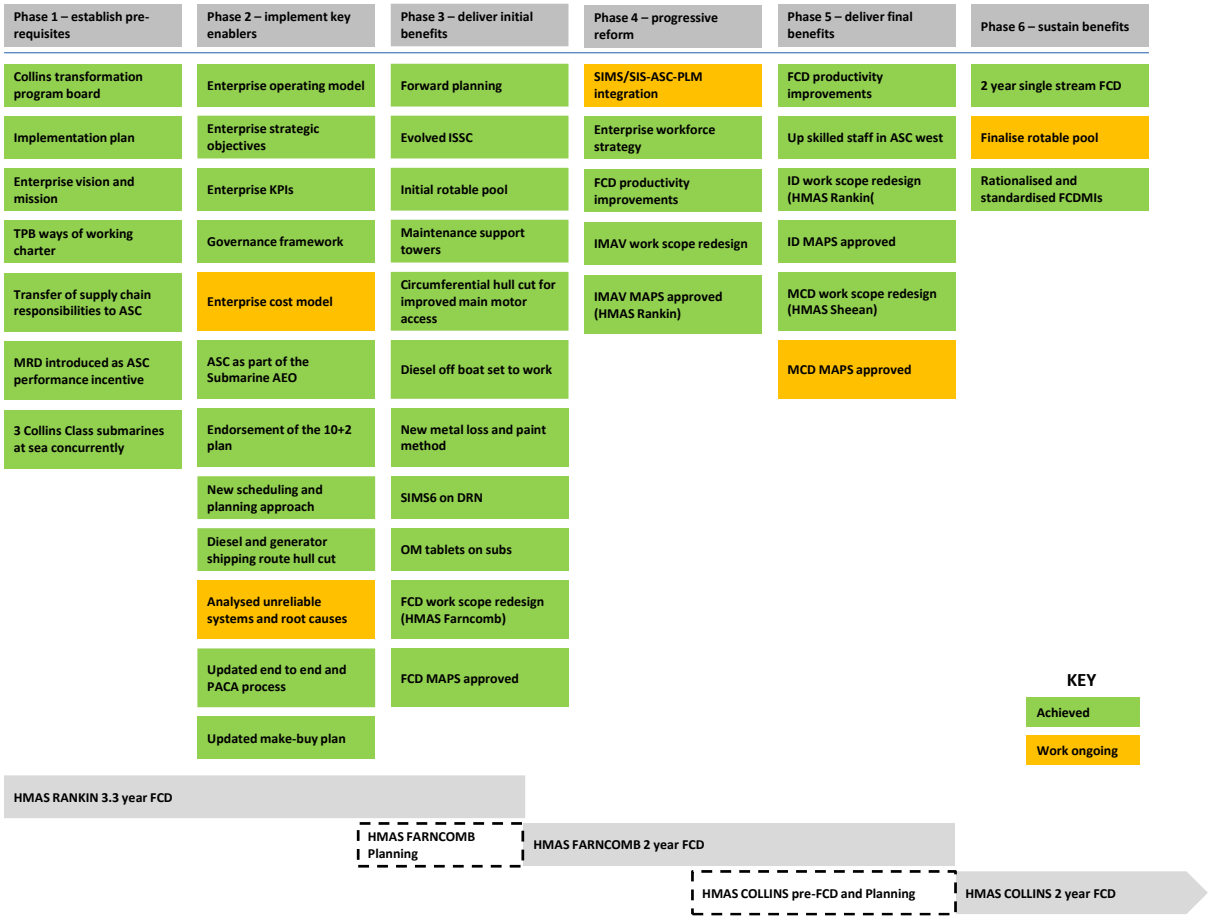
Two additional achievements worthy of note include on-time completion of HMAS *Dechaineux*'s lengthy MCD with its extensive work package, as well as the commencement of capability upgrades and the planning effort undertaken during HMAS *Collins*' pre-FCD. The opportunity to commence installation of capability upgrades during the pre-FCD period for HMAS *Collins* was used very effectively—this might not have been possible in a two-year FCD, and will ensure that the submarine will return to service with the latest modifications rather than as an "orphan".

1.3.1 Key milestones and benefits achieved

Achieving these milestones has been largely due to the implementation of the activities contained within the Collins Transformation Program Refreshed Implementation Plan as outlined in Figure 14[9]. Items in green indicate the activity has been achieved and amber indicates that work is remaining. The plan is largely complete with 39 out of 44 activities being assessed as completed and the objective achieved. These completed activities have contributed a reduction in planned maintenance duration and days lost to overruns. The Review Team have highlighted the contributing factors within the improvement drivers section below.

[9] The Collins Transformation Program Refreshed Implementation Plan v5.2 has not been actively managed as the Transformation Program Office was disestablished and the plan not refreshed since 2013.

Figure 14 - Collins Transformation Program Refreshed Implementation Plan v5.2



1.3.2 Improvements drivers

The ASC has redesigned its approach to FCDs to align with the 10+2 UUC. Improvements to planning, productivity, inventory investment, and performance monitoring have contributed significantly to the decrease in maintenance time required to achieve a two-year FCD timeframe.

Previously, approximately 1,150,000 work hours were required in each 3.3 year FCD. Through several investments and productivity improvements approximately 780,000 man hours are now planned over slightly less than a two-year period.

Some key enablers for the two-year FCD include:

- Drafting Full Cycle Docking Maintenance Instructions (FCDMIs) that outline the actual work to be undertaken
- Consolidating the ASC's Planning and Production departments into the Operations department, (which has enabled more effective planning and execution of maintenance)
- Improving the planning process to allow management of the critical path
- Undertaking productivity improvements to reduce the time taken to perform maintenance.

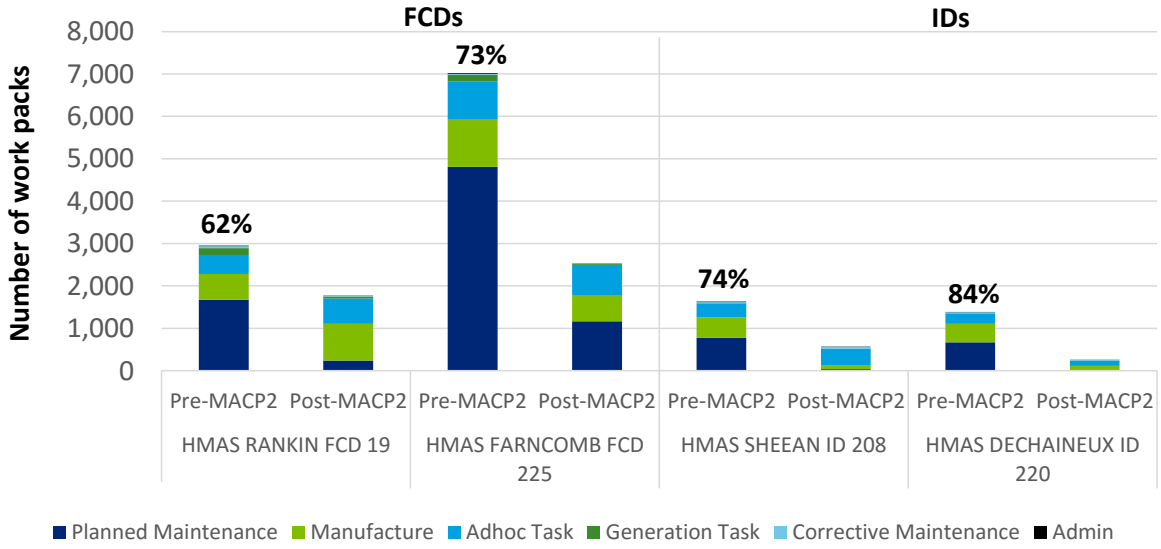
1.3.2.1 Planning Improvements

The development of FCDMIs, which more clearly define the work scope to be completed has resulted in increasingly accurate maintenance planning and supports execution to schedule. As the FCDMIs are documented, the likelihood of unanticipated work decreases and this reduces the likelihood of maintenance overruns.

A planning improvement for HMAS *Farncomb* was a change to the way maintenance was scheduled. Some 5000 tasks for the FCD were grouped into about 900 planning hammocks, each with 50 - 500 hours of planned work. The hammocks are used to generate the critical path, which is assessed in regular schedule health checks as part of the contractor performance report. The use of hammocks has also considerably eased the effort to re-plan when major changes to the schedule must be made.

Figure 15 shows that work scope accuracy during the last two FCDs (HMAS *Rankin* and HMAS *Farncomb*) has increased from 62% to 73% and for the last two Intermediate Dockings (ID) (HMAS *Sheean* and HMAS *Dechaineux*) has increased from 74% to 84%. The amount of work added post Maintenance Amendment Change Proposal 2 (MACP2) work scope 'lock-in' can be considered unplanned or emergent work and should be targeted for reduction. Note that due to the planning improvements the number of work packs for FCD activities has increased but this has the benefit of being more manageable (and reportable) pieces of work.

Figure 15 - Work scope accuracy



The Review Team considers 90% work scope accuracy is a sensible target with the remaining 10% for truly emergent work

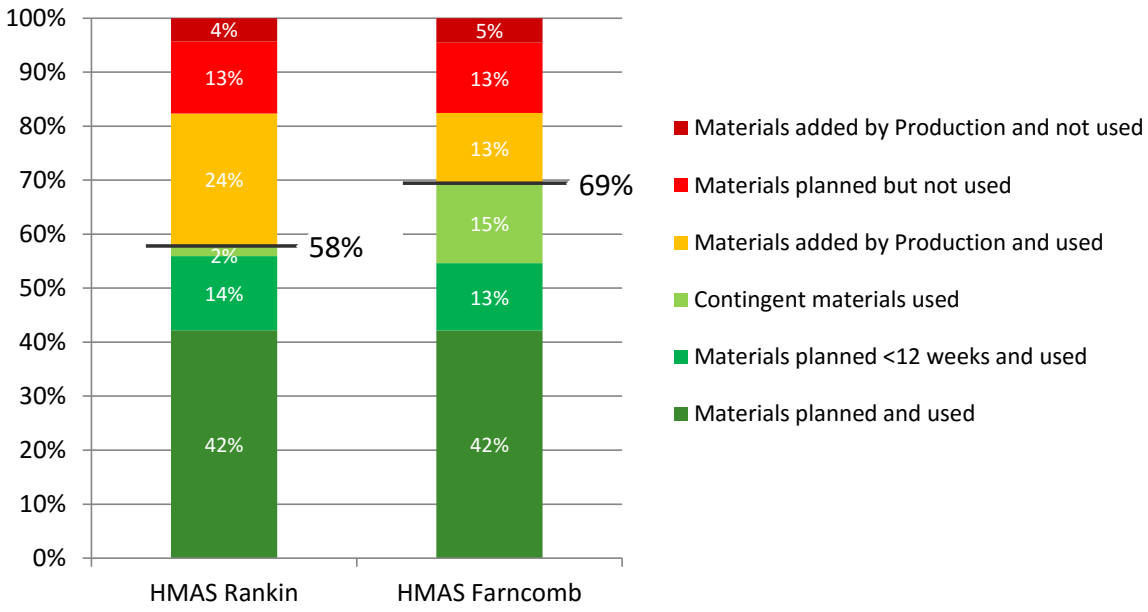
The Planning and Production departments have been consolidated within the Operations department which is now responsible for the planning and execution of work. Importantly, Operations now has responsibility for material demand accuracy, which is an important metric that measures the performance of the department's ability to plan and request the

correct quantity and type of materials required to complete their work. This in turn allows the Supply department to effectively plan and replenish their inventory holdings.

By improving demand accuracy, planning for materials can be undertaken with increasing confidence. Staff also spend less time waiting for materials, enabling shortened work duration and reduced likelihood of overruns as a result of unanticipated material demands.

Figure 16 demonstrates that the material demand accuracy has increased from 58% for HMAS *Rankin*'s FCD (completed in June 2014) to 69% for HMAS *Farncomb* (scheduled for end of May 2016).

Figure 16 - Material demand accuracy



In addition to these planning improvements, HMAS *Farncomb* and HMAS *Collins* have also benefited from the sharing of major equipment, including rotable spares, between the two FCDs. This has reduced schedule pressure due to access to more readily available material.

1.3.2.2 Productivity improvements

Since the March 2014 progress review, ASC has realised a range of productivity improvements to FCD activities that have been primarily driven through:

- Maintenance Support Towers (MST)
- Production support desk
- Circumferential hull cut
- Diesel and generator shipping route hull cut
- Diesel and generator off board test facility
- Improved metal loss, blast and paint method
- Improved rotable pool
- Improved workshops
- Improved materiel flow through the maintenance areas.

The first two-year FCD should complete on schedule, and ASC reports approximately 370,000 (30%) hours savings from these initiatives as well as several others. The Review Team has noted that the workforce is more focused and aligned on delivery of outputs as observed during the Safely on Time meetings.

Future productivity benefits for HMAS *Collins* are now expected, for example schedule compliance, particularly for the critical path, and learning curve efficiency for labour hours. Investment in a new main motor workshop is a key enabler for ASC to complete the main motor work within six months rather than 12, which is ASC's requirement for the HMAS *Waller* FCD schedule.

This is an important initiative to de-risk HMAS *Waller*'s FCD as the main motor will be removed, refurbished and replaced. HMAS *Waller* will not have the benefit of an exchange main propulsion motor, nor will there be a pre-FCD period for preparations.

1.3.3 Focus areas for ongoing work

The Review Team has assessed that five activities within the Collins Transformation Program Refreshed Implementation Plan are still progressing (amber). An assessment of each of these activities is outlined below.

1.3.3.1 Enterprise cost model

An Enterprise cost model was developed (see Annex A - Recommendation 25) and partially populated with data. However, the Review Team was unable to easily identify how this tool is being used to manage Enterprise costs. While a cost model would not contribute to timely achievement of FCD periods in the short term, it provides the opportunity to more accurately make investment decisions and trade-offs.

1.3.3.2 Analysed unreliable systems and root causes

The Enterprise continues to work on improving the reliability of critical systems by Root Cause Analysis (RCA) following URDEFs or failures during maintenance periods. Despite the conduct of RCA, the Review Team note that a significant number of Configuration Change Proposals (CCPs) have not been fitted.

A RCA is undertaken for each P1 URDEF and efforts are underway to analyse how P2 and P3 URDEFs are contributing to losses in MCDs assessed by Enterprise KPI-3. Determining root causes for unreliable systems and implementing mitigating actions will reduce MRDs lost to P1 URDEFs and MCDs lost to P2 and P3 URDEFs.

The Review Team have noted through analysis that of the 1051 CCPs that are approved, the number that have been fitted to each submarine range between 404 and 639. While not all of these are aimed at improving submarine reliability, and while there are schedule and resource constraints during planned maintenance periods, the Review Team conclude that implementation of CCPs could be improved. Proactive reliability improvements can be identified through condition monitoring. ASC is utilising basic condition monitoring for this purpose and is achieving some successes. The program is being targeted for enhancement to enable more reliable detection of emerging failures.

The implementation of CCPs could be improved

The condition monitoring program should be enhanced to detect incipient failures which will reduce the URDEF count

1.3.3.3 SIMS/SIS-ASC PLM integration

Integration of Submarine Information Management System (SIMS) with the ASC PLM tools was intended to allow electronic data transfer between the Commonwealth and ASC systems. Objective Quality Evidence (OQE) is loaded by ASC into SIMS to meet certification requirements. However, not all data is electronically transferred resulting in two sources of asset data for the submarines. While this is not considered to be a risk as the Enterprise is clear on which data sets are to be used, it is an efficiency issue as it is a duplication of effort.

1.3.3.4 Finalise rotable pool

A rotable pool of spares takes time pressure out of the schedule by enabling equipment to be removed and replaced, with repairs being done outside the scheduled maintenance period. HMAS *Farncomb* had, and HMA*S Collins* FCD will have, the benefit of a full set of rotable items (as a result of HMAS *Farncomb* seeding HMAS *Collins*, and HMAS *Collins* seeding HMAS *Farncomb*). However, with the move to single-stream FCD in June 2016 there will be no donor submarine to populate the rotable pool. Such items will instead need to be refurbished and returned to the submarine or additional equipment items will need to be purchased.

The Review Team understands that further investment is required to complete the rotable pool for FCD and Mid-Cycle Docking (MCD) maintenance periods. The Collins Inventory Investment Plan has recognised this requirement and a proposal has been submitted to resolve a coherent way forward.

Further investment is required to complete the rotable pool for FCD and MCD maintenance periods

1.3.3.5 Spares to support submarines in Western Australia

Spare parts are required to be available for alongside maintenance periods and the rectification of defects. The move to a 10+2 UUC will bring the number of submarines based in Western Australia to five, an increase from four. Further, with increases in materiel availability of the submarine fleet there will be more pressure on the supply chain for spares and consumables.

Some early action will be required to ensure that the MRDs, which would be gained through the new 10+2 UUC, are not lost should spares not be readily available to fix defects or for routine maintenance. It would be unfortunate to increase the number of submarines potentially available but fail to adequately provide for their support.

It is essential to acquire the spares necessary to support five submarines rather than four in the West

1.3.3.6 MCD MAPS approved

The first MCD under the new 10+2 UUC will be for HMAS *Sheean* which is scheduled for December 2016 to December 2017. Work is ongoing to have the Maintenance Amendment Proposals (MAPS) approved in time for finalisation of work scope.

1.4 Review of underlying performance drivers

In the November 2012 report and the March 2014 progress review the Review Team defined Collins sustainment using a value chain that described the key activities to deliver sustainment effectively. As part of the study, performance drivers were analysed to determine how they related to each other and where they sat on the value chain.

To make an assessment on whether the Enterprise is able to continue on its current trajectory, the Team reviewed the underlying value chain attributes (see Table 2). Findings and observations are made on each and these are contained at Annex A.2.

Table 2 - Underlying performance drivers

Enable Capability	Sustain capability					Use capability
Governance and strategy	Capability	Engineering	Planning	Supply	Production	Force Generation
• Operational requirements effectively stated • Clear sustainment objective • Overarching Asset Management Strategy • Cooperative and collegiate Enterprise • Effective governance • Sustainment cost actively managed • Performance driven culture	• Capability upgrades identified early • Submarines effectively crewed	• Clear design authority • Obsolescence and reliability managed • Appropriate preventative maintenance plan • Design configuration accurate • Quick approvals • Effective and efficient asset management plan	• Working level master plan • Work scope is accurate • Accurate BoM • Efficient scheduling of the work scope	• On time POs • High delivery performance • Supplier relationships effectively managed • Effective inventory policy • Inventory record accuracy high • Sufficient parts available in the warehouse • Returns and repairables managed • Effective wharf side distribution • Achieve accurate SAL	• Maintenance staff skilled and enabled • Schedule adherence is high • Adequate feedback from production • Maintenance staff levels balanced between SA and WA	• RAN crews are appropriately skilled and enabled • O-level maintenance completed • Feedback and at sea record keeping is high
		Managing maintenance activities				

2 Part B - Continuing performance during transition to the Future Submarine

In this section the Review Team has assessed the Enterprise's performance to date and made a determination of its capability to sustain this performance through to the Collins end of life and the transition to the future submarines. The Collins submarines will be in service for the next 10 years and perhaps for another 10 years after that and will need a coherent sustainment plan.

The Enterprise has done exceptionally well to transform the Collins sustainment and deliver the 10+2 UCC, which has resulted in improved three and sometimes four submarine availability. In addition, the FCDs are now reduced to two years and all five submarines are expected to be home-ported in Western Australia by mid-2016. There are other significant milestones achieved by the Enterprise over the past few years, which has resulted in a long catalogue of impressive achievements.

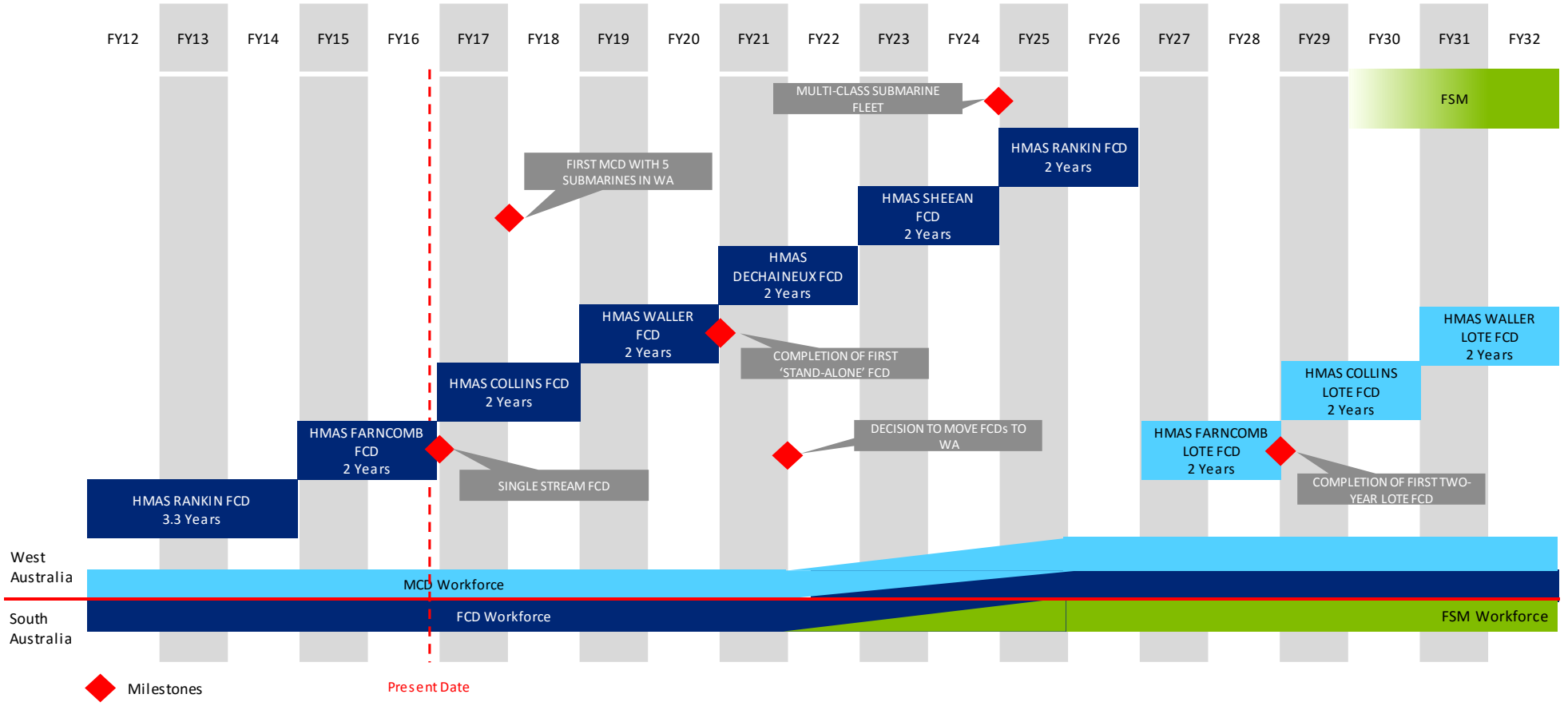
The challenge for the Enterprise is to sustain this performance given there are some key issues over the next five years that will test the Enterprise's capability:

- **Workforce** - one of the biggest challenges will be the competing demand for resources between the Collins program and future submarines. The Enterprise will need to develop a cohesive plan to preserve the ongoing integrity of the Collins workforce while supporting the introduction of the future submarines
- **Five submarines in Western Australia** - from June 2016, five submarines will be based in the West and will need to be supported by adequate stores and other services so they can operate to their full potential
- **FCDs in Western Australia** - a decision may be made to move the FCDs to Western Australia at an appropriate time. The Enterprise requires a clear and substantive plan that demonstrates how this can be managed from a material, infrastructure and workforce perspective
- **Life of Type Extension** - the plan for Life of Type Extension is in very early development. This needs strong support and focus at the Enterprise level to ensure it is funded and all aspects are considered including infrastructure
- **Sustainment cost** - there is currently no active Enterprise cost model and the Review Team expect this will limit the Enterprise's ability to maintain costs or find opportunities to reduce and or reallocate cost to fund inventory, infrastructure etc. from savings made elsewhere
- **Capability insertions** - the Enterprise will need to be able to execute capability insertions to maintain regional superiority in tandem with reliability and obsolescence programs during FCDs, MCDs and IDs
- **HMAS *Waller*'s FCD** - while this will be the third FCD under the 10+2 UUC and much will have been learnt from the preceding FCDs, this FCD will be without the benefit of exchange equipment, seed rotables and a pre-FCD period
- **ISSC** - the ISSC will have to be negotiated for the next performance period probably in a more enlightened Enterprise culture

- **Introduction of Future Submarines** - this will place considerable demands on Commonwealth resources to operate and maintain two classes of submarines concurrently. This presents the greatest challenge for the submarine community.

These issues and indicative milestones and decision points are outlined in Figure 17.

Figure 17 - Indicative milestones and decision points



The Review Team assessed the Enterprise's capability to sustain benchmark performance through to the Collins end-of-life, including the transition to future submarines. This included the following:

- Defined what good looks like
- Compared current performance and future requirements
- Made recommendations for improvement.

2.1 What good looks like

To define what good looks like, the Review Team utilised a hypothesis tree to investigate Enterprise performance. The hypothesis tree provides an overarching statement of what good looks like and the 'branches' outline the key areas the Enterprise must demonstrate competence in order to achieve future sustainment. The Review Team defines the overarching statement of what good looks like as:

> *"The Enterprise has the established capability to deliver the availability of the Collins Class Submarine beyond the international benchmark, whilst maintaining regional superiority and reducing sustainment costs"*

The supporting 'branch' areas are:

1. Enterprise goals exist and reflect the necessary elements to achieve current and future required availability
2. Enterprise strategy articulates how sustainment goals will be achieved through life and is underpinned by appropriate planning artefacts and processes
3. The Enterprise encourages continuous improvement
4. Appropriate structures are in place to support Enterprise improvements until the planned withdrawal date for the Collins Class.

The Review Team undertook a detailed assessment of the Enterprise's performance in each of these four areas. A summary of the results is outlined in the next section.

2.2 Enterprise performance

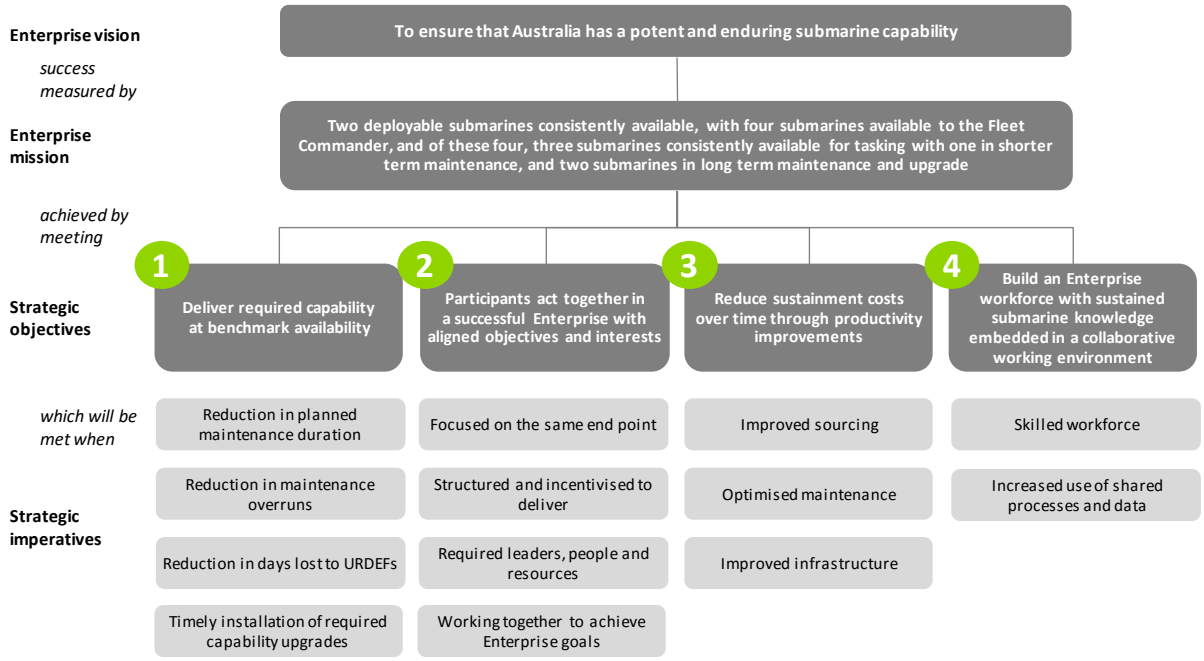
2.2.1 Enterprise goals exist and reflect the necessary elements to achieve current and future required availability

The Enterprise vision has been agreed, operating model defined, Key Performance Indicators (KPIs) identified and implemented, governance framework and ways of working charter established.

The Submarine Enterprise defines its vision "to ensure that Australia has a potent and enduring submarine capability" and its mission to meet the Navy's requirement of having "two deployable submarines consistently available, with four submarines available to the Fleet Commander and of these four, three submarines consistently available for tasking with one in shorter term maintenance and two submarines in long term maintenance and upgrade".

Recognising that the Australian submarine capability needs to be potent and enduring, four strategic objectives have been defined by the Enterprise (refer Figure 18). The goals place emphasis on ensuring that benchmark availability is delivered with suitable levels of capability and provide detail on what it means to actually operate as an Enterprise.

Figure 18 - Enterprise vision and strategic objectives



Enterprise strategy articulates how sustainment goals will be achieved through life and is underpinned by appropriate planning artefacts and processes.

The Collins Transformation Plan has served the Enterprise well to achieve the 10+2 UUC and to achieve benchmark performance in FY16/17. The Review Team note that the following examples have delivered significant benefits for the Enterprise:

- The Navy's workforce plans are designed to take account of the desired availability profile, including the requirements of the future submarines
- Maintaining regional superiority is achieved through the capability upgrade plans
- The reliability program examines in-service failures and is widening its use of condition monitoring. Increasing use of condition monitoring will enable incipient failures to be detected and managed, which will reduce the number of in service defects
- The Forward Planning Team incorporates Configuration Change Items (CCIs) into a seven-year high-level forecast which specifies when each CCI should be inserted. The Review Team feels this should be extended to a longer term plan, preferably to end-of-life. There is a specific allowance in each planned maintenance period for CCI insertion. The Review Team note that there appears to be sufficient room in the FCD schedule to increase the level of CCI work although detailed analysis of HMAS *Collins*' FCD will be needed. Experience suggests a target of approximately 15% of labour hours would not be unreasonable. After HMAS *Sheean*'s MCD, analysis should be undertaken to determine if additional CCIs can be fitted during MCD activities.

The Review Team found that the plans put in place by the Enterprise thus far have not been particularly forward looking and that is understandable. In the absence of a decision of the SEA1000 program, detailed forward planning would not have been prudent.

However, with the announcement of the preferred SEA1000 international partner, the opportunity now exists to develop detailed future plans and this should be driven at the Enterprise level. Managing the Collins fleet to end-of-life and transition to the future submarines will require coordination at the Enterprise level to ensure continuity of capability.

The Review Team understand that the Enterprise has recently developed an intent to sustain benchmark availability once it is attained. The draft Collin's Program intent and management priorities are:

1. Enable submarine capability continuity
2. Promote Collins program efficiency
3. Assure regional superiority
4. Manage the transition to a multi-class submarine force
5. Manage Collins to withdrawal.

The Review Team note that these intents are in draft and have not been widely socialised and not yet drafted to a level that constitutes a strategy or plan. The draft intent is a precursor to developing a coherent strategy.

Plans and assumptions underpinning the SEA1000 program will need to be integrated at some point with those for the sustainment of the Collins to ensure there will be a continuous submarine capability to maintain regional superiority. The Review Team has not sighted any advance planning documentation and could go no further than recognise the need.

2.2.2 The Enterprise encourages continuous improvement

For the Enterprise to encourage continuous improvement it must demonstrate that it has created an environment where corrective actions are proactively implemented and a program of self-monitoring is undertaken.

The Review Team has found that each of the Enterprise partners has made good progress with corrective actions and to continuously self-monitor. To achieve this, the Navy, CASG and ASC developed and implemented individual plans that were internally focused rather than Enterprise focused. This was a sound approach given the situation; each organisation had been found to have a range of systemic issues to be resolved to meet the Collins sustainment challenges and mature the capability of the organisation to support the 10+2 UUC.

Varying degrees of self-monitoring have been established together with Enterprise monitoring in the form of the Transformation Board. Assessment of these is outlined in Annex B.

While the Transformation Board, chaired by GM Submarines, has met with varying regularity since its establishment, it has driven major improvements and shown to be effective in monitoring and maintaining transformation progress.

ASC has had success with the 10+2 UUC Executive Governance Briefings with GM Submarines, and these have been instrumental in driving the organisation to adopt corrective actions and undertake broader improvements to achieve the 10+2 UUC. From an internal perspective, ASC monitors performance against its Collins Business Improvement Strategy and Plan Paper and sources external audits.

Navy's New Generation Navy program has proven effective in the adoption of corrective actions through a dedicated program of continuous improvement. Navy also monitors its submarine sustainment program through monthly performance reports on CN10 metrics, six-monthly Fleet Screenings and annual reports to the Navy Reform Board. Measurement points include the KPIs and Key Health Indicators (KHIs) of the Collins sustainment program embedded in the CN10 Product Statement (PdS) and cascaded down to the ISSC between CASG and the ASC.

CASG corrective actions have been achieved and the development of the CASG workforce plan is an example of that. However, to self-monitor, CASG would require a document such as a business plan that outlines the program of work that this group is required to perform and then undertake regular reporting on progress. Informal plans exist and monitoring is undertaken and these need to be formalised.

2.2.3 Appropriate structures are in place to support Enterprise improvements until the planned withdrawal date for the Collins Class

To assess the Enterprise's performance in this area the Review Team determined whether:

- Appropriate and effective governance structures are in place to drive improved performance
- Technology / IT is in place and operating effectively to enable the Enterprise to achieve its goals
- Infrastructure exists or is planned to enable delivery of the goals of the Enterprise
- Appropriate work force exists to support materiel availability, capability upgrade, and enable the Enterprise to achieve its goals.

2.2.3.1 Governance

Following publication of the November 2012 report, the Enterprise formed the Collins Transformation Board to oversee Collins sustainment to meet benchmark performance, supported by the Transformation Program Office (TPO). The context for the governance is outlined in Figure 19. The Collins Transformation Board directed the development of the Collins Transformation Implementation Plan and prosecuted the changes necessary to attain the benchmark availability. This included updating the change program, in the Collins Transformation Program Refreshed Implementation Plan that was issued in December 2013.

The Collins Transformation Board, under the chairmanship of GM Submarines, monitored all the activities contributing to the attainment of benchmark availability for about two years.

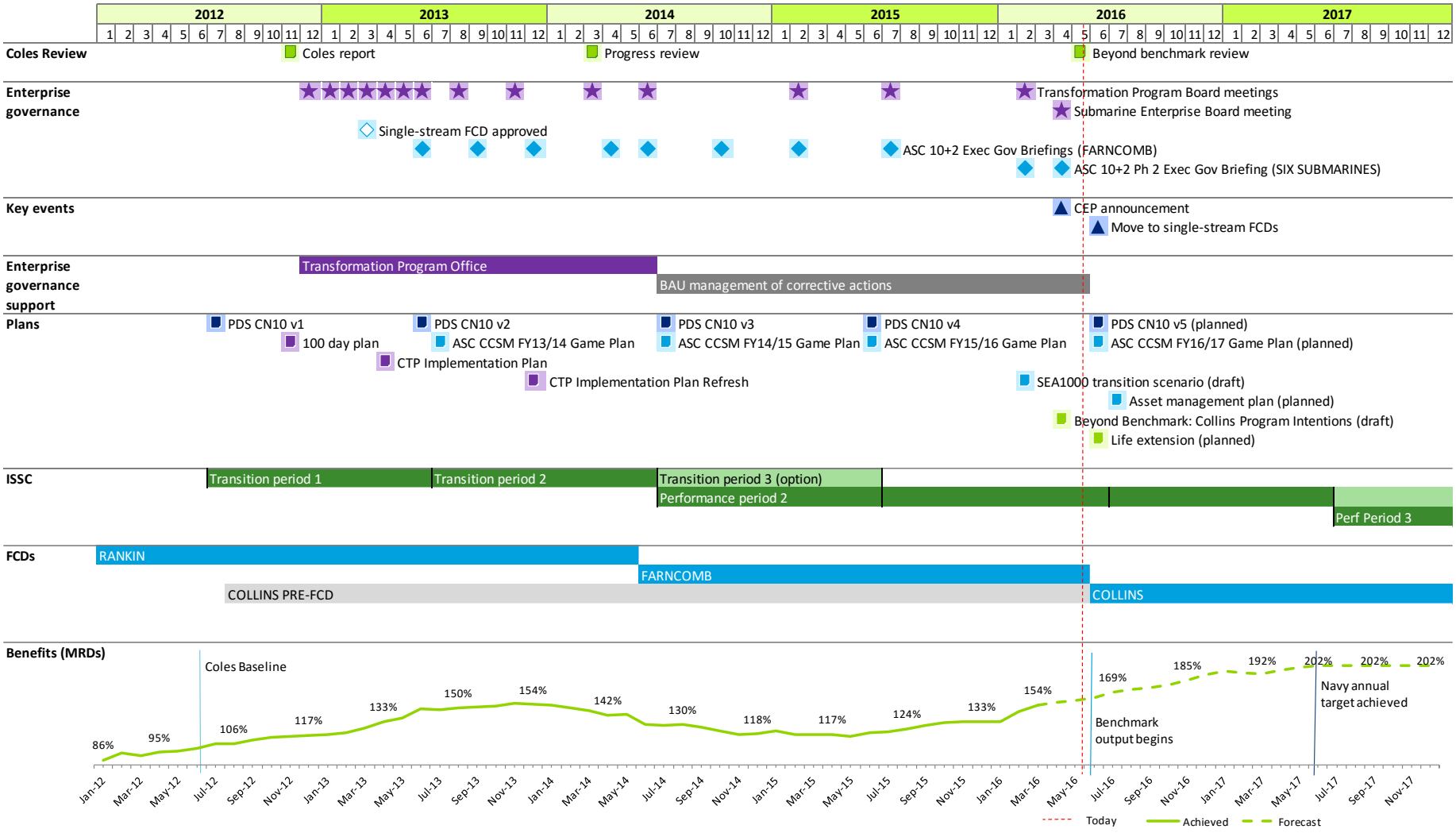
The TPO, which supported the Collins Transformation Board, contributed to effective self-monitoring of the changes implemented post 2013.

At the most recent Collins Transformation Board meeting it was agreed to rename the board the Submarine Enterprise Board. It will continue to provide similar oversight and functions as the Collins Transformation Board, however with a greater focus on continuous improvement.

With the establishment of the Submarine Enterprise Board, it should develop an Enterprise level continuous improvement plan and equip itself with the necessary staff, planning and monitoring tools

The ISSC has proven to be an effective contracting mechanism thus far and has successfully migrated ASC from a “cost plus” funding contract to one of cost reimbursement plus a performance payment for delivering an agreed availability. While this current performance incentive could continue, and would provide the Navy with the necessary performance required to achieve its mission, the Review Team believe that performance incentives should be refocused to deliver reliability improvements on the reduction in P1 URDEFs arising and days lost to P1 URDEFS. This is explored in more detail in Part C. The opportunity will naturally occur in establishing the conditions for Performance Period 3 when at the same time it would be opportune to consider making the contract less complex.

Figure 19 - Context for Collins Transformation governance



2.2.3.2 IT and Infrastructure

No Enterprise-wide plan currently exists, which makes it difficult to prioritise IT requirements across the Enterprise. However, ASC has an IT plan in place, which has proven effective in managing internal IT requirements and projects.

Major infrastructure requirements are immature and currently not funded. However, the Review Team understands that work is underway to develop such plans.

The newly formed Submarine Enterprise Board should incorporate IT and infrastructure requirements into its plan

2.2.3.3 SIMS and ISCMMS data

The analysis in this report depends on the quality of the data presented to us, and if it is faulty or if there are omissions, then the conclusions reached may be incorrect.

SIMS was designed to record transactional data of maintenance records for O-level and I-level maintenance (unfortunately not D-level) and to track engineering improvements, and to be a powerful source of information for analysis for future improvements. SIMS remains an under-utilised asset information system as compared to systems in use across wider industry. True effort or work on the submarines, a key input into reliability engineering and continuous improvement, is not captured. The Review Team make the following comments:

- There has been considerable effort by the Submarine Force in training ships staff and assisting them to plan their maintenance periods and complete their records. Attention to the material condition of their submarines and record-keeping is paying off and is a major factor in reducing the number of URDEFs
- Backlog reporting for Maintenance Amendment Proposals (MAPs), Design and Material Deficiency Report (DMDRs) and CCPs should be considered to ensure that these engineering improvements and modifications are tracking through the Enterprise properly and in a timely manner, and MCR backlog risk reporting as a possible driver of risk to submarine reliability would be considered good practice
- SIMS data suggests that the CCP process for the class has stalled between 2013 and 2016; hence there is little progress on capability improvement of the submarines using this controlled process
- Long term delays in implementing DMDRs suggests that this process is not supported by a long term capital budgeting processes or a lack of access to the submarines which is not likely given the time they spend in External Maintenance Periods
- The Team's analysis identified a number of key areas of concern for submarine reliability, and cross checked to see if the remedial work was likely to manage down the reliability risk; this is the kind of follow-up to remedial work that the Review Team would expect of the Enterprise.

If the Commonwealth IT systems (in the case of SIMS) do not contain a true record of all work undertaken on RAN ships and submarines, then the Enterprise is severely hampered in its intent to undertake continuous improvement and deliver effective naval engineering

SIMS (and ISCMMS) contains a wealth of information and greater use of analysis can be made

2.2.3.4 Workforce planning

Since the March 2014 progress review, the Enterprise has made significant progress in developing and implementing workforce plans to support the Enterprise achieve its goals (see Annex A - Recommendation 21). ASC should be commended for adopting the Australian Standard 5620:2015 for workforce planning.

While the Navy, CASG and ASC workforce plans documents vary in time horizons, content and format, they contain the necessary workforce planning information required to support the Collins program in the immediate future. However, to effectively support the introduction of the future submarines an Enterprise-wide workforce plan for a total Collins and future submarine workforce should be developed or at a minimum, an Enterprise workforce planning forum should be established and run on regular basis (quarterly) to coordinate workforce planning across the Enterprise.

In addition, the Enterprise should also consider:

- All workforce plans should be brought in line with the Australian Standard 5620:2015 for workforce planning
- Navy and CASG should consider whether to invest in dedicated (and possible shared) workforce planning resources.

2.2.3.5 Summary

The Review Team considers that the next step for the Enterprise is to develop a strategy for sustaining the Collins post the completion of HMAS *Farncomb*'s FCD. This strategy should then be developed into a formal plan for the program office to manage and the new Submarine Enterprise Board to oversee. This follows the successful pattern for the transformation of the Collins into the new usage and upkeep cycle and the development of the new performance metrics covering the Enablers, Sustainers and the Deliverers - in effect, an extension of the Collins Transformation Implementation Plan.

3 Part C - Improving beyond benchmark

The Enterprise can successfully attain benchmark availability with the completion of the first two-year FCD for HMAS *Farncomb* in FY16/17. The question is, should the Enterprise look to improve beyond the benchmark, and if so where? This section provides the Review Team's examination of the opportunities for the Enterprise to improve Collins performance - captured by "beyond benchmark".

Table 3 shows the Review Team's recommendations for the performance areas and recommended priorities to move beyond benchmark. The detailed analysis follows.

Table 3 - Improvement areas to be targeted

Performance areas	FY16/17 Performance	Beyond benchmark
Total availability (MRDs)	Benchmark MRDs achieved through the 10+2 UUC	Not a priority - The options to generate additional days are unlikely to be able to be planned and used by Navy
Length of time between maintenance periods	Continuous blocks of availability for tasking achieved through the 10+2 UUC	Not a priority - The 10+2 already provides uniform blocks of appropriate duration
Planned maintenance duration	Benchmark achieved through the 10+2 UUC	Not a priority - The options to generate additional days are unlikely to be able to be planned and used by Navy
Time lost to overruns	Benchmark achieved through ASC planning and performance	Not a priority - Benchmark allowance should remain whilst holding timely maintenance completion
Submarine reliability (time lost to defects)	Benchmark days lost to URDEFs achieved	Priority 1 - disruptions disproportionally affect Navy's operations
Resilience	Achieved through the 10+2 UUC	Not a priority - The 10+2 allows up to four months of critical failure per year without seriously disrupting two-submarine availability
Capability	Forward planning has enabled required capability to be inserted	Priority 2 - Maintaining regional superiority will require rolling capability upgrades - Enterprise KPIs on capability insertions need further development
Cost Effectiveness	$/MRD achieved	Priority 3 - Now need to focus on cost reduction to reallocate funds for inventory, infrastructure, obsolescence / reliability
Workforce	Individual organisation workforce plans exist	Not a priority - Should be addressed as part of sustaining benchmark performance, beyond benchmark is not required

3.1 Beyond benchmark

3.1.1 Future targets

To determine what a new objective for beyond benchmark performance could be, it is necessary to reflect on how the benchmark is defined.

Achieving benchmark performance has fundamentally been about achieving the international benchmark availability target in the form of MRDs. In June 2012, the Enterprise had been performing at 56% of benchmark availability. An improvement of 80% was required to meet benchmark as shown in Figure 20. The greatest opportunity to improve this performance was to reduce planned maintenance and this has been accomplished by the Collins Transformation Program in moving to the 10+2 UUC.

Figure 20 - Opportunities to reach benchmark

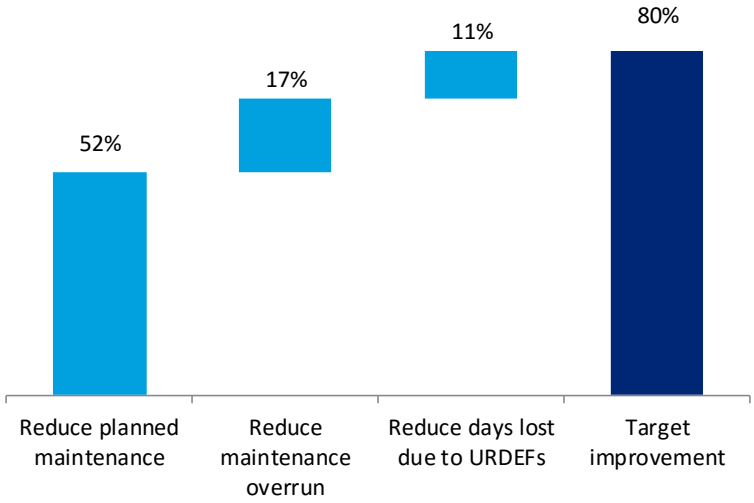
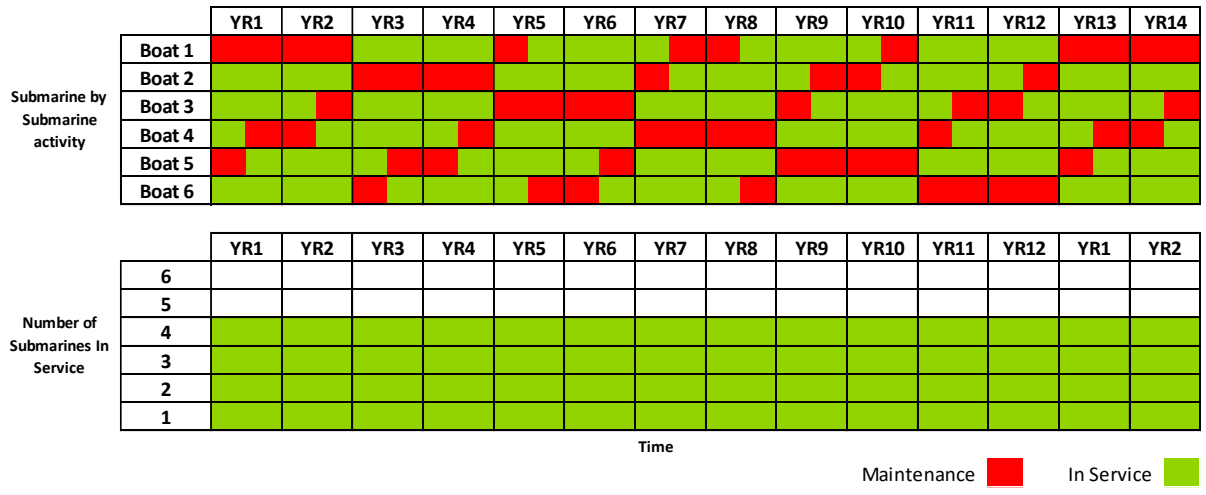


Figure 21 shows that the 10+2 UUC provides the stability required by Navy with a consistent number of submarines materially available, and a steady throughput of submarines during maintenance periods.

Figure 21 - 10+2 UUC



As a result of collective efforts, the Enterprise is forecast to achieve benchmark output in mid-2017, principally due to the reduction in planned maintenance but also contributions from a reduction in time overruns and unreliability. Whilst the 10+2 UUC delivers the benchmark MRDs, it has a number of other benefits that already put Australia ahead of benchmark performance in some significant aspects.

3.1.2 Uniquely balanced

The 10+2 UUC is uniquely balanced between meeting the needs of the Navy (usage) and the maintenance required to keep the submarine serviceable (upkeep) coupled with a level demand on industrial workforce, facilities and Navy crews. It is characterised by 10 years in commission, with in-service maintenance periods, followed by two years of FCD. For a fleet of six submarines this allows four submarines to be available consistently to the Fleet Commander in equal blocks of time for operational planning. The Review Team has not identified another cycle or submarine combination that delivers such a uniformity of MRDs in both quantity and sequence. This balance provides stability to:

- Plan and carry out Navy operations
- Undertake Navy workforce planning
- Achieve appropriate naval crewing.

Experience to date has confirmed that it also provides stability for both industrial and naval manpower utilisation, with a rhythm that delivers a consistent level of output. A recent ASPI paper called the 10 + 2 UUC "a beautiful thing" and the Review Team agrees that it provides self-evident stability at a rhythm of immense simplicity that has the capacity and resilience to deliver the required national output of "two deployable submarines at all times".

The Review Team believes there is no advantage to making any change to the current UUC and recommends that the Enterprise maintain it, citing "stability - for the conduct of operations, planning for the installations upgrades; adequate time to conduct upkeep and update; providing a level of consistency of output".

This symmetry of operations applies equally to a fleet of 12 submarines.

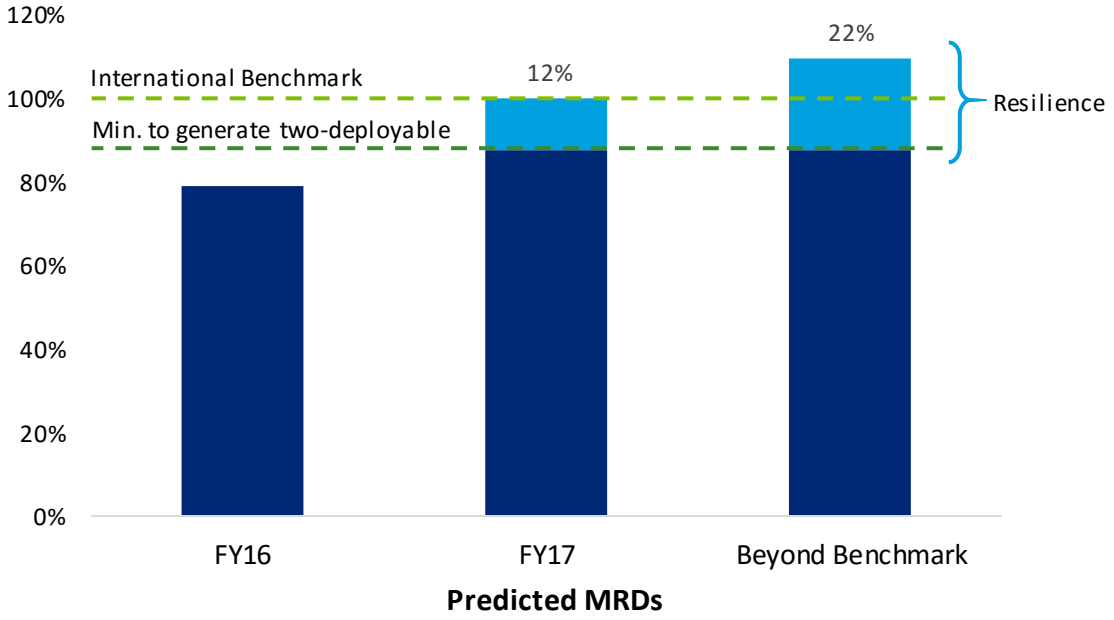
Recommendation:

Maintain the 10+2 UUC

3.1.3 Resilience

Underpinning the Navy requirement for "two deployable submarines consistently available" is a minimum number of MRDs that should enable operational requirements to be achieved. Figure 22 shows that for FY15/16, the predicted MRDs will approximate 90% of the Navy's minimum level to achieve two submarines consistently available without unintended disruptions.

Figure 22 - Improvement in resilience by going beyond benchmark



A margin exists between this minimum MRD requirement and the international benchmark. This provides a measure of resilience for unplanned events such as the *Waller* fire and its remediation or reliability issues with air turbine pumps. The anticipated achievement of international benchmark availability in FY16/17 is estimated to provide approximately 12% resilience to such events.

If materiel availability is increased beyond benchmark levels this would further increase resilience to around 22% in excess of the minimum required. However, the resilience provided at international benchmark availability is likely to be sufficient to meet Navy requirements and any additional MRDs achieved by beyond benchmark targets are potentially surplus to requirements.

3.1.4 Improvement opportunities

While availability (measured in MRDs) is expected to reach the level required by Navy in 2017, there are three primary dimensions to performance that can still be improved upon to deliver beyond benchmark performance. These dimensions are:

1. Reduce the time spent in planned maintenance
2. Reduce maintenance overruns and reduce time lost to defects
3. Reduce costs.

These dimensions were tested by the Review Team to determine their impact on the program and how effort should be applied to each in the future. The rationale for targeting reliability improvements as the priority is laid out in the following sections.

3.1.4.1 Time spent in planned maintenance

If pure availability improvement is required there are two main options to increase MRDs. Time spent in deep maintenance could be reduced or time spent in in-commission

maintenance could be reduced. Both are problematic and could be seen as shortfalls against achieving the ideal balance offered by the 10 + 2 UUC.

Reducing time in deep maintenance would disrupt the level demand on industrial workforce and would be an inefficient use of labour as there would be large periods of time where the workforce would have little to do.

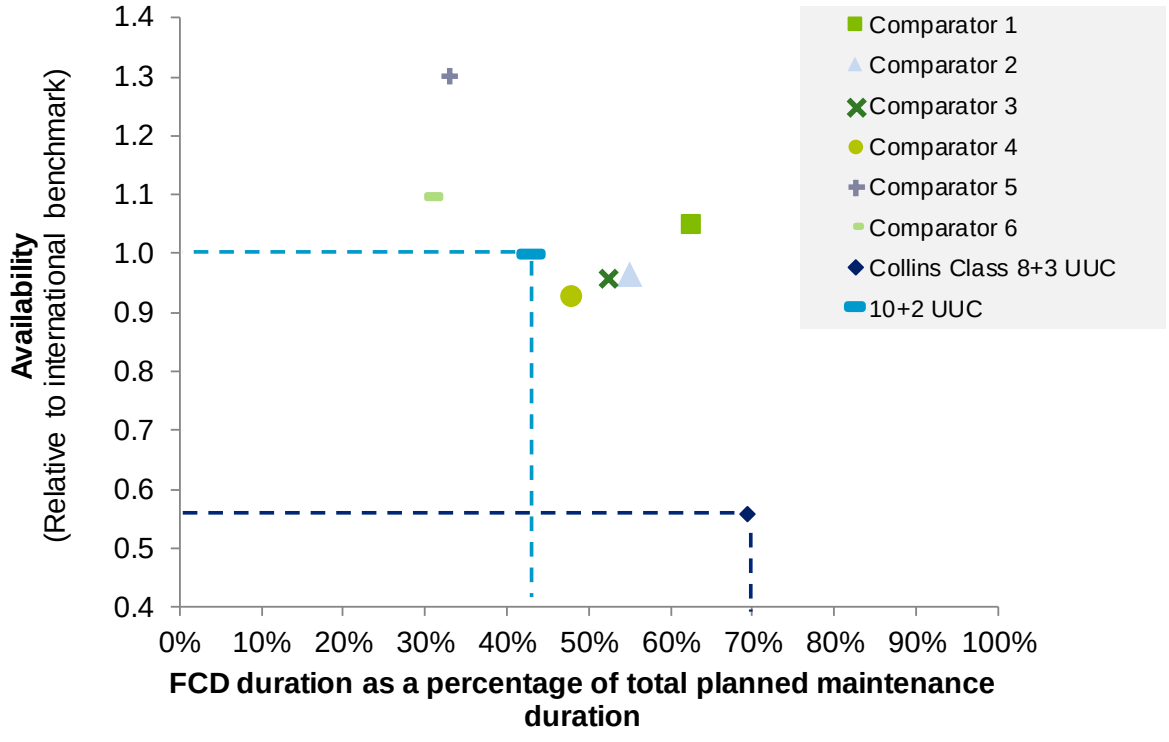
Reducing time in in-commission maintenance (such as reducing an MCD duration by 25%) would create some additional MRDs but whether they are usable is questionable. If you were to use the MRDs in one block there may be enough days to support a mission requirement. However, the operational periods either side of the MCD will then become unbalanced, making planning more difficult and introducing volatility back into the usage and upkeep pattern.

It might also place a greater proportion of maintenance into deep maintenance, which would be taking Collins back towards where it came from under the 8+3 UUC.

Figure 23 shows that the movement to the 10+2 UUC provides for more even distribution of maintenance over the operating cycle. 43% of the more intrusive and deeper maintenance is now conducted during the FCDs (down from 70%) while the remaining 57% is spread across the MCD, two IDs and four IMPs.

Submarines have multiple systems that require regular maintenance and spreading the maintenance load more evenly is in line with the “little and often” approach - the accepted mantra for successful sustainment of submarines. The IDs of six months and MCDs of 12 months duration also provide regular opportunities of sufficient duration for capability insertions between FCDs, incrementally or as complete upgrades so necessary to retain regional supremacy.

Figure 23 - Relationship between FCD maintenance split and availability



Any efficiency in the schedule could be used to:

- Incorporate capability enhancements to maintain regional superiority
- Install equipment modifications to reduce unavailability from system or equipment failures
- Provide training opportunities for Collins and SEA1000
- De-risk the SEA1000 program by creating opportunities for fitting and testing new equipment.

Recommendation:

Planned maintenance periods should not be reduced from current durations to specifically achieve additional availability; some flexibility in the working level plan is essential

3.1.4.2 Reduce maintenance overruns or time lost to defects

Maintenance overruns and time lost to defects both contribute to lost availability. Reducing maintenance overruns allows submarines to undertake operations as planned while reducing time lost to defects means fewer disruptions to operations. There is the option to either focus on one reduction or both.

The Review Team wanted to determine if one option would be better than the others and what this would mean. Table 4 shows the five scenarios to be compared.

Table 4 - Scenarios for maintenance overrun and URDEF allowances

Scenario	Maintenance Overruns	URDEF days lost
1. International benchmark overruns and defect losses	benchmark	benchmark
2. Halve overruns and maintain benchmark defect losses	half benchmark	benchmark
3. Maintain benchmark overruns, halve defect losses	benchmark	half benchmark
4. Halve overruns, halve defect losses	half benchmark	half benchmark
5. Benchmark overruns and double defect losses	benchmark	double benchmark

The Review Team used results from a logistics function or 'S-curve' model to compare the scenarios and determine the likelihood that a specific number of submarines would be materially available.

The results are plotted in Figure 24. This plot is for illustrative purposes and represents the general trend observed[10]. The vertical green dotted line for four-submarine availability intersects each scenario, and the following can be observed:

- Scenarios 2 and 3 both show about 11% improvement above benchmark
- Scenario 4 (with half the overruns and half the defect losses) shows the greatest improvement above benchmark (some 23%).

The vertical black dotted line highlights the performance when benchmark performance for defects is not met (scenario 5). The following can be observed:

- Scenario 5 shows about 14% reduction in 3 boat availability
- Scenario 5 shows about 15% reduction in 2 boat availability

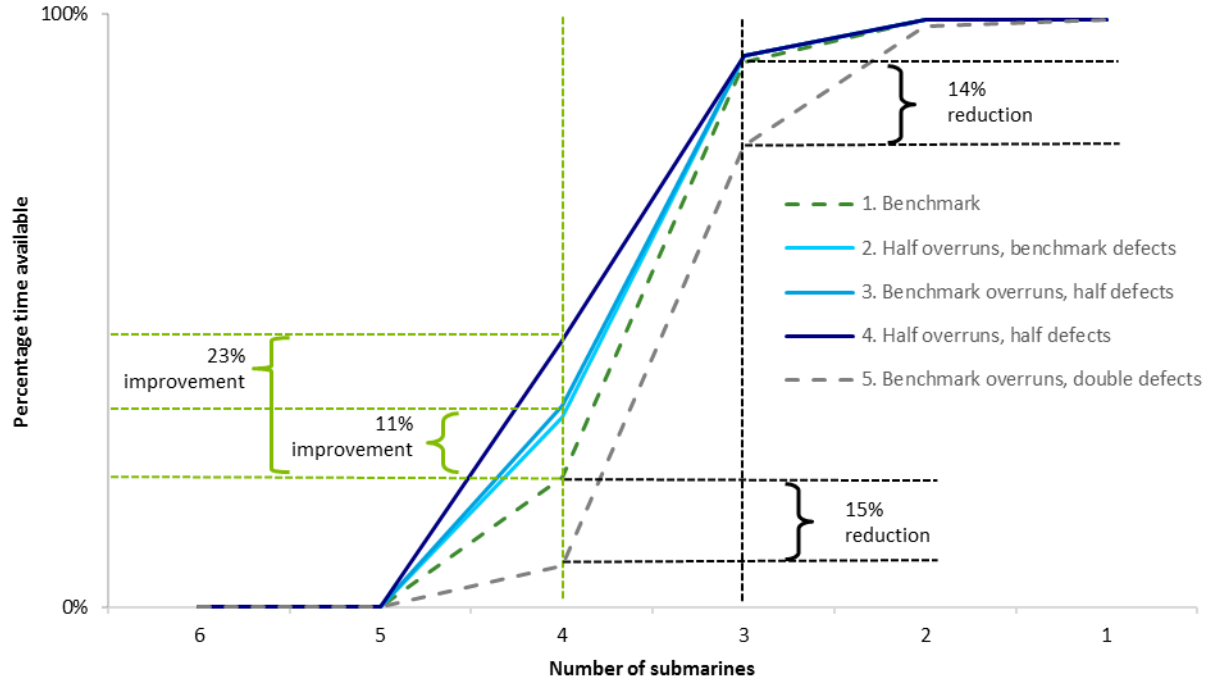
A significant loss in boat availability will occur if benchmark performance is not met and days lost to defects are allowed to increase past the specified allowance

The Review Team notes that the Enterprise has already accepted minor overruns (well within benchmark) of some maintenance activities in favour of safe completion while managing quality. This is good and responsible Enterprise behaviour. Instinct might be to aim for the greatest improvement (scenario 4) but the Review Team believes that the allowance for overruns should not be reduced, to avoid the inclination to rush the completion of maintenance periods at the expense of safety or quality.

Leaving the allowance for maintenance overruns at benchmark target as an "Enterprise regulating buffer" and reducing the allowance for days lost to defects by half describes scenario 3, and effectively aims the focus at days lost to defects.

[10] The full statistical analysis was provided to the Review Team by CMDR Lindsay Gordon RAN and included several S-curves for a variety of scenarios with an expected variation between points.

Figure 24 - Availability S Curve, variation of maintenance overrun and defect allowances



Improving days lost to defects, whilst difficult, will have the greatest benefit for the Navy. This can be achieved by incorporating more reliability improvements aimed at reducing the defect rate, and by reducing the time taken to satisfy spares demands.

The Enterprise has already improved the days lost to URDEFs from around twice benchmark days lost to defect in 2013/2014 to approximately 0.75 of benchmark in 2015/2016, which is a commendable achievement. Maintaining and even improving this performance should be a priority.

Recommendation:

The Enterprise should focus on:

- Incorporating more reliability improvements during maintenance periods
- Ensuring sufficient spares exist in the correct locations to respond to short-term demands
- Leaving the allowance for maintenance overruns at benchmark target as an "enterprise regulating buffer"

3.1.4.3 Costs and cost effectiveness

A higher submarine availability has already been achieved without any significant increase in budget provision. The efficiency of the delivery of MRDs and other services has received less focus. Previous reviews advised that efficiency should be introduced once benchmark availability has been achieved and the opportunity to do that has now arrived.

To date the Enterprise has focused on tracking dollars per MRD. This measure has shown a steady improvement as MRDs have increased whilst cost levels have been maintained. With benchmark availability being achieved the Review Team suggests that the dollar per MRD measurement has achieved its objective and there is now an opportunity to refocus the measurement. Attention should be placed on the actual dollars, and their break up and how they are being spent.

Recommendation:

Focus on cost reduction not just $/MRD

Populate the cost model and use the model to inform investment decisions and financial reallocation across the Enterprise

3.1.5 ISSC

Contracting to deliver a consistently higher output under the existing terms and conditions of the ISSC might prove to be challenging for both the Commonwealth and ASC to agree. The strategic aims of the ISSC were to migrate ASC from a "cost plus" contract to one of cost reimbursement plus a performance payment for delivering an agreed availability. All the evidence suggests that this has been implemented and prosecuted successfully.

However, while it has proved straightforward to measure the outputs beyond dispute, accounting for the cash forwarded each month is a source of potential friction. Performance payments (effectively the profit) earned cannot be reimbursed without a satisfactory resolution by the ASC and Commonwealth to account for the costs incurred - the later having potentially endless scope for seeking ever-greater levels of fidelity.

The Review Team believes that a better balance between the necessary accounting for the expenditure of public funds in a non-competitive environment and payment of performance reward (profit in this case) is required to further enshrine the relationship between client and supplier in an Enterprise culture - essentially to de-conflict accounting fidelity with payments for superior performance.

The current performance incentive of delivering 24 days above benchmark provides a level of comfort but does not necessarily let Navy do anything to better achieve its mission. The Review Team suggest the performance incentives should be refocused on fitting reliability improvements or the reduction in P1 URDEFs arising and days lost to P1 URDEFS.

Recommendation:

As the ISSC enters its third performance period, the opportunity should be taken to renegotiate terms, conditions and incentives under an increasingly collegiate Enterprise culture

4 Annex A - Recommendation progress and review of underlying performance drivers

A1.1 Recommendation progress

A1.1.1 Recommendation 1

Set a realistic target for the DMO to deliver MRDs and incorporate in the MSA

Why this recommendation is important	To ensure that the MRD in year targets were seen to be set by the customer (CN) and these were comprehended, realistic yet challenging for the budgetary provision		
Progress observed	**Evidence sighted:** • CN10 PdS Sustainment of the Collins Class Submarine dated 27 June 2013 • CN10 PdS Sustainment of the Collins Class Submarine dated 7 July 2014 • CN10 PdS Sustainment of the Collins Class Submarine dated 30 June 2015 MRD targets are set in CN10 and are being amended year-to-year to take account of increasing targets towards benchmark but also accounting for extraordinary events (e.g. HMAS *Waller* fire). It is noted that there is inconsistency in calculations for estimates between the CN10 and Collins RAM Plan in the way Maintenance Period Overruns and Time lost to URDEFs are calculated. These should be corrected.		
Risks identified	The linkage to budget provision is not firmly established and output may not be deliverable. Refer Recommendations 15 (Develop an asset management plan) and 25 (Develop a cost baseline/model and supporting processes for the sustainment program).		
Status	Coles 2014 Green	Submarine Enterprise 2016 Green	Coles 2016 Green

A1.1.2 Recommendation 2

Define a clear (unclassified) requirement for the sustainment program

Why this recommendation is important	To ensure a common and shared view is available to all across the Enterprise		
Progress observed	Originally promulgated in 2012 and continues to be repeated in related documents **Evidence sighted:** • CN/OUT/2012/991 Dated 18 October 2012 • CN/OUT/2013/1006 Dated 30 Sept.2013 • CN10 PdS dated 30 June 2015 • Submarine Workforce Growth Strategy 2014-2025		
Risks identified	None.		
Status	Coles 2014 Green	Submarine Enterprise 2016 Green	Coles 2016 Green

A1.1.3 Recommendation 3

Implement the ISSC to encourage performance-based behaviour:

i. *Review the overall structure of the ISSC to allow a greater focus on the performance management of individual maintenance periods; the management on a continuous basis of "Parent Navy" activities; support services to operational submarines.*
ii. *Set an annual target for MRDs, based upon the MSA, in the ISSC*
iii. *Apply specific senior level oversight to ensure that the specification for a maintenance period (the work scope) contains all known work and that the contract price and schedule/plan is based upon this more complete specification*
iv. *Remove or increase the thresholds for the ASC needing approval to commence emerging work. These are set far too low for an output based performance contract and should be optimised during the Transition Period*
v. *Before entering a performance period conduct an independent audit of performance and cost before formalising the metrics for the contract performance period*
vi. *Introduce early in the Transition Period a formalised process involving DMO and ASC senior management to agree adjustment events during the Transition Period*
vii. *Adopt a framework of guidelines for Make-Buy decisions and the refinement of this during the Transition Period*

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">i. Encourage major maintenance periods to be managed as projects, avoiding issues related to maintenance periods spanning end of contract and allow in-service support to be managed as a service provision.
ii. Incentivise reduced time in maintenance as well as timeliness and days lost to URDEFS.
iii. Improved definition enables a better plan and Bill of Materials (BoM) to be developed.
iv. Trial the proposed end game and not drip-feeding.
v. Provides confidence that a sound footing has been achieved.
vi. Adjustment events tend to de-focus the effectiveness of the contract performance mechanisms.
vii. Enables cost efficiency, quality improvements and ability to flex resources.</td></tr>
<tr><td>Progress observed</td><td colspan="3">There has been much progress made since implementing the ISSC, and the contract entered the performance period mid-2015. The Transformation Program Board declared this item closed on 11 Feb 2016.

In the March 2014 progress review, the Review Team identified a key risk that the successful operation of the ISSC during the performance period (the next five years) could be undermined if behaviours, even of some parts of the Enterprise, revert to the “old way” not Enterprise behaviour.

Overall, the ISSC has been successful in driving a performance based culture and in changing the behaviour of most parts of the organisations. However, the Review Team have been made aware of a small pocket lagging behind. This has been made known to the leadership so that more effort may be brought to bear to ensure consistent alignment with culture and behaviour.

It may be that to reach the next stage of performance the ISSC needs to be revisited.</td></tr>
<tr><td>Risks identified</td><td colspan="3">The recommended changes have been satisfactorily incorporated; however, there remains a risk that the successful operation of the ISSC during the upcoming performance period (next five years) could be undermined if behaviours, even of some parts of the Enterprise, revert to the “old way” not Enterprise behaviour.</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Amber</td></tr>
</table>

A1.1.4 Recommendation 4

Finance to strengthen and broaden the accountability framework for the oversight of ASC

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">To ensure that the ASC Board of Directors is focused on output and the financial metrics, and that objectives of the CEO and other senior company executives reflect that focus.</td></tr>
<tr><td>Progress observed</td><td colspan="3">In conjunction with ASC, Finance reviewed and refreshed ASC's performance monitoring and reporting arrangements in 2012-13. The arrangement put in place at this time continue to provide a successful accountability framework for oversight of ASC.

A key achievement since the last report was the successful governance separation of the ASC shipbuilding and submarine entities.

In addition, Finance continues to receive, refine and monitor ASC corporate reports. The IPS and quarterly reports have proven effective for the purposes of monitoring performance.

Evidence sighted:
• ASC Corporate Plan</td></tr>
<tr><td>Risks identified</td><td colspan="3">While the ASC focus on MRDs is clear, this could be weakened if:
• With the introduction of the future submarines, there is a risk that this may shift focus away from the Collins sustainment</td></tr>
<tr><td>Status</td><td>Coles 2014
Green</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.5 Recommendation 5

Strengthen the RAN as the Intelligent Customer for sustainment

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">Navy owns the operational output of the Submarine capability so it is vital that sustainment understands the output and delivers the materiel state needed for the output.

Navy must operate the submarines within its sustainment budget, to do this it must be fully engaged in the sustainment decision-making processes.

• Navy as experienced, educated, informed and engaged participant
• Setting realistic requirements and continuous monitoring
• Managing risks and making trade-off decisions.</td></tr>
<tr><td>Progress observed</td><td colspan="3">Navy is clearly engaged in the Enterprise, and as the customer is setting targets towards the benchmark, in collaboration with CASG and ASC in the Forward Planning Team, and using as a basis the 10+2 UUC and the IMS (now 5.4) to calculate in-year MRD targets and budgets. Budgets are estimated year by year taking into account all sustainment factors, and adjusted where necessary by making trade-off decisions within budget limits.

Navy also conducts fleet screenings twice yearly to assess progress of the CASG and to assess adjustments.

Evidence sighted:

• Enterprise Governance Framework
• Collins Class Capability Management Plan (CMP) and Statement of Operating Intent are evidence of Navy’s clear requirements for Sustainment and how this fits in to the overall capability.
• CN10 PdS dated 30 June 2015 (a strengthened document since 2013, 2014)
• CN10 Fleet Screening record of March 2016</td></tr>
<tr><td>Risks identified</td><td colspan="3">Navy could be distracted by other pressures and step back to let CASG and ASC manage submarine availability on its behalf - its role must be well embedded in Enterprise processes.

Key personnel could change and bring other priorities. Requirements could become unrealistic again.

The Forward Planning process could falter if not supported by leadership in Navy, CASG and ASC.</td></tr>
<tr><td>Status</td><td>Coles 2014
Green</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.6 Recommendation 6

A forum to bring together all suppliers within the CCSP

Why this recommendation is important	OEMs and other suppliers can often find innovative ways of removing / refurbishing / installing or setting to work equipment and systems or providing advice on reliability improvements or obsolescence issues. Giving them a regular forum (such as twice a year) to offer input will provide an advantage to the Collins sustainment program. This is more challenging for Australia where submarine suppliers are at the high-end, low volume part of the supply spectrum. This will also be an issue for the SEA 1000 program.		
Progress observed	In the March 2014 progress review, the Review Team stated that Original Equipment Manufacturers (OEMs) and other suppliers can often find innovative ways of removing / refurbishing / installing or setting to work equipment and systems or providing advice on reliability improvements or obsolescence issues. To this end, recommendation 6 was focused on the entire contractor team supporting ASC and the other Tier 1 contractors. The Transformation Program Board declared this item closed on 23 June 2014 on the basis that the Collins Class Supply Council (CSSC) has been established. The CSSC does not satisfy the recommendation as intended because the supply base is much broader than the participants at the CSSC though the initiative is excellent for bringing together the tier 1 suppliers. The Review Team have noted that the ASC has convened a supplier forum in the middle of 2015 and intends on conducting another at the end of 2016. The current intended interval is approximately 18 months and is intended to bring the ASC supply chain partners together. These two separate forums satisfy the intent of the recommendation.		
Risks identified	The CSSC and the Supplier Forum are not coordinated; a risk exists that the Supplier Forum will not be fully effective if its goals are not linked to that of the CSSC.		
Status	Coles 2014 Amber	Submarine Enterprise 2016 Green	Coles 2016 Green

A1.1.7 Recommendation 7

Co-ordinate existing initiatives, accept recommendations from the Phase 3 Report and co-ordinate implementation according to the Implementation Strategy

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">There are a large number of recommendations and other initiatives still running - all of which will contribute either directly or as an enabler to maintaining availability. The Team's intention was for the TPO to direct the implementation of recommendations and initiatives where necessary and to support their delivery whilst monitoring progress.</td></tr>
<tr><td>Progress observed</td><td colspan="3">A large number of recommendations have shown good progress and have been closed or are showing good progress toward being closed. The Review Team have however observed a number of recommendations for which the Team's assessment does not align with the Enterprise assessment and some lapses of feedback loops with regard to communications between Enterprise Governance Forums and Support teams, specifically recommendation 25 cost model.

The disestablishment of the TPO has resulted in reduced coordination or monitoring of recommendations and implementation activities.

Evidence sighted:

• A number of recommendations that have been closed that do not align with the Review Team assessment, specifically recommendations 3, 8, 12, 15, 24, and 25
• Outstanding Coles Recommendations status at July 2015 and January 2016 stated "The plan recognises that the Submarine Enterprise has matured to a point where change activities can and should be owned by those personnel who are accountable for achieving the Enterprise performance targets. Indeed, a number of change activities have occurred, or are underway, which are not captured by the Plan, rather they have been established as part of maturing Enterprise continuous improvement processes and devolved responsibilities to be managed locally and/or by relevant Enterprise governance boards and stated that The outcomes of this project could be considered mostly complete and transferred to normal business; however there remains some benefit in a coordinated approach to reporting"</td></tr>
<tr><td>Risks identified</td><td colspan="3">Existing recommendations that are important to Enterprise improvement remain in their current state and do not receive due attention limiting performance of the Enterprise.

The Enterprise does not sufficiently look forward to appropriately plan for future circumstances.</td></tr>
<tr><td>Status</td><td>Coles 2014
Red</td><td>Submarine Enterprise 2016
Amber</td><td>Coles 2016
Amber</td></tr>
</table>

A1.1.8 Recommendation 8

Develop and implement a contracting strategy

Why this recommendation is important	Alignment of the supply base to support the achievement the performance metrics within the ISSC will increase the value of the supplier base contribution to improving the overall availability of the Collins Class.		
Progress observed	The evidence presented was the same offered previously and for which the Review Team reported in March 2014 the status to be open (Amber). The Review Team stated that the contracting strategy needed amendment to cover alignment of other Tier 1 contractors other than the ASC towards the benchmarks. The Transformation Program Board declared this closed on 23 June 2014 on the basis that "*the contracting strategy is developed and is being implemented. It is outlined in the Asset Management Strategy, and amplified in the relevant higher delegate submissions as they are finalised* with evidence that *Asset Management Strategy Version 1 along with relevant Regulation 9 and Section 44 Approvals."* The Asset Management Strategy however remains in draft and has not been updated, and the Review Team have not identified evidence of a contracting strategy that is of holistic benefit, rather than the individual contract benefit. The Review Team note that the ISSC is incentivised for relevant performance measures but have been unable to find an overarching document or evidence that outlines how each of the Tier 1 contractors contribute to the success of the Submarine Enterprise. The Review Team also note that in the minutes of the Collins Supply Council, there appears to be robust discussion and direction from CASG driving beneficial behaviour; however, this appears dependent on the individual rather than a collective strategy that optimises the Enterprise. **Evidence sighted:** • Transformation Board Minutes • Collins Class Submarine In-Service Support Contract • Collins Class Submarine In-Service Support Contract Attachment E (Performance Management) • Collins Class Submarine Asset Management Strategy (v0.2, Nov 2013 unsigned) • Minutes of the Collins Supply Council Meetings • Collins Class Submarine Reliability and Asset Management Plan (ASC-12706) **Issues identified:** • Optimal incentives for the Tier 1 contractors appears driven by individuals rather than being driven by an overarching strategy that will be enduring when key personnel rotate through the organisation. This may not last beyond the tenure of the individuals		
Risks identified	There are many contracts outside the scope of the ISSC that contribute to the Enterprise objective to reach or exceed the international benchmark by 2017. These can be marshalled in several ways. The risk is that without an overarching contracting strategy these contracts will be optimised on an individual and not best overall basis.		
Status	Coles 2014 Amber	Submarine Enterprise 2016 Green	Coles 2016 Amber

A1.1.9 Recommendation 9

Create a collaborative framework known as the 'Enterprise' without diluting the individual responsibilities of the participants

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">Enterprise level behaviours will continue to deliver high levels of performance under difficult circumstances without an over reliance on the commercial frameworks.</td></tr>
<tr><td>Progress observed</td><td colspan="3">Transformation Program Board is established, and meeting regularly to make program decisions. It is supported by joint governance and working teams. This is a completely different way of working from the silos of yesteryear. Members expressed satisfaction and a preference for the collaborative style.

The latest Enterprise Board meeting was Friday 8 April 2016.

Evidence sighted:

• CN10 Pds dated 30 June 2015 showing current governance mechanisms, KPIs, KHIs, Responsibilities and Delegations
• ISSC performance framework (current)
• Minutes of Transformation Program Board dated 11 Feb 2016 and previous meetings, showing performance metrics being used by all members and collaborative discussions on resolutions to problems.</td></tr>
<tr><td>Risks identified</td><td colspan="3">Failure to continue to maintain Enterprise vision and culture and relationships may impact performance levels.</td></tr>
<tr><td>Status</td><td>Coles 2014
Green</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.10 Recommendation 10

Improve leadership skills, knowledge and experience

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">The Enterprise needs transformational change to achieve its benchmark targets.

For transformation to be effective senior leaders across the Enterprise must work together to drive change at a program-wide level.

Executive management team must lead change and drive improved performance with common purpose.</td></tr>
<tr><td>Progress observed</td><td colspan="3">The Enterprise has implemented appropriate leadership development frameworks to develop skills, knowledge and experience.

High Performance Leadership and Management Teams (HPLT) development program delivered.

ASC has implemented the ASC Leadership Framework, which identifies five leadership levels and three management levels and the associated behaviour profiles that must be met. ASC leaders and managers are assessed against this framework each year and the results captured in a performance development plan. ASC also runs regular leadership forums for all leaders. 18 forums will be run over the next 22 months.

Navy and CASG both utilise the leadership frameworks in their respective organisations. Both frameworks incorporate 6-monthly performance evaluations, 360-degree leadership assessments and leadership coaching.

The Enterprise would benefit from the implementation of a senior leaders' orientation program to support the initiation and integration and new or promoted leaders.

Evidence sighted:
• ASC Leadership Framework</td></tr>
<tr><td>Risks identified</td><td colspan="3">Transformational change will stall and Enterprise goals will not be achieved.</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.11 Recommendation 11

Defer HMAS Collins Full Cycle Docking (FCD) and improve maintenance planning

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">The original recommendation was to delay the start of HMAS Collins and develop an improved FCD schedule, and hold the original HMAS Collins end-date. This was important to progressively move to a two-year FCD and thereby enable a 10+2 UUC.</td></tr>
<tr><td>Progress observed</td><td colspan="3">The Enterprise agreed to move to an immediate transition to a two-year FCD for HMAS Farncomb and overhaul the Planned Maintenance Management Program (PMMP). As part of the 10+2 UUC program, seven major projects commenced at ASC to achieve a two-year FCD from HMAS Farncomb onwards with HMAS Collins being used as an enabler as part of the transition.

Transformation Program Board declared this closed on 23 June 2014.

HMAS Farncomb FCD anticipated complete 23 May 2016.

Evidence sighted:

• Analysis of ASC Collins FCD Prima Vera files
• All of ASC’s seven major projects completed
• PMMP overhauled, majority of MAPS closed out.</td></tr>
<tr><td>Risks identified</td><td colspan="3">None.</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.12 Recommendation 12

Develop an Asset Management Strategy for sustainment

Why this recommendation is important	The Asset Management Strategy (AMS) should connect the Asset Management Plans (the details) with the Navy's asset management policy - simply described as the capability requirement - in short, "two deployable submarines from a fleet of six". The strategy should explain how the UUC (10+2 years) will maintain the policy. The strategy should direct maintenance program planning, including improvement and upgrade work (Asset Management Plans) to be developed with the accompanying budgets. Currently these are embodied in the CASG's budget estimates.		
Progress observed	The TP Board declared this closed on 23 June 2014. However, previously the Review Team reported this as outstanding and the evidence presented (Collins Class Asset Management Strategy Version 1.0 November 2013 - unsigned, unapproved) has not changed. The Asset Management Strategy is important because it should connect the Asset Management Plans (the details) with the Navy's asset management policy - simply described as the capability requirement - in short, "two deployable submarines from a fleet of six". The draft document was good in its infancy but has not been updated to take account of progress. The strategy should explain how the 10+2 UUC will maintain the "2 deployable" policy and should direct maintenance program planning, including improvement and upgrade work (the Asset Management Plans) to be developed with the accompanying budgets.		
Risks identified	The AMS is an important document to provide governance and drive priorities in what people focus on, such as: requirement for asset management plan; knowledge of the material condition of the submarines (therefore what needs to be prioritised); accurate capture of task-level costs to support long-term decision making and availability improvement; development of appropriate skills (reliability, maintenance management, planning/scheduling); commitment to Enterprise IT strategy.		
Status	Coles 2014 Amber	Submarine Enterprise 2016 Green	Coles 2016 Amber

A1.1.13 Recommendation 13

Availability requirements in the MSA should be derived from the IMS and a working level plan generated

Why this recommendation is important	It is vital to have a 'single point of truth' for availability data, which flows down from and supports the clearly-stated operational output. All Enterprise participants must have confidence that there is a shared aim point. The authorised IMS is used as a planning template by Navy/CASG to establish annual Enterprise performance targets.		
Progress observed	Navy as the customer is setting targets in collaboration with CASG and ASC in the Forward Planning Team, and using as a basis the 10+2 UUC and the IMS (now 5.4) to calculate in-year MRD targets and budgets. Budgets are estimated year by year taking into account all sustainment factors, and adjusted where necessary by making trade-off decisions within budget limits. The availability targets (MRD) derived from IMS 5.4 are reflected in the PdS Product Operating Profile and in Enterprise KPIs in the latest CN10 PdS dated 30 June 2015. The ISSC Contract Master Schedule uses the same availability requirements, flowed down from CN10 PdS. **Evidence sighted:** • CN10 PdS dated 30 June 2015 incorporates IMS v5.4 (the latest version) • ISSC Contract Master Schedule • IMS 5.4 (the latest version being used for planning) • CN10 Fleet Screening record of March 2016		
Risks identified	The IMS change process must remain agile enough to avoid the IMS becoming rigid and therefore outdated to be of little value.		
Status	Coles 2014 Green	Submarine Enterprise 2016 Green	Coles 2016 Green

A1.1.14 Recommendation 14

Develop a through-life Capability Management Plan reflecting the updated requirement

Why this recommendation is important	The Capability Management Plan (CMP) is the top-level document that sets out how all FICs contribute to the submarine capability. CMP reflects the Navy Statement of Requirement and covers all FICs. It is endorsed and used for planning.		
Progress observed	The CMP sets the high level FIC requirements to meet the Navy Requirement (two deployable submarines). More detailed FIC requirement annexes are still in production. **Evidence sighted:** • Submarine CMP issued by Director General Submarine Capability (DGSMC), August 2013.		
Risks identified	The CMP may become less relevant if not updated annually.		
Status	Coles 2014 Green	Submarine Enterprise 2016 Green	Coles 2016 Green

A1.1.15 Recommendation 15

Define and endorse an Asset Management Plan

Why this recommendation is important	The Asset Management Plan is key to ensure the "design intent" is preserved and what upgrades or modifications (including all reliability and obsolescence issues) should be fitted and when. This will allow a bottom up budget to be compiled (the cost model) for forward budget planning and allocation, and for prioritisation and long-term decision making.		
Progress observed	The asset management plan presented for this review is the Collins Reliability and Asset Management Plan dated 24 September 2013. It has not been updated since the March 2014 progress review. While the plan refers to the CN's unclassified statement of availability and the supporting 10+2 UUC, and how reliability and obsolescence are managed, there is no description of how budgets are compiled, including planned and corrective maintenance, engineering improvements and capability insertions against the 10+2 UUC, although the Review Team understand these activities are being achieved. The plan is not properly aligned with the guidance of the public specifications or standards (see Cl 6.22 of ISO 55000). ASC is redrafting the Asset Management Plan in accordance with ISO 55000 **Evidence sighted:** • Collins Reliability and Asset Management Plan Doc No ASC-12706, 24 September 2013 • Draft Asset Management Plan March 2016, provided by ASC • Draft Forward Planning Team ToR and minutes		
Risks identified	Without a "single point of truth" with regard to submarine work activity including budget data, the overall material health of the submarines may deteriorate. This has been recognised by virtue of the development of the CASG budget estimates, the Enterprise need for a Forward Planning Team and cost model.		
Status	Coles 2014 Amber	Submarine Enterprise 2016 Green	Coles 2016 Amber

A1.1.16 Recommendation 16

Implement and complete a fully-integrated sourcing and materials supply support program under the ISSC

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">This recommendation when implemented is intended to provide the strategy for how the right supplies will be made available at the right time and in the right place. It also covers the relationships with suppliers to ensure the inventory is maintained at the right levels and early obsolescence etc. identified. The relationships can range from Vendor Managed Inventory (VMI) under a long-term contract to specific buys under a transactional arrangement; often a short-term contract. In general, and particularly where there is limited competition in the supply base, the Review Team would expect long-term support contracts would be more beneficial than short-term and VMI or Availability contracts to be the ultimate goal.</td></tr>
<tr><td>Progress observed</td><td colspan="3">The Review Team have observed that all Collins unique and common supplies (28,174 items) are now managed by the ASC which is a significant step forward. Tier 1 contractors are responsible for approximately 6% (1,892 items) of inventory. The Inventory Investment Program has kept the work pack fill rate consistent for FCD activities at 92% and reduced materiel exceptions from an average of 81 per day for HMAS Rankin to an average of 41 per day (49% reduction) for HMAS Farncomb. Two yearly polling of suppliers is proactively identifying obsolescence issues which are then dealt with under the Obsolescence Plan (draft rev 07) ASC-9400.

The Collins Class Supply Support council appears to be working harmoniously though James Fisher Defence has attended one from the last five CSSC meetings.

ASC has finalised their Sourcing Plan embarked on a program of strategic sourcing to provide supply chain resilience and assurance, and held the inaugural supplier forum to bring the ASC supply chain partners together and intends on holding the forum at 18 month intervals. These initiatives should continue to provide benefit to the Enterprise.

Evidence sighted:
• Breakdown of Collins inventory per Stock Item Holder
• Collins Class Supply Support Council meetings minutes
• Work pack fill rate
• ASC Sourcing Plan ASC- 16408 Rev00

Issues Identified
• The current material support arrangements could be further optimised by having Vendor Managed Inventory rather than the ISSC managing, the ISSC may be carrying non-optimised holdings or inventory at risk of obsolescence that would be better managed by the Tier 1 contractors
• It is not clear if the inventory will be sufficient for four submarines to be always available as the current direction is to have four submarines available 75% of the time in FY15/16</td></tr>
<tr><td>Risks identified</td><td colspan="3">Sufficient sourcing and material supply support should consider four submarines always available to the Fleet Commander</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.17 Recommendation 17

Treat defects occurring prior to the completion of Sea Acceptance Trials (SATs) as part of the contracted maintenance period

Why this recommendation is important	The standard international practice is to treat any defects occurring prior to the completion of Sea Acceptance Trials (SATs) as part of the contracted maintenance and therefore as part of the original contract.
Progress observed	Not accepted Whilst NOT ACCEPTING R17 (Treat defects occurring prior to the completion of SATS as part of the contracted maintenance and therefore as part of the original [maintenance] contract), a Key Health Indicator adopted in CN10 is 3.1.1," No. of P1 URDEFs raised between completion of planned maintenance and the award of License 5". The Enterprise does therefore measure the occurrence of P1 defects in these periods and whether attributable to appropriateness of the maintenance, quality of contracted work, or to crew deficiencies.
Risks identified	None identified
Status	Original recommendation not accepted.

A1.1.18 Recommendation 18

Review and where necessary improve procedures to audit O-level maintenance and records

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">Ships staff needs assistance in planning and execution of their work. Their knowledge of material condition of equipment is critical to correcting small defects or nursing stressed equipment before they become URDEFs, as an input to Intermediate Level Maintenance and Depot Level Maintenance plans, and to keeping the risk to operations at a manageable level between maintenance periods.

Good knowledge of material condition and planning by ships staff, and good practices for material supply will enable start/finish compliance with tasks and more efficient progress of activities. This will reduce the load on ships staff resources at the O and I level but also reduce maintenance backlogs and maintain work at manageable levels.</td></tr>
<tr><td>Progress observed</td><td colspan="3">Progress is underway but will not provide sustainable benchmark performance until it is embedded as business as usual within the SUBFOR HQ technical office.

• SUBFOR HQ established a technical planning office which oversees, educates and monitors O-Level maintenance planning, completion and record-keeping
• A program to correct maintenance shortfalls was implemented for Self-Maintenance Periods
• A five-day maintenance management course is being conducted and has trained nearly all senior sailors and engineering officers

Evidence sighted:

• Covaris/Secora-Watchfire Collins Class Fleet- Reliability Analysis-SIMS Analysis report - October 2012
• CSMP Maintenance Availability Planning and Review (End to End) Process V1-5 - January 2014
• Collins Total Open MCR Count of 2 May 2016
• End-to-end SMP Planning Matrix Ver 3.0
• MSA KPI/KHI Master Open MCR count.</td></tr>
<tr><td>Risks identified</td><td colspan="3">That the procedures and practices being implemented will not be embedded as business as usual within the SUBFOR HQ and that the momentum being developed will be lost, that ships staff skills, knowledge and experience will not be improved.</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.19 Recommendation 19

Create a Head of the Submarine Profession

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">This action establishes a single point of accountability in Navy for the capability output. It makes clear CN's ultimate role as Capability Manager and the delegation of this responsibility to DGSMC.</td></tr>
<tr><td>Progress observed</td><td colspan="3">CN Directive designates DGSMC as 'Head of the Submarine Profession'.

Heads of all Fundamental Inputs to the Submarine capability liaise routinely with DGSMC staff.

Evidence sighted:

• CN Directive 3/12 to DGSMC establishes him as Head of the Submarine Profession and Navy lead in the Submarine Enterprise
• CN10 June 2015 PdS Annex A to Section 6, sets out DGSMC's responsibilities as the Customer in the sustainment Enterprise—with some obligations as asset owner—unique in that DGSMC is not a Force Commander but delegates a number of responsibilities to COMSUB.
• CN10 lists delegations from DGSMC to subordinates
• The Submarine CMP issued by DGSMC describes how FICs are managed to deliver the capability output.</td></tr>
<tr><td>Risks identified</td><td colspan="3">FIC requirements will be determined from a range of organisations across the submarine community leading to confusion and uncertain outputs.</td></tr>
<tr><td>Status</td><td>Coles 2014
Green</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.20 Recommendation 20

Develop a clear line of authority for maintenance of the design intent

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">Necessary to remove ambiguity in responsibility and provide a single line of authority, also to prevent the seeking of “alternative” approval through Fleet Engineer.</td></tr>
<tr><td>Progress observed</td><td colspan="3">The Chief Engineer position is well established within the Submarine Sustainment Group as the head of the Submarine Authorised Engineering Organisation (AEO). Engineers from ASC and Raytheon now hold Level 2 Engineering Authority within the AEO, and there is intent to similarly integrate other industry partners.

Evidence sighted:
MP11750 Submarines Group Engineering Management Plan, v2.0, 14th May 2014. Establishes the Chief Engineer as the head of the Submarine AEO. Defines the line of authority for maintenance of the Material Certification Basis and Operational Certification Basis.
Technical Directive 16-016, Change Management of the Technical Component of the Collins Certification Basis, 16th February 2016. Provides policy guidance to supplement the NTRS for assessment, authorisation and approval of changes to the Certification Basis.
CN10, 30th June 2015. DGSC is responsible for maintaining accreditation with Head Navy Engineering as an Authorised Engineering Organisation under the Naval Technical Regulatory System, while maintaining ISO9001 accreditation (#37, p 29).
LOG(SMC) 12-0-015 - CSMP Engineering Authority Delegations Register, 19th April 2016.</td></tr>
<tr><td>Risks identified</td><td colspan="3">The Coles Phase 4 report identified risks due to DSME workforce sustainability. While there is now intent to recruit senior and junior engineers, the ability to fill and retain these roles will be challenged by competing demands from the FSM program.

Proposed changes to the NTRF to an evolved Navy Seaworthiness model may impact the AEO construct and the roles and responsibilities of its members. The transition between these frameworks must be managed appropriately to maintain clear lines of authority.</td></tr>
<tr><td>Status</td><td>Coles 2014
Green</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.21 Recommendation 21

Develop and implement a workforce strategy to specifically address skills shortages at the management level

Why this recommendation is important	To ensure that the staff across the Enterprise have the skills, competence and knowledge to undertake the new tasks following transformation of the roles and responsibilities.
Progress observed	Significant progress has been made across the Enterprise with Navy, CASG and ASC all developing and implementing workforce strategies/plans. ASC should be commended for adopting the Australian Standard 5620:2015 for workforce planning. Navy and CASG have developed strategic workforce planning documents outlining workforce requirements to 2025 and 2035 respectively, which take into account future submarine workforce considerations. These plans clearly identify the number of staff required in specific functions/work areas e.g. Ashore based workforce, SPO's etc. Neither document currently contains information relating to critical role segmentation (other than submariners) or the attraction and retention strategies, however Navy is in the process of approving the Submarine Deliberately Differentiated Package to attract and retain submariners. CASG informed the Review Team that this information exists informally and will be progressed into formal plans in the future. ASC's plan is operationally focused and outlines detailed workforce requirements for the Collins to 2018 (ASC currently undertake 3 year rolling workforce planning). It should be noted that ASC have begun future submarine workforce planning and this is contained in a separate document. While the ASC time horizons are short in nature, there is clear articulation of workforce challenges, staffing requirements, critical role segmentation and associated interventions. While the three Enterprise documents vary in time horizons, content and format, they demonstrate a maturing of the Enterprise's workforce planning capability and contain the necessary planning required to manage the workforce in the short-term. **Evidence sighted:** • Navy Submarine Workforce Growth Strategy 2014 - 2025 • Navy Submarine Workforce Requirements Plan 2015 - 2025 Plan Delphinus • 07 6- 160121 - Submarine Deliberately Differentiated Package - Communications Plan (Version 2) • CASG Initial Submarine Workforce Plan: Collins, Combat Systems Acquisition, Future Submarines • Collins Program Workforce Plan 2015-2018
Risks identified	There is no Enterprise-wide workforce strategy and plan for a total Collins and future submarine workforce. This is critical given that organisations within the Enterprise and DCNS (and associated suppliers/contractors etc.) will be recruiting from the same labour market. This is likely to impact CASG the most given the imbalance of purchasing power between CASG, ASC and DCNS. There are no formal Enterprise workforce planning forums. ASC does not have a total workforce plan for Collins and future submarines (it is noted that planning is underway to develop one).

	Navy and CASG have not undertaken critical role segmentation to determine workforce risks and associated interventions. CASG does not have formal attraction and retention strategies, which will be important in supporting the APS attract and retain the optimal workforce Navy and CASG do not have internal workforce planning resources solely dedicated to submarine workforce planning. Relying on wider-Defence workforce planning services may not deliver the workforce planning capability and maturity required to manage the unique nature of the Collins and future submarine workforce		
Status	Coles 2014 Red	Submarine Enterprise 2016 Amber	Coles 2016 Green

A1.1.22 Recommendation 22

Develop and implement a plan to resolve loss of Naval Engineering skills

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">Strong Naval Engineering skills are central to Navy's role as Informed Customer, CASG's role as Intelligent Buyer and Industry as the Skilled Provider.

A submarine is a sophisticated machine and requires a high level of electrical and mechanical engineering knowledge and skills to maintain it in a safe and reliable condition. In particular, experience in power electrics (main storage batteries, generators, motors and switchgear) is crucial.

The harsh operating environment also places extreme demands on many mechanical systems, including the diesel-generators and propulsion. The submarine is also highly reliant on others, including high pressure air, hydraulics and cooling.

This is especially critical during sea training days and safety and operational readiness evaluations when failures are injected by the training staff to test the ability of the crew to cope with emergencies.

Reconfiguration and operation of high energy systems should be supervised by qualified senior staff who are properly trained, and step-by-step check-off lists used to counter the effects of fatigue and stress.

This program is well underway but the Review Team have been advised that it is "only half-way there". The Review Team strongly supports this initiative and encourages its progress.</td></tr>
<tr><td>Progress observed</td><td colspan="3">The Navy Submarine Capability Improvement Program has been in place since 2012 and focuses on the upskilling of Marine Technician Submarines (MTSM) and Electronics Technician (ETSM) categories with training and outplacement programs.

The Transformation Board agreed to close this out on 18 February 2015, however the Review Team have found that this recommendation is still progressing.

The Capability Improvement Program implemented by Navy is an effective plan. However, resolving the loss of engineering skills is a task that is likely to make multiple years, if not a decade, to resolve.

This recommendation has been rated Amber to reflect that Navy has not yet resolved this issue and will need to continue to implement and monitor the plan until such time that Navy has the full complement of engineering skills.

Evidence sighted:
• Submarine Technical workforce up-skilling and repatriation of maintenance to members in uniform - Project Implementation Plan - June 2012
• SMCIP Progress reports</td></tr>
<tr><td>Risks identified</td><td colspan="3">Lack of a clear monitoring framework in place to measure improvements.</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Amber</td></tr>
</table>

A1.1.23 Recommendation 23

Improve adequacy of the Ships Information System and implement the use of onboard portable technology to aid in maintenance efficiency

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">Ships staff need assistance in conducting and recording maintenance. Maintenance records, especially at O-level, are critical to understanding the material condition of the equipment, the correct planning of maintenance availabilities, and the avoidance of small defects becoming URDEFs. This applies to simple maintenance routines such as cleaning and inspection as much as to more complex procedures.</td></tr>
<tr><td>Progress observed</td><td colspan="3">This was closed by the Transformation Board in February 2016.

The Review Team have been informed that:

• The addition of the tablets was made easier by the discontinuation of SIMS 6 and continuing the development of SIMS 5.
• HMAS Rankin has been using tablets for some 12 months, HMAS Dechaineux has been issued tablets, HMAS Collins and other submarines are being issued with tablets as they exit major maintenance periods.
• Crews are extremely happy with the tablets - they have ready access to the ABRs (books, drawings, etc.) and maintenance recording has been made very easy.

Evidence sighted:

• PDB Approval: SIMS Way Ahead - continuation with SIMS 5
• Unclassified DRAFT Collins Class IT Strategy 2013-FIN copy
• Unclassified Dec TPB Paper Project I15 SIMS 6 deployment to DPN 13Dec2013 copy
• SIMS Decision Brief
• SIMS Evaluation Paper 1 0
• Strategy Foreword
• Digital Tablets

While the issue of tablets is not yet complete, the Review Team assesses this issue as complete.</td></tr>
<tr><td>Risks identified</td><td colspan="3">The digital tablets are not easy to use by the crews and maintenance recording is not improved.</td></tr>
<tr><td>Status</td><td>Coles 2014
Amber</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Green</td></tr>
</table>

A1.1.24 Recommendation 24

Develop an Enterprise-wide IT strategy and information management strategy

<table>
<tr><td>Why this recommendation is important</td><td colspan="3">The Enterprise IT Strategy was intended to address the issue of a lack of single set of accurate information to improve decision making. The Collins IT environment requires the rekeying of information which wastes time, introduces errors in data and data latency which are difficult to detect and correct, which negates good control of records and materials.</td></tr>
<tr><td>Progress observed</td><td colspan="3">The Transformation Program Board agreed to close this recommendation on 18 February 2015 on the basis that progress was being made. Enterprise IT focus is aimed at improving integration of existing systems rather than instituting a single source of truth. The single set of accurate information is managed by respecting the value chain and seeking the appropriate persons to provide information.
Significant progress has been made in the IT space in terms of:
SIMS 5 has been migrated to the DRN and Tier 1 contractors receiving DRN Note SIMS 6 was discontinued after SIMS 5 was migrated. SIMS 5 is currently at release #12 with release #13 scheduled for late 2016.
Maintenance tablets are in use on HMAS Rankin, Dechaineux, and will soon be released on HMAS Collins. These tablets are integrated with the SIMS system
Plans by the end of CY 16 ASC/Defence connectivity (CONTROL/Military Integrated Logistics Information System (MILIS) should be established reducing the need to manually update MILIS with information
Evidence sighted:
Draft Collins IT Strategy, February 2013
Project I15: SIMS/ASC integration - SIMS #6 (DRN), December 2013
SM Group Joint Management Plan (SMG-SUS) 01-016 dated April 2016 about to be signed.
Issues identified:
There is no consolidated IT plan that describes the schedule of update for IT systems and how they trade off against one another
Currently there is no list of risks / priorities describing the IT solutions and systems (For example, NAVALLOW is currently used to manage APL and Ships Allowance List (SAL), however SIMS is capable of storing this information therefore NAVALLOW might not be necessary and is requiring rekeying of information)
The Review Team assesses this Recommendation 24 as Amber as it is not materially complete, although it is well underway and heading in the right direction.</td></tr>
<tr><td>Risks identified</td><td colspan="3">The Enterprise may not be able to drive further efficiencies after benchmark availability has been achieved because a coordinated method prioritising IT upgrades, assessing issues, risks, and opportunities for improvement is not in place.</td></tr>
<tr><td>Status</td><td>Coles 2014
Red</td><td>Submarine Enterprise 2016
Green</td><td>Coles 2016
Amber</td></tr>
</table>

A1.1.25 Recommendation 25

Develop a cost baseline/model and supporting processes for the sustainment program

Why this recommendation is important	An Enterprise level cost model will provide an essential tool for the Enterprise to proactively manage cost. It will provide a complete understanding of the entire costs across the Enterprise linked to the outputs and will underpin the balancing of expenditure across the Enterprise (maximize bang for the buck) and direct efficiency initiatives to best effect.		
Progress observed	An Enterprise cost model was developed and partially populated with data. However, the Review Team was unable to easily identify how this tool is being used to manage Enterprise costs. While a cost model would not contribute to timely achievement of FCD periods in the short term, it provides the opportunity to more accurately make investment decisions and trade-offs. **Evidence sighted:** • Collins cost model specifications and user guides • Transformation board paper 3A outstanding Coles recommendations Status as at 17 June 2014, states that the model is ready and that "*the Forward Planning Team (FPT) will be well positioned to utilise the model from 1 July 2014, supported by DMO's finance team*" • Transformation board minutes 18 Feb 2015 states that Action "*item 12.5 closed - cost model is populated and funding scenarios are being tested against the model via the FWD Planning team*" • The Forward Planning Team minutes 28 April 2015 stated "*it was understood that cost sheets from suppliers were not updated and no suppliers had been contracted to provide updates to their own information…it was not understood how the cost model could be effective, as it did not appear that a support framework had been established*". Despite a recommendation for a part time cost modeller to maintain the information, no further action was taken.		
Risks identified	The management of cost across the Enterprise will not be managed in the most effective manner. A cost model provides the opportunity to more accurately make investment decisions and trade-offs. Those involved with the delivery of the cost model services should be core users, and independent assurance should be provided by the Central Finance Group in CASG		
Status	Coles 2014 Red	Submarine Enterprise 2016 Green	Coles 2016 Amber

4.1 Annex A.2 Review of Underlying Performance Drivers

4.1.1 Governance and strategy

4.1.1.1 Operational requirements effectively stated

CN10 and cascading documents contain the statement, “two deployable submarines consistently available, with four submarines available to the Fleet Commander and of these four, three submarines consistently available for tasking with one in shorter term maintenance and two submarines in long term maintenance and upgrade”. The operational requirement is clearly and effectively stated across the enterprise.

4.1.1.2 Clear sustainment objective

The Review Team note that the KPIs and KHIs in the CN10 PdS are cascaded to the ISSC performance framework. The enterprise performance framework is reflected in the ISSC to incentivise the desired behaviours.

4.1.1.3 Overarching asset management strategy

The Review Team note the Collins Class AMS remains in draft. The Team suggests the 10+2 UUC should be included at the core of the AMS and that the strategy should direct maintenance program planning, including update, and upgrade work (Asset Management Plans) to be developed with their accompanying budgets.

The document as presented (see recommendation 8) does not describe how the 10+2 UUC will support the “two deployable submarines consistently available from a fleet of six” asset management policy, nor does it direct how the 10+2 UUC is to be applied to upkeep, update and upgrade plans to develop the budget. This document should form the core of the 10+2 UUC and describe the upkeep, update, and upgrade strategy within this framework.

4.1.1.4 Cooperative and collegiate enterprise

The Review Team has observed a significant improvement in the cooperative behaviour across the Enterprise, particularly in the way that challenges are being resolved. The performance payment for the preceding period has not been agreed between CASG and the ISSC through the true-up method and the Review Team conclude that this is affecting cooperative and collegiate behaviour. The requirement for accounting for expenditure of public funds by the ASC is an obligation that cannot nor must not be sidestepped. Any performance payment should be agreed and finalised as a priority.

4.1.1.5 Effective governance

The Submarine Enterprise Governance Framework has been approved since the March 2014 progress review. It is clear and unambiguous.

4.1.1.6 Sustainment costs actively managed

An Enterprise cost model was developed and partially populated with data. However, the Review Team was unable to easily identify how this tool is being used to manage Enterprise costs. While a cost model would not contribute to timely achievement of FCD periods in the short term, it provides the opportunity to more accurately make investment decisions and trade-offs.

4.1.1.7 Performance driven culture

CN10 sets realistic targets cascaded into the ISSC which is now in performance period two. As the ISSC enters its third performance period, the opportunity should be taken to renegotiate terms, conditions and incentives under an increasingly collegiate Enterprise culture.

4.1.2 Capability

4.1.2.1 Capability upgrades identified early

Capability upgrades have been planned until end-of-life and some $2billion is included in the Defence White Paper and Defence Integrated Investment Plan 2016.

4.1.3 Submarines sufficiently crewed

The Review Team notes that the fifth crew was assembled in January 2016, standing by HMAS *Collins*. This is reported in the monthly reports to the Navy Reform Board.

4.1.4 Engineering

4.1.4.1 Clear design authority

The Team has observed engineering delegations and certificates to Level 2 engineers in Navy, CASG, ASC and Raytheon Australia. Engineering delegations are clear and unambiguous and the 'engineering goodness' respected.

4.1.4.2 Reliability and obsolescence managed

A properly funded and managed reliability and obsolescence program is required to ensure an ageing submarine is able to sustain benchmark performance. The reliability program is managed by the Collins SPO (CASG) and is divided into the platform and combat system programs.

The Platform Sustainment Steering Group (PSSG) and Combat Sustainment Steering Group (CSSG) are responsible for setting program priorities and providing governance.

ASC manages platform obsolescence in accordance with their plan. Of the 90,000 parts tracked by the ASC, approximately 60,000 are in stock, and approximately 8,000 are subject to obsolescence. Funding is available to conduct the polls. Funding to manage identified obsolescence concerns is sought on a Survey and Quote basis.

The platform reliability program is managed by the ASC as defined in the Reliability and Asset Management Plan. The Team has been advised by ASC that this plan is subject to external review including compliance to ISO 55000 standards for asset management, which is seen as a positive step to improving the reliability program in place.

Combat system reliability and obsolescence is overseen by CASG through the Combat Systems Steering Group. Tier 1 contractors are responsible for individual assessments of their systems. Each year, CASG and the Tier 1 contractors convene for the Annual Planning Workshop where priorities for sustainment are set. These priorities are transformed into the annual plans which are monitored by CASG.

The Review Team has analysed the configuration change proposals and configuration change items in SIMS and note that Obsolescence and Reliability engineering improvements have identified items for management and incorporation into maintenance periods.

Reliability CCIs should be targeted for inclusion into Maintenance Availability Periods.

Future funding for obsolescence concerns and reliability improvements should be estimated and included into the budget.

4.1.4.3 Appropriate preventative maintenance plan

The Team has inspected the balance of corrective and preventative work records in SIMS and conclude there is an appropriate balance in the planned maintenance program plan between preventive and reactive (corrective) work.

4.1.4.4 Design configuration accurate

Controlling the configuration is the responsibility of the Configuration Control Board (CCB) which continue to be held monthly as evidenced by the CCB minutes. The CCB considers Configuration Change Proposals and concessions and is supported by the Platform Systems Steering Group and Combat Systems Steering Group. The Team suggest the monthly frequency is appropriate and should remain.

The Collins Class Configuration Management Plan (revision 2.0, 2014) has been released since the 2014 progress review. It defines how the configuration of the Collins Class is to be controlled and approved. The Review Team have inspected this document and its structure is based upon good practice. Requirements for Physical Configuration Audits (PCA) should be tightened to include regular PCA activities on systems that have a defined safety impact to ensure that their configuration remains as documented.

4.1.4.5 Quick approvals

Analysis shows that there are delays implementing recommendations to address DMDRs and therefore few CCPs are progressing to review stage.

This requires investigation and could be due to financial constraints or procedures, rather than with engineering management.

CCPs and engineering improvement work from DMDRs should be progressed faster than current trends.

4.1.4.6 Effective and efficient asset management plan

The AMP presented by CASG as evidence was the same as presented in 2014 (the Collins Reliability and Asset Management Plan Doc No ASC-12706, 24 September 2013). However, ASC is developing a new AMP based on the principles of ISO 55000. The AMP review at ASC is a positive step toward achieving an effective and efficient asset management plan.

4.1.5 Planning

4.1.5.1 Working level master plan

The IMS (version 5.4) reflects the 10+2 UUC and is structured to deliver Navy's MRD target expressed in the CN10 PdS. Capability insertions are planned and integrated into the IMS over a seven-year window, which is a greater length of time than the current performance period of the ISSC. Benchmark availability is achieved through maintaining the 10+2 UUC. The stability afforded by the 10+2 UUC provides the opportunity for capability insertion.

The adjustment of the IMS to accommodate the HMAS *Waller* fire is an example of the master plan being a dynamic working level document.

4.1.5.2 Work scope is accurate

Accurately forecasting maintenance work scope is critical to ensure that tasks are completed on time, and within resource constraints, and also to ensure that sufficient materials can be ordered to enable maintenance execution.

The Review Team notes an improvement in work scope accuracy for an FCD of 62% to 73% and an ID of 74% to 84%. This improvement is a result of a change in the way planning has been conducted with work packs being created for expected corrective maintenance and a reduction in unplanned manufacturing tasks. This is likely due to a combination of the rotable spares pool and work being taken off submarine and performed in the workshops. Performing tasks in the workshops provides greater flexibility through easier planning and execution of work.

It is expected that this result will improve during the HMAS *Collins* FCD with the lessons from HMAS *Farncomb*'s FCD work scope being incorporated. There are a greater number of tasks on HMAS *Collins* and this is reflective of an update in planning whereby the work orders have been split into remove, repair, and replace.

4.1.5.3 Accurate BoM

ASC have updated their Bill of Materials (BoM) accuracy measure to better measure planning performance and also to reduce the amount of waste in a maintenance period. The measure looks at whether the required materials were listed in the BoM 12 weeks prior to the start of the work pack and at the start of the work pack.

An improvement in the materials planned and used from 58% to 69% has been achieved. This reflects the work undertaken to update work packs with the actual materials used during the FCD.

Inclusion of this metric in the ISSC performance framework and having the ASC Operations department own the metric are important steps toward reducing wastage and the amount of material demanded late. Such ownership was not in place during the last progress review and is evidence of a learning organisation with continuous improvement loops in place.

4.1.5.4 Material completeness

Material completeness is defined as the amount of materials that were forecast as being required at work scope freeze (MACP2). It is a lag measure that can only be calculated at planned maintenance completion. Table 5 shows a small improvement in material completeness between FCDs for HMAS *Rankin* and HMAS *Farncomb*. Material completeness graphed over time for the two FCDs is shown in Figure 25 for HMAS *Rankin* and Figure 26 for HMAS *Farncomb*. The Review Team does not yet consider this to be high performance. With only 32% of material completeness at the start of an FCD, there is insufficient time to purchase long lead items and there is too much materials planning activity after FCD commencement. Now that demand accuracy has improved, we expect the material completeness to improve for HMAS *Collins*.

Table 5 - Material completeness

	HMAS *Rankin* FCD		HMAS *Farncomb* FCD	
Activity	Date	Material completeness	Date	Material completeness
Initial BoM explosion	17/07/2010	16%	20/10/2013	21%
MACP2	13/11/2010	27%	12/04/2014	30%
FCD Start	01/01/2011	28%	31/05/2014	32%

ASC should measure material completeness or a similar BoM accuracy measure at the start of a docking activity to track improved performance in BoM accuracy at a longer lead time than 12 weeks.

Figure 25 - Material completeness for HMAS *Rankin*

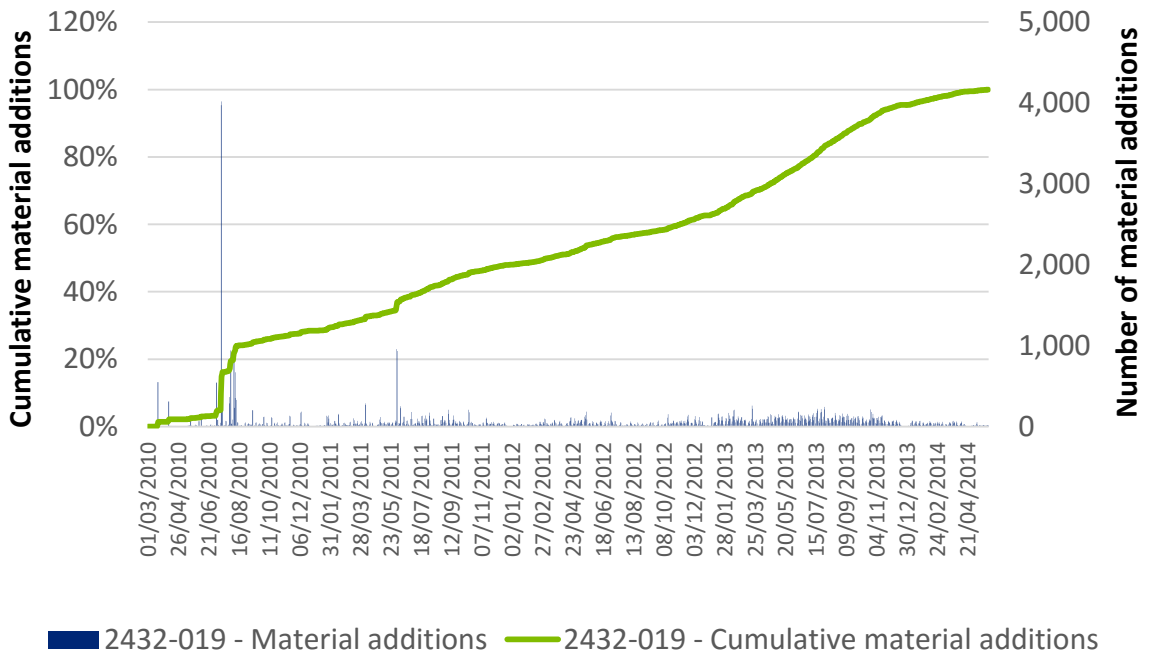
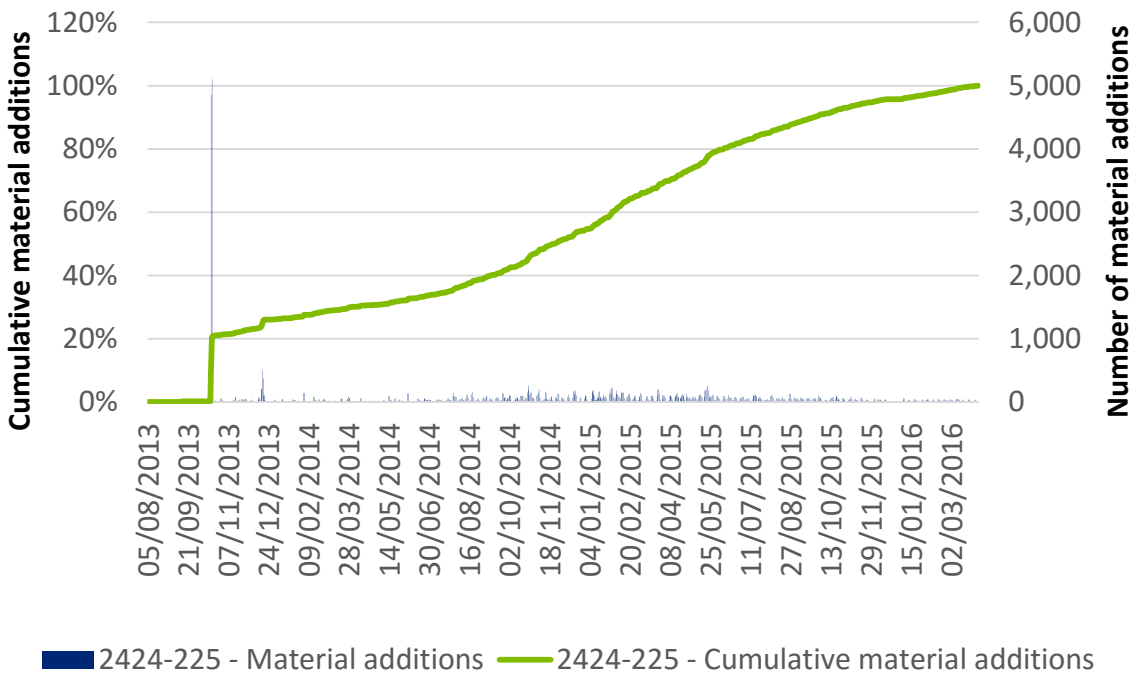


Figure 26 - Material completeness for HMAS *Farncomb*



4.1.6 Supply

The Collins supply chain is a Contractor Managed Commonwealth Asset supply chain with the distribution shown in Table 6. These numbers are consistent with the March 2014 progress review. Importantly, Tier 1 contractors are responsible for items related to their respective systems.

Table 6 - Supply chain responsibilities

Category	Item	%	Manager
Platform	27,351	91%	ASC
Combat	1,345	4%	Raytheon
Commons	823	3%	ASC
Periscopes	227	1%	BAE Systems
Sonar	320	1%	Thales
Total	**30,066**	**100%**	

4.1.6.1 On time purchase orders

Table 7 shows on-time purchase order placement has improved since the March 2014 progress review with the numbers remaining consistent over the previous two years. Previously the Review Team had reported 89% of RFQs were issued within five days and 84% of POs placed within 14 days. In the 2012 period, the number of quotations issued within five days was approximately 25-70%.

These continued improvements reflect the current arrangements in place to have ASC responsible for the supply chain and should be considered a success by the Enterprise.

The Team notes, through discussions with the ASC Supply department, that automatic order placement is being considered for contracted components which is likely to increase the on time purchase orders.

Table 7 - On time purchase orders

Time period	# purchase orders	% RFQ issued within 5 days	% POs issued within 14 days	# PO lines
Jan 14 - Jan 15	11315	91%	88%	46,030
Jan 15 - Jan 16	10871	92%	87%	31,253

4.1.6.2 High delivery performance

ASC supplier delivery performance has been assessed in the same manner as the March 2014 progress review. Table 8 shows that the Delivered In Full On Time to Quality (DIFOTQ) rate for purchase orders has declined from 92% to 84%. Of note, during HMAS *Farncomb*'s FCD there was a hose project to increase life for 10+2 UUC which failed, requiring the hoses to be re-procured and resulting in an additional 1.6% of hoses quarantined. This contributed to a drop in performance.

Repairs in Table 9 showed a significant increase over the 2014 calendar year to 80% DIFOTQ. However, this has reduced to 74% over the 2015 period. The weighted and combined DIFOTQ rate in Table 10 has remained constant at 83% largely driven by an improvement in on time performance for repaired items.

The Review Team observed that while the DIFOTQ rate has fallen, the demands on the supply chain are higher due to the two-year FCD for HMAS *Farncomb*, MCDs and HMAS *Waller* fire repairs.

The Team suggests a target rate of 95% DIFOTQ would represent leading performance with improvement to repairable items being the area representing the largest improvement.

Table 8 - Supply chain delivery performance for Purchase Orders[11]

Time	# deliveries	% quarantined	% delivered in full	% delivered on time	% delivered in full, on time, to quality
Jan 12 - Jan 14	31,362	1.5%	99%	93%	91%
Jan 14 - Jan 15	23,837	2.1%	100%	91%	89%
Jan 15 - Jan 16	20,854	3.1%	100%	86%	84%

[11] The quarantined inventory amount from the November 2012 report has been recalculated to be consistent with current ASC reporting

Table 9 - Supply chain performance for Repairable Items[11]

Time	# deliveries	% quarantined	% delivered in full	% delivered on time	% delivered in full, on time, to quality
Jan 12 - Jan 14	1,238	2.0%	99%	62%	60%
Jan 14 - Jan 15	1,909	9%	99%	89%	80%
Jan 15 - Jan 16	2,684	1.5%	98%	77%	74%

Table 10 - Combined supply chain performance[11]

Time	# deliveries	% quarantined	% delivered in full	% delivered on time	% delivered in full, on time, to quality
Jan 12 - Jan 14	32600	1.5	99%	92%	89%
Jan 14 - Jan 15	25,746	2.7%	100%	91%	88%
Jan 15 - Jan 16	23,538	2.9%	100%	85%	83%

4.1.6.3 Supplier relationships managed

The Review Team noted in the March 2014 progress review that to achieve benchmark supplier performance, active supplier relationship management should be put in place and that these improvements could come from long term partnerships with key suppliers. The ASC Supply department has embarked upon a strategic sourcing project based on a supplier segmentation in order to achieve this. This is a significantly positive step.

A Collins Supplier Forum began in the middle of 2015 and the ASC intends to conduct another at the end of 2016. The intended interval is approximately 18 months and is intended to bring the ASC supply chain partners together.

4.1.6.4 Effective inventory policy

Since the March 2014 progress review, ASC have continued the Inventory Investment Plan (IIP) to take into account material requirements for Maintenance Availability Periods, satisfaction of URDEF requirements, and parts required for the Ships Allowance List (SAL).

Materials allowances have been determined through historical URDEF demands rates inclusive of repair times, requirements for maintenance periods, cannibalisation data, and Subject Matter Expert input. The IIP remains phased to the IMS to ensure that sufficient spares remain available throughout each planned maintenance period.

It is the Team's view that the IIP is effective as demonstrated by the supply chain's ability to respond to late demands or urgent requests for parts to rectify defects. However, to remain effective the IIP requires sufficient funding.

Current estimates to complete the rotable and URDEF spares pool to 100% require an additional $45M investment. The recent CCP funding injection has mitigated the projected IIP shortfall in FY16/17 from $26.7M to a maximum exposure of $4.6M.

4.1.6.5 Inventory accuracy high

146,000 items of inventory are tracked to approximately 99% accuracy within the ASC. There is a requirement to cascade this into MILIS for Commonwealth accounting purposes. This requires a significant amount of personnel effort, and the requirement to conduct it post-hoc means the accuracy for MILIS is significantly lower at 78.7%. The requirement to conduct post-event alignments to MILIS to the current level of fidelity provides little benefit to the supply chain.

Noting the Commonwealth must have the data for accounting purposes, increasing the alignment efficiency is worthwhile and there is a program to increase the automation of this by improving the data transfer between Control and MILIS. Consideration should be given to further improvements, for example reducing the number of bins in MILIS (e.g. SA and WA).

4.1.6.6 Sufficient parts available in the warehouse

The ASC continues to plan inventory holdings to ensure that materiel is available to account for demands from various maintenance activities. Measuring the ability of the supply chain to meet Operation's demand for materiel is measured by the work pack fill rate.

Figure 27 shows the work pack fill rate for the HMAS *Rankin* and HMAS *Farncomb* FCDs. The fill rate has remained constant at 92.1% however the average number of open work packs has reduced from an average of 1017 for HMAS *Rankin* to 518 for HMAS *Farncomb*. This 49% reduction is likely a benefit of the redesign of the work packs for specific tasks, tighter management, and the Safely On Time meetings.

Figure 27 - Work pack fill rate for HMAS *Rankin* and HMAS *Farncomb*

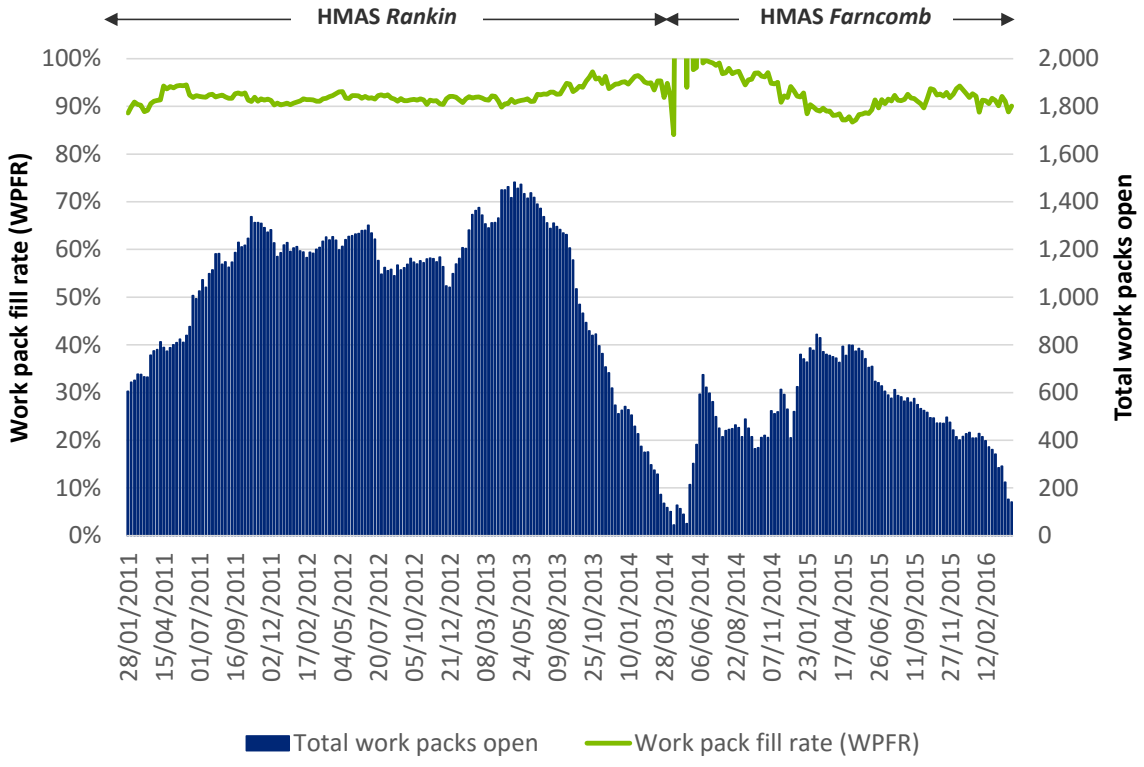
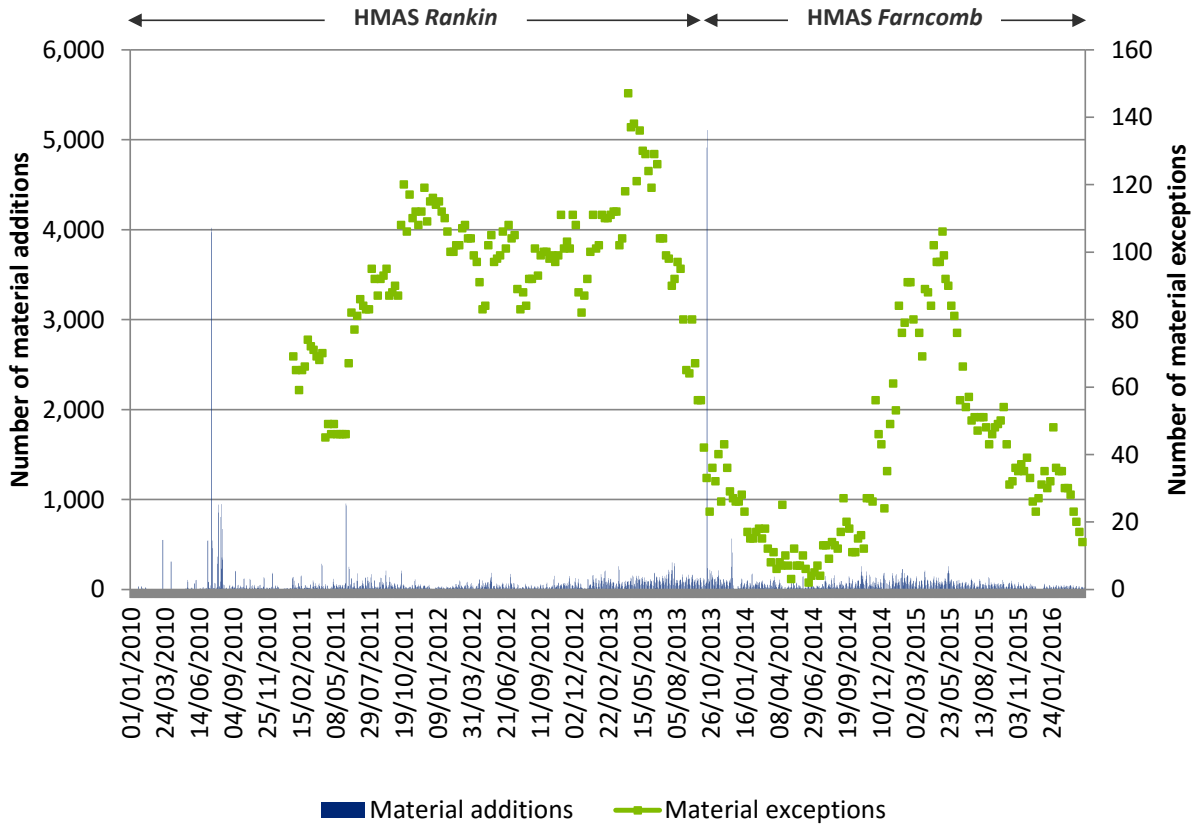


Figure 28 shows that part availability has enabled a 49% reduction in the number of material exceptions between HMAS *Rankin*, which averaged 81 per day and HMAS *Farncomb* which averaged 41 per day.

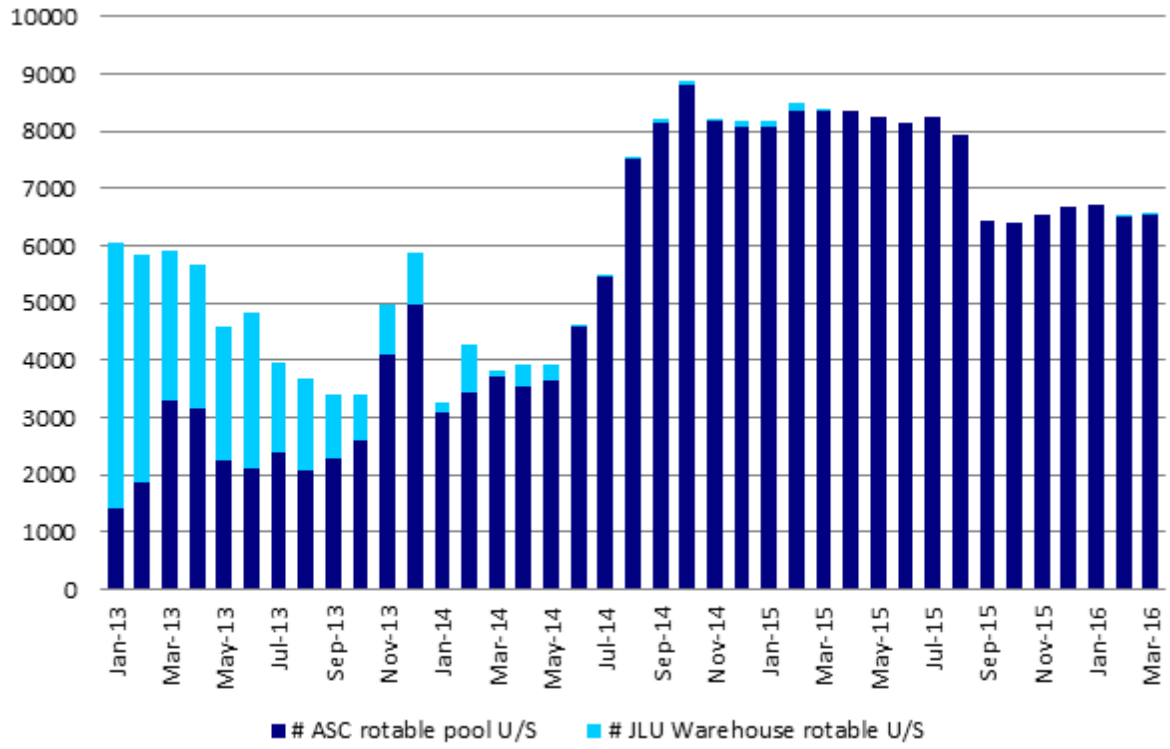
Figure 28 - Material exceptions for HMAS *Rankin* and HMAS *Farncomb*



4.1.6.7 Returns and repairables managed

Responsibility for managing the return of repairable spares is now under the authority of the ASC. Figure 29 shows that up to January of 2014, a considerable rationalisation occurred resulting in spurious stock being removed from the repairables list. This is consistent with the March 2014 progress review. The number of repairable items returned for repair then shows significant increase beginning in May 2014, consistent with the induction of HMAS *Farncomb* into the first two-year FCD, MCD activities and the HMAS *Waller* fire.

Figure 29 - Unserviceable items



4.1.6.8 Effective wharf side distribution

Consistent with the March 2014 progress review the wharf-side distribution performance has been maintained. SUBFOR indicated that emphasis is being placed on developing and filling work packs for O and I-level maintenance activities conducted by ships staff. This relies upon accurate work scope planning by the ships staff. A project is underway to improve the work scope accuracy and planning at SUBFOR HQ by visually displaying KPIs and ensuring that lessons learned are passed among ships staff.

4.1.6.9 Achieve an accurate Ship Allowance List

Having the correct spares and consumable items available on the submarines allows timely completion of planned maintenance activities and rectification of defects as they arise. This reduces the likelihood of URDEFs being raised. The SAL has been prioritised to include mission critical spares to allow for prioritised filling. Current SAL completion information reported during April 2016 from SUBFOR is in Table 11 - SAL fill rate showing good completeness across the submarines. The Review Team suggest that good practice completeness should be 95% to minimise the effect of seaborne failures.

Table 11 - SAL fill rate

Submarine	Total SAL completeness	Mission critical SAL completeness
HMAS *Rankin*	95%	98%
HMAS *Dechaineux*	89%	83%
HMAS *Sheean*	94%	100%
HMAS *Waller*	92%	92%
HMAS *Collins*	93%	99%
HMAS Farncomb	N/A - FCD	N/A - FCD

4.1.7 Production (industry)

4.1.7.1 Maintenance staff are skilled and enabled

The Team has sighted the ASC workforce plan and have observed that a significant upskilling of personnel has occurred in WA along with an increase in the WA workforce.

4.1.7.2 Schedule adherence is high

Schedule health is monitored as a health indicator in the ASC Contractor Performance Report. The KHIs show that planning is generally effective, but execution does not score as highly. This indicates that greater feedback from production is required to update the plans such that execution is more likely to follow the schedule. The ASC North Operations Roadmap 2015 contains improvement projects under Readiness and Schedule Adherence to increase this metric.

The Review Team has observed weekly Safely On Time meetings conducted in both SA and WA, which monitor the maintenance schedule and work to resolve issues, which is an excellent initiative. These Safely On Time meetings are subject to continuous improvement initiatives that will enhance their effectiveness over time.

4.1.7.3 Adequate feedback from production

ASC conducts feedback from Production in accordance with the Work Pack Feedback Process (revision 3.0); the Operations department monitors the results of feedback and this is presented at management level.

The Review Team has been advised that approximately 60% of the FCDMIs have received update from Production. It is too early to tell if production feedback is effective, however the Team anticipate HMAS *Collins'* FCD should benefit.

HMAS *Collins*' FCD and HMAS *Sheean*'s MCD should be monitored for production feedback to allow lessons learned to be applied to future planned maintenance periods.

4.1.7.4 Maintenance staff levels are balanced between SA and WA

The Team has sighted the ASC workforce plan and have observed that a significant upskilling of personnel has occurred in WA along with an increase in the WA workforce.

4.1.8 Force generation

4.1.8.1 RAN crews appropriately skilled and enabled

ET/MT upskilling and outplacement programs are in place and delivering improvements, but more is underway. Maintenance management is being addressed by SUBFOR with formal 5 day courses and establishment of the planning cell in SUBFOR HQ to manage and oversee quality of ships staff planning, execution and close-out of maintenance records.

Areas that are attracting more attention include high power systems, main propulsion system (normal and emergency propulsion) and main storage batteries.

Focus on RAN crew technical proficiency should include greater focus on high power systems, main propulsion system (normal and emergency propulsion) and main storage batteries.

4.1.8.2 O-Level maintenance completed

SUBFOR is concentrating on improving O-level maintenance compliance. MCR O-Level backlog weekly reports are visually displayed and discussed at SUBFOR HQ, and SMP Planning milestone actual/due date reports are monitored.

This is work in progress and improving rapidly, also aided by issue of electronic tablets to ships staffs.

4.1.8.3 Feedback and at sea record keeping is high

SUBFOR is concentrating on improving O-level maintenance compliance. MCR O-Level backlog weekly reports are visually displayed and discussed at SUBFOR HQ, and SMP Planning milestone actual/due date reports are monitored.

SUBFOR HQ is monitoring outcomes and providing feedback for improvements.

5 Annex B - Part B detailed analysis

5.1 Key analysis assumptions

In undertaking the assessment for Part B, the Review Team was advised by the Enterprise on a number of key assumptions, including considerations relating to the SEA1000 program. These key assumptions are:

- There will be a continuous submarine capability during the transition from the Collins to the future submarines
- Life of Type Extensions for three Collins submarines (for their full cycles) have been assumed. The number of submarines to undergo an extension could be reduced or increased to match the introduction of the new submarines into service
- The Life of Type Extension work will be timed to coincide with an FCD within the 10+2 UUC to provide continuity of submarine capability
- Noting the need to avoid resource demand conflicts in South Australia, commencement of the future submarine assembly in South Australia will trigger the relocation of the Collins FCDs to Western Australia. This will ensure that the submarine workforces in South Australia and Western Australia are focused on their respective areas of work
- As a result, the final Collins (LOTE) FCDs would occur in Western Australia estimated in the years 2026 to 2032
- The 10+2 UUC will be the bedrock for future planning purposes
- The Collins will continue to have reliability and obsolescence programs
- Capability upgrades will occur to maintain regional superiority.

5.2 Enterprise goals exist and reflect the necessary elements to achieve current and future required availability

5.2.1 Scale of capability improvement required for Collins

The Defence Industry Investment Plan 2016, indicates approximately $2billion investment in capability upgrades for the Collins submarines to ensure regional superiority. The main upgrades include sonars and communications with major obsolescence work for the Integrated Ship Control Management and Monitoring System (ISCMMS).

Modern military electronics systems are moving from militarised systems towards commercial off the shelf technology, which may be less costly to acquire. However, they require a new method of sustainment with regular technical insertions and software updates (similar to desktop and home computers and hand-held mobile telephones). This method should encompass all software-driven processing technologies including the weapons discharge system and ISCMMS.

The Team have canvassed those in the Enterprise who plan and implement such significant modifications and all agree that some systems can be installed incrementally in a mixture of FCD, MCD and even ID for smaller increments, once the first installation has been completed and proven. Due to its nature, the communications centre upgrade will have to

be completed in a single block but the sonar upgrades can be accomplished incrementally. This is an important consideration for a relatively expeditious fleet-wide fit.

Based on the Team's assessment including the work carried out by Covaris on the FCD and MCD workflow demands and the efficiency gains already delivered by ASC, and the increase of IDs from three to six months, the Review Team believe there should be sufficient time within these maintenance activities to install the capability upgrades (some incrementally) without extending the current planned maintenance durations.

Expert, specialised 'tiger' teams provided by the relevant equipment or system suppliers who know their equipment intimately, working alongside ASC, would also assist in keeping installation and testing times to a minimum.

Whether capability upgrades can be installed in small slices between maintenance slots will depend on how fundamental and how invasive the work is. For example, sonar arrays positioned below the waterline will require a docking and any modifications requiring welding or 'hot' work must be carefully planned to avoid mutual conflict with maintenance work.

5.3 Enterprise strategy articulates how sustainment goals will be achieved through life and is underpinned by appropriate planning artefacts and processes

5.3.1 New material demands

5.3.1.1 Reliability program

The reliability program is managed by the Collins SPO (CASG) and is divided into the platform and combat system programs.

The Platform Sustainment Steering Group (PSSG) and Combat Sustainment Steering Group (CSSG) are responsible for setting program priorities and providing governance.

The platform reliability program is managed by the ASC as defined in the Reliability and Asset Management Plan. The Review Team have been advised by the ASC that this plan is subject to external review including compliance with ISO 55000 standards for asset management, a positive step to improving the reliability program in place.

ASC has initiated a condition monitoring program encompassing vibration analysis for pumps and motors every six months resulting in the identification of root cause faults for the air conditioning unit, oil analysis to detect early bearing failures, and motor circuit analysis used to detect impending failure for the high pressure air compressor on HMAS *Dechaineux*. The Review Team recommend that the condition based monitoring program be enhanced to detect incipient failures.

Reliability trends are tracked and presented to the Submarine Reliability and Asset Management Group for prioritising and recommendation to the PSSG. The program has provision for labour, materials and sub-contractors and this funding should continue into the future to meet reliability targets.

Combat system reliability is overseen by CASG through the CSSG. Tier 1 contractors are responsible for individual assessments of their systems. Each year, CASG and the Tier 1 contractors convene for the Annual Planning Workshop where priorities for sustainment are set. These priorities are transformed into the annual plans which are monitored by CASG.

Engineering solutions to reliability issues, implemented through Configuration Change Items, are developed separately for the Platform and Combat systems. They are then provided to the Forward Planning Team for incorporation into the CCI 7-year high level forecast.

5.3.1.2 Obsolescence program

There are two separate programs for the Platform and Combat systems overseen by the PSSG and CSSG.

Platform obsolescence is overseen by CASG and managed by the ASC in accordance with the ASC Obsolescence Plan. ASC conducts two yearly polls of their suppliers and the Review Team have been advised that of the 90,000 parts tracked, approximately 8,000 are subject to obsolescence concerns with 75% of suppliers polled. Each obsolescence concern is prioritised for action based on the demand forecast and system criticality. These are presented as an artefact to the SRAM-G for prioritisation. Significant risks are presented to the PSSG for approval. Funding for conducting the program assessment is assured under the ISSC. Solutions to identified issues require survey and quote funding from CASG.

ASC has developed the Strategic Sourcing Plan which is based on supplier market segmentation. This plan will add resilience to contractual arrangements and de-risk obsolescence concerns for valuable systems by developing long term relationships with suppliers giving them stability required to continue working.

Combat systems obsolescence is overseen by CASG and also managed through the CSSG in a similar manner to the reliability program. Each Tier 1 contractor is responsible for presenting the outcomes from a Logistics Support Analysis to the Program Management Board at each six months, including pro-active identification of obsolescent items. These are prioritised and managed by the steering group and funding sought as necessary.

5.3.1.3 Capability insertion program

Capability insertions are managed by CASG under both acquisition and sustainment programs. As acquisition programs are developed and finalised, the Forward Planning Team incorporates these into the IMS using the seven-year CCI high level forecast.

Production hours for capability insertions are estimated and then refined by the ASC within 12 months of the required maintenance availability period as part of the specific planning for that planned maintenance period. The IMS is a dynamic tool, but also provides the stability to facilitate this future planning.

5.3.1.4 Combined program planning and execution

Effective execution of the reliability, obsolescence, and capability insertion programs requires sufficient scope within the Maintenance Availability Periods. The Review Team

have analysed the task loading within each Maintenance Period through ASC provided Prima Vera files and conclude:

- There is scope within the FCD period for additional configuration changes (CCI) work based upon the hour distributions within each period
- There is insufficient evidence to determine if the MCD periods can incorporate additional CCI work
- There is limited scope within the ID periods for additional CCI work.

The Review Team suggest that approximately 15% of the FCD periods could be allocated for CCI work, corresponding to approximately 120,000 hours for a FCD. As many CCIs should be incorporated as possible between FCD activities.

The Forward Planning Team is responsible for determining the number of CCIs to be inserted at each planned maintenance period and is made up of members from Acquisition, Combat System Sustainment, and Platform Sustainment Groups. Specific allowance is made in each planned maintenance for CCIs and the hours estimates are shown in Table 12.

Table 12 - CCI allowances per planned maintenance

Full cycle docking	Mid cycle docking	Intermediate docking
80,000 hours	40,000 hours	20,000 hours

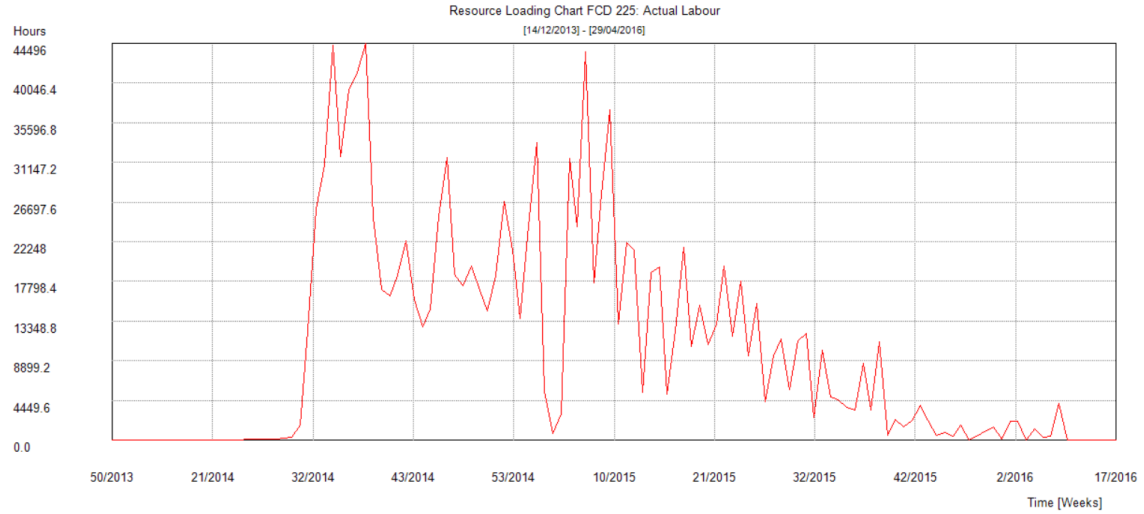
The number of hours expended on CCI insertions for the last two FCDs and HMAS *Collins* planned FCD is shown in Table 13. The Review Team note that both HMAS *Rankin* and HMAS *Collins* are allocated significant CCI work while HMAS *Farncomb* was below that budgeted.

Table 13 - CCI hours consumed per planned maintenance

HMAS *Rankin* FCD	HMAS *Farncomb* FCD	HMAS *Collins* FCD (Planned)
109,525 hours	61,734 hours	124,226 hours (28,270 consumed in pre-FCD)

The Review Team have conducted analysis of the actual hours loaded to tasks for HMAS *Farncomb*'s FCD in Figure 30, HMAS *Dechaineux*'s MCD in Figure 31 and HMAS *Sheean*'s ID in Figure 32. For the FCD and MCD the Team note periods of intense labour hours booked at the start of the maintenance periods, and then a relatively long tail toward the end.

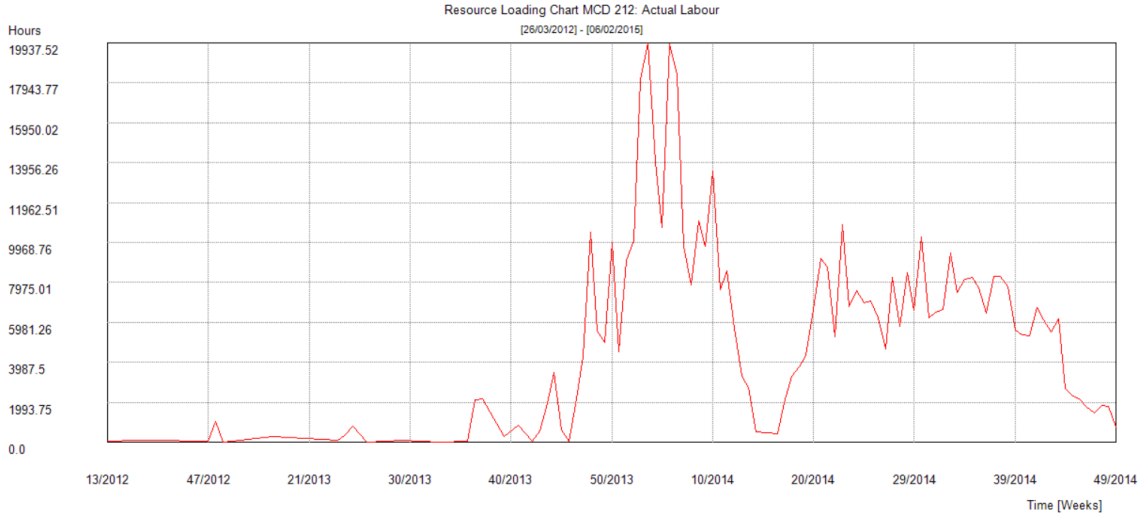
Figure 30 - Resource loading for HMAS *Farncomb*'s FCD



While the workshops are likely receiving a portion of the work that may not be fully reflected in the Prima Vera files, the analysis in Figure 30 indicates there was some head-room for greater CCP inclusion in the schedule.

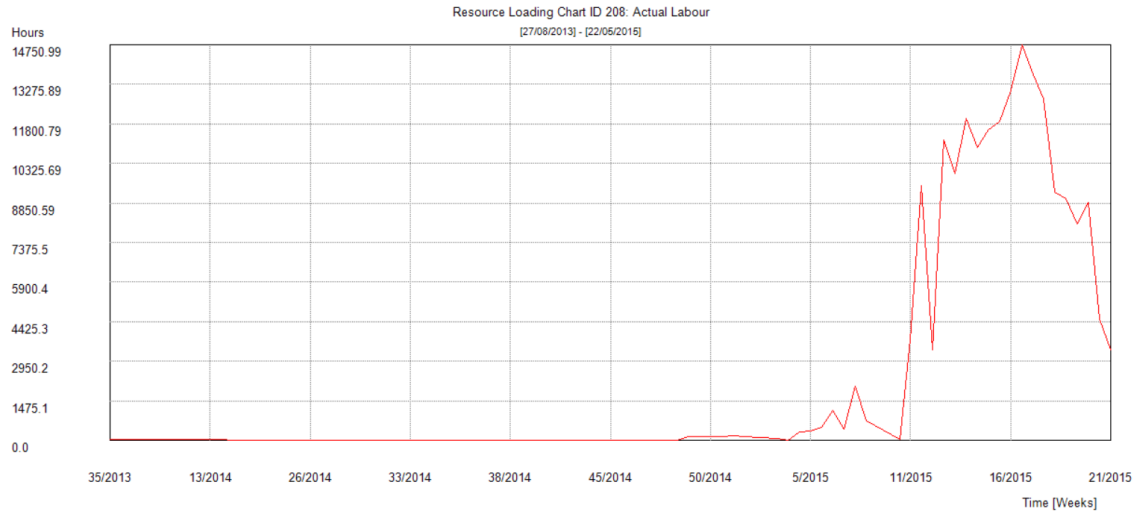
Figure 31 shows a lull in the middle of the MCD for HMAS *Dechaineux* which may represent an opportunity for greater CCP inclusion, however the drop in work toward the tail of the MCD is not as apparent as it is for the FCD. After the HMAS *Sheean* MCD, further analysis should be conducted to determine if there is room for additional CCI work.

Figure 31 - Resource loading for HMAS *Dechaineux*'s MCD



HMAS *Sheean*'s ID in Figure 32 shows consistent task loading across the docking cycle. The level of effort applied indicates that there is unlikely time for greater CCI incorporation.

Figure 32 - Resource loading for HMAS *Sheean*'s ID



Hours required for CCIs are unlikely to decrease as the submarines age and require further capability upgrades. Schedule analysis of HMAS *Farncomb*'s FCD shows there is likely sufficient slack to incorporate additional CCI time. The Review Team suggest that a minimum target of 15% of the work scope for a FCD should be considered by the Enterprise. Further work should be conducted after HMAS *Sheean*'s MCD to determine if there is scope to increase the allowance for the CCI program.

It would appear that Reliability, obsolescence, and capability insertions can take place without the need to trade-off one against the other in the medium term.

The Forward Planning Team would benefit by having greater involvement with ASC and Tier 1 planners to refine their hours estimates for capability insertions such that more accurate planning decisions can be taken for the CCI forecast into the IMS.

5.3.2 Evidence of recent submarine classes being extended

Open source evidence is that there are modern submarines with extended service lives of between 30 and 40 years. The evidence includes submarines representative of a broad range of design and operating intents: conventional and nuclear, blue water and coastal, short and long range, attack and strategic deterrent submarines with displacements in the range from 1000 to 16700 tonnes.

Examples of conventional and nuclear propelled submarines are illustrated in Table 14 and Table 15. Notably, two classes of Swedish-designed and built submarines with the same pedigree as Collins have or are being modernised and upgraded with forecast extended lives of 35+ years.

Table 14 - Conventional submarines with a life of 30 - 40 years

Country/Class	Surfaced Displacement	Planned Withdrawal Date	Forecast Life	Comments
Canada Victoria Class	2400 tonnes	PWD from 2030 onwards	40+ years with 6-18 year life extension	Note 7-10 year gap between UK and Canadian ownership Long range
Netherlands Walrus Class	2400 tonnes	PWD mid to late 2020s	35+ years	Long range
Chile Thomson Class Type 209	1800 tonnes	PWD mid-2020s	40+ years	Coastal
Sweden Gotland Class	1500 tonnes	PWD 2030s	35+ years	AIP, mid-life upgrade, modernisation Same family, age as Collins
Singapore Sodermanland Class - formerly Swedish Vastergotland	1200 tonnes	PWD early 2020s	32+ years	Same family as Collins New capability section inserted Tropicalised and modernised
Ula Class, Norway	1000 tonnes	PWD early 2020s	30-35 years	Coastal Tropicalised and modernised

Table 15 - Nuclear submarines with a life of 30 - 40 years

Country/Class	Surfaced Displacement	Planned Withdrawal Date	Forecast Life	Comments
UK Vanguard Class	15,000 tonnes	PWD forecast mid to late 2020s	30+ years	Mid-life refit
UK Trafalgar Class	4,800 tonnes	PWD from late 2010s to late 2020s	40+ years	Last four of class
USA Ohio	16,700 tonnes	PWD mid 2020s to 2040	45+ years	14 SSBN and 4 SSGN conversions
US Los Angeles Class	6,000 tonnes	PWD 2010 - 2030	35+ years	Final 23 upgraded as 688i class
France Rubis Class	2,400 tonnes	PWD 2010 to 2030	35+ years	Six in the class, smaller tonnage than Collins

Mission types vary in intensity from short range coastal to long range blue water operations. Life extensions for a modern submarine should be feasible provided the fundamentals are solid, the design intent is maintained and the associated risks are appropriately managed.

5.3.3 Comparison with Collins Class life and utilisation

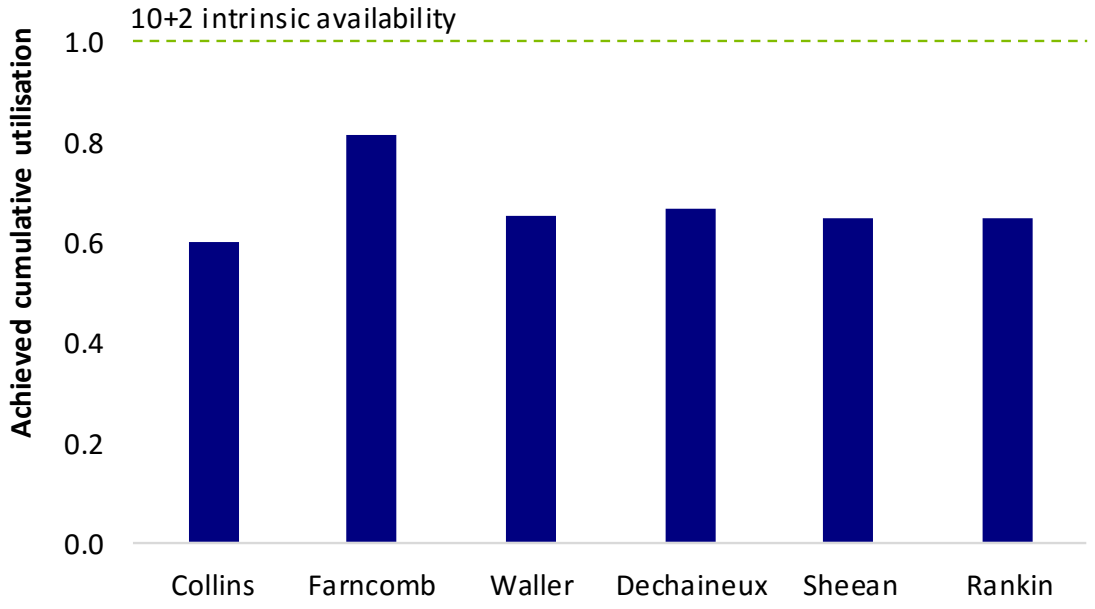
In consideration of the planning assumption to extend the lives of some of the submarines, the Review Team wished to gain a measure of how much the submarines have actually been utilised. This would give some indication, however rough, of hull fatigue and equipment usage.

Cumulative at-sea utilisation was calculated as a proportion of total life for each of the submarines using data extracted from SIMS. Measurements commenced at the start of contractors' sea trials in the build program, to April 2016, less outages from:

- FCD (time of arrival in SA to time of leaving for sea trials)
- MCD/ID (time of arrival at the docking facility to time of leaving for sea trials)
- Intermediate Maintenance Period (IMP), Self-Maintenance Period (SMP), alongside maintenance)
- Repairs for a serious breakdown (for example fire or flood).

The approximate cumulative at-sea utilisation (relative to 10 + 2 intrinsic availability) of each submarine is shown in Figure 33.

Figure 33 - Approximate utilisation of the Collins fleet



As a comparison, the Team has plotted in Figure 33 the intrinsic availability for the 10+2 UUC. Therefore the utilisation of the submarines to date has been much lower than intended and while the rate of utilisation is now increasing due to adoption of the 10+2 UUC, there is a prima facie case, i.e. head-room is available, for a life extension.

Notably, the higher utilisation for HMAS *Farncomb* can be attributed to its first FCD which was conducted in less than two years. The lower utilisation for HMAS *Collins* can be attributed to its first FCD which was extended to remedy welding defects in two hull sections, and the pre-FCD period just completed.

5.3.4 Life of Type Extension Definition Study

There are a number of factors that could limit service life - e.g. fatigue, excessive hull or system corrosion for the pressure hull or systems and hull forgings, cable disintegration through heat and age, high pressure air bottle safety, or other safety critical items.

In the case of hull fatigue, the Team assessment is that the Collins is unlikely to have experienced pressure cycling that might reach the fatigue limits, diving limitations could be used and the Review Team would not see this as an overriding limit to overall capability.

The Service Life Evaluation Program (SLEP) in 2012 did not immediately confirm any technical risks or issues which would prevent a life extension. However, a proactive investigation would yield greater benefits. The Review Team has seen evidence that a "Life of Type Extension Definition Study Plan" is in development led by the Collins Chief Engineer.

The fundamental assumption for the definition study is a three-submarine extension of one 10-year operating cycle each. The objectives of the plan are to review and update the status of the risks identified by the 2012 SLEP, and use this as a basis to identify Rough Order of Magnitude Costs and schedules for LOTE. The plan will seek subject matter expertise from local and overseas designers and Original Equipment Manufacturers, particularly those with LOTE experience. While this work is yet to be approved, the intention is that this plan will be submitted for implementation and incorporated in the FY16/17 CN10 PdS and long term planning.

5.3.5 External factors not taken into account

In all reviews, the Team have not taken into account some of the factors that contribute to sustainability e.g. ordnance support, measurement ranges and other infrastructure. Ordnance, including processing practice weapons to support certification could be a limiting factor. Such factors are not considered in this review but the Review Team draw attention to the need for an all-encompassing investigation of these fundamental inputs to capability.

5.3.6 Is a longer life feasible for Collins?

Taking into account that submarines of similar pedigree, mission type and intensity have or are having service lives extended it is certainly feasible for the Collins. The Review Team have assessed the planned maintenance program to be balanced and the reliability and obsolescence plans to be sound. At this stage there appears to be no technical impediment to continue to upgrade the class to retain regional superiority and to incorporate such upgrades alongside technical updates within previously planned maintenance periods. Some upgrades may be incrementally incorporated if done in blocks and this will ensure a fleet-wide fit in a shorter time period.

Following these guides, a life extension for Collins is feasible provided the detailed analysis is carried out and the funding in the Defence Industry Investment Plan is applied.

5.4 The Enterprise encourages continuous improvement

5.4.1 CASG

Within CASG, the Collins Sustainment Group as the principle decider supports the Collins Program and makes the arrangements for the installation of new capability. Its principle function is to sustain the capability of the Collins on behalf of the Navy. This is done in accordance with its quasi contract with the Navy (CN10) to deliver the agreed output within agreed budget.

As part of delivering requirements to Navy, CASG have clearly implemented corrective actions and the development of the CASG workforce plan is an example of that. However, in order to self-monitor, CASG would require a document such as a business plan that outlines the program of work that this group is required to perform and then undertake regular upwards reporting on progress. Informal plans certainly exist and monitoring is undertaken however these need to be formalised.

The Review Team believe the CASG is a learning organisation but it is not so obvious to the outside observer as in other areas.

5.4.2 Navy

The Navy is constantly improving itself through its New Generation Navy program. The Navy also monitors its submarine sustainment program through six-monthly Fleet Screenings and monthly reports to the Navy Review Board. Measurement points include the KPIs and KHIs which form the framework of the Collins sustainment program embedded in the CN10 PdS and cascaded down to the ISSC between CASG and the ASC.

The Review Team are aware that at the operational level Navy (and Defence) has in place procedures to learn from serious incidents in order to avoid a future occurrence. An example is the HMAS *Waller* fire which effectively removed the submarine from service for over a year. The Review Team were advised that an official inquiry was convened and actions put in place to prevent a reoccurrence.

During the lengthy repair period, only three submarines were available for operations. Despite this setback, the Enterprise managed to make two submarines consistently available during this period through effective priority setting, close monitoring and collaboration. The Review Team believe this would have been nearly impossible before establishment of the Enterprise. Certainly the Navy has learned how to handle such repercussions of unforeseen incidents, by invoking assistance from its Enterprise partners.

The Review Team believe the Navy has clearly demonstrated continuous improvements through its actions.

5.4.3 ASC

ASC has embarked upon a significant program of self-learning and continuous improvement, driven by the Collins Class Submarine Business Improvement Strategy and Plan Paper (the Review Team have sighted the draft under final management review). The Review Team note that the cost performance target for the Collins is to perform equal to or better than the 2015 budget allowance.

The improvement model is founded on Lean Continuous Improvement with the target of ensuring that practices are deployed in all areas of the ASC. Some teams within the organisation plan to achieve autonomous self-improvement by the end of ISSC Performance Period 2. Compliance to the plan is monitored by internal and external auditors; external audits scheduled in 2018 and 2019 will assess the ASC against the framework for the Shingo Prize for Operational Excellence. Including specific goals and timeframes for improvement is considered to be an excellent initiative by the ASC.

ASC is ensuring specialist improvement personnel are embedded across the organisation. Department heads are responsible for ensuring adequate budget and work responsibilities are in place to allow these personnel to work full time on improvement initiatives. The plan provides requirements on the personnel that are required to execute this plan, involving:

- **Operations** - Two people are already embedded in place with four additional persons planned. The centre of gravity is in SA
- **Engineering** - One embedded and three additional persons planned. These people will be spread across SA and WA.
- **Supply chain** - Two persons are planned, one in WA and one in SA
- **Services** - Persons are identified into business services to enable improvement up and down the Enterprise.

These people undertake Lean Six Sigma training through belt-based training and qualification systems. Each of the improvement projects must be measureable, align with Collins objectives, which in turn align with ASCs vision and objectives.

The Review Team have sighted a corporate Business Improvement Request (BIR) summary that is presented at the executive level. This BIR summary shows the improvement request status by department, including those that are overdue and coming due. The system allows for the data to be interrogated visually when necessary. This process is a positive step that allows executive knowledge of the level of business improvement.

The Review Team conclude that the ASC is a learning organisation and that this will continue to improve over the next several years.

5.4.3.1 Operations department continuous improvement

Continuous improvement is embedded in the Operations. The ASC Operations Vision 2015 and the ASC Operations Improvement Roadmap to Improvement Q2 2015 outlines how the Operations Department plans on improving their performance. These plans align to the ASC strategic objectives for improvement. Implementing these plans and identifying future opportunities is significantly assisted by two full time improvement specialists being embedded in the department since 2014.

The Review Team have noted that the Operations Department is now responsible for the Demand Planning KPI which is reported to the executive by the Material Demand Accuracy Control Phase Measure. Accurate demand planning allows the Supply Department to perform accurate planning to provide material. The Review Team have been told by ASC that approximately 60% of the FCDMIs have received red pen amendments by staff during the FCD of HMAS *Farncomb*. These updates are processed in accordance with the Work Pack

Feedback Process, tracked to completion and should improve performance. Implementation of projects such as the visual workplace, integrated work teams, Safely On Time meetings, and IT projects to combine IT systems for business intelligence improvement demonstrate the commitment toward continuous improvement.

The majority of improvement initiatives and continuous improvement is occurring at ASC North in SA. Employment of the improvement specialists in WA will improve the organisation in the west.

The Review Team conclude that the Operations Department is a self-monitoring and learning organisation and that the processes for improvement are data driven and aligned with ASC objectives.

5.4.3.2 Supply department continuous improvement

The Supply Department has been tracking performance metrics for several years. The Review Team note that the supply chain has been under greater pressure because of the shorter FCD periods and the additional demands through the HMAS *Waller* repairs. This is likely responsible for metrics not improving significantly in this assessment compared to the March 2014 progress review.

Currently there are no dedicated improvement specialists employed within the Supply Department though there are plans to employ two.

Performance improvement and learning is driven by The Supply Chain Operating Model Update 2016 and the "game plan" it contains. Within the game plan, the Team noted five top objectives including strategic sourcing, reducing the IIP funding gap, and improving industry partnerships, and included in performance improvement was automatic purchase orders and improving DIFOTQ for materials.

Discussions with ASC regarding the DIFOTQ rate the Review Team are reporting reveal that the Supply Department were aware of declining DIFOTQ and have launched an investigation and specific actions to improve it.

From this the Review Team concludes that the ASC Supply Department is a self-monitoring and learning organisation and that the processes for improvement are generally data driven.

5.4.3.3 Engineering department continuous improvement

The Review Team note that a single improvement specialist has been embedded in the department since the end of 2015, therefore the maturity of improvement in this department is not as progressed as the other two.

Of note, the current Asset Management Plan is receiving a significant rewrite and will be compliant with ISO 55000 standards for Asset Management. This rewritten plan is scheduled to be released in 2016.

The Team concludes that the Engineering Department is progressing toward a self-monitoring and learning organisation, however it is not as mature as the other departments.

5.4.3.4 SIMS and ISCMMS data

The review has drawn heavily on information (nearly 60,000 records) contained in SIMS which is the Navy's key information source for work undertaken on the submarines. The Team are also aware that system and equipment data is recorded in the on-board ISCMMS which can be used for analysis, including root cause analysis and material condition analysis for reliability purposes.

The analysis in this report depends on the quality of the data presented, and if it is faulty or if there are omissions, then the conclusions reached may be incorrect. In some cases the Team found it difficult to obtain some very simple data such as nautical miles steamed, engine running hours and so on. It seemed that there was no one with interest in this kind of simple data, considered both normal and essential for inputs to high level planning. In other cases, SIMS was able to deliver (although late and with difficulty) the data necessary for analysis.

The difficulties faced in getting the data gave the impression that the importance of the data is not well understood nor acknowledged by the Enterprise and its constituent organisations. However, the integrity of the data is all-important to self-improvement.

SIMS was designed to record transactional data of maintenance records for O-level and I-level maintenance (unfortunately not D-level) and to track engineering improvements, and to be a powerful source of information for analysis for future improvements. The Review Team make the following comments:

- True effort or work on the submarines, a key input into reliability engineering and continuous improvement, is not captured
- While SIMS remains an under-utilised asset information system as compared to systems in use across wider industry, the rate of work being recorded suggests a reasonable effort has been made to record O- and I-level work on a consistent basis. Unfortunately, the practice of not recording all of the D-level work has continued
- There has been considerable effort by the Submarine Force in training ships staff and assisting them to plan their maintenance periods and complete their records. Attention to the material condition of their submarines and record-keeping is paying off and is a major factor in reducing the number of URDEFs
- However, studies of the work history of in-service submarines exposed a high degree of variability in O-level maintenance recorded in SIMS to the extent the Team are not confident that all shipboard maintenance is being recorded
- MCR backlog should be considered as a possible driver of risk to submarine reliability; some form of backlog risk reporting would be considered good practice if taken up by the Enterprise
- There is a fair proportion of MAPs which have been some time in backlog; the key areas of interest are Hull, Propulsion, Power and Combat Systems plus Weapons Discharge and Handling; long term MAPs (greater than 12 months) in these FGC areas should be reviewed
- Long term delays in implementing recommendations to address DMDRs suggests that this process is not supported by a long term capital budgeting processes; if this

is the case then final implementation is being held up by either lack of access to the submarines which is not likely given the time they spend in External Maintenance Periods, or there is insufficient funding to implement the recommendations

- SIMS tracks capability improvement of the submarines and the Team have seen that few CCPs have even progressed to the review stage; this suggests that the CCP process for the class has stalled between 2013 and 2016; hence there is little progress on capability improvement of the submarines using this controlled process
- SIMS data is incomplete where for example, the system is not used for scheduling and hence the scheduled start and finish dates of the work are not updated; hence SIMS cannot be used to inform standard maintenance work performance KPIs such as schedule compliance; because work is not scheduled from SIMS, accuracy of scheduled start and finish dates is low in the Team's analysis
- The Review Team identified a number of key areas of concern for submarine reliability; these areas are tested in Section 3 of the Covaris report for URDEF trends to validate that they are genuine areas of concern; they were then cross checked in Sections 3 to 6 of that report for remedial work in the same areas to see if this work was likely to manage down the reliability risk; this is the kind of follow-up to remedial work that the Team would expect of the Enterprise
- The Commonwealth has allowed its contractors to ignore the use of its own information systems to capture true effort of work on the submarines; this is one of the key inputs into reliability engineering and continuous improvement (this is relevant to cost of ownership and the cost model)
- Labour costs are not captured in SIMS and the small amount of cost data is more to do with material costs; it is so infrequently captured on the MCR that the cost history has no useful purpose
- Continuous improvement of the submarine outside of ASC resources will be hampered with poor data quality in SIMS blocking insight into past submarine maintenance history; this will limit the ability to determine the true cost of ownership of the submarines or test the cost/benefit of specific submarine maintenance approaches
- There is a need for a detailed and comprehensive review of all available data, including ASC holdings, to form a good baseline reliability report for every submarine system to facilitate an asset management plan, long term planning and assessment of scope of each External Maintenance Period
- SIMS is set up for time-based maintenance, now based on the 10+2 UUC. This limits the ability to use equipment performance data to plan service routines, i.e. apply condition based maintenance.

If the Commonwealth IT systems (in the case of SIMS) do not contain a true record of all work undertaken on RAN ships and submarines, then the Enterprise is severely hampered in its intent to undertake continuous improvement and deliver effective naval engineering.

SIMS (and ISCMMS) contains a wealth of information and greater use of analysis can be made.

5.5 Appropriate structures are in place to support enterprise improvements until the planned withdrawal date for the Collins Class

5.5.1 The maintenance, development and succession planning for key skilled staff in the Collins program

5.5.1.1 Current state assessment of Enterprise workforce plans

Since the March 2014 progress review, the Enterprise has made significant progress in developing and implementing workforce plans to ensure an appropriately sized and skilled workforce is committed to the Collins program (see Annex A - Recommendation 21). ASC should be commended for adopting the Australian Standard 5620:2015 for workforce planning.

While the Navy, CASG and ASC workforce plans each outline the size of the workforce required to sustain the Collins, there are some important differences between the documents that will have both short and long-term.

As per the Australian Standard, there are three types of workforce planning: strategic workforce planning, operational workforce planning and workforce management planning. These are often described as strategic, operational and tactical planning and exhibit the following characteristics:

- **Strategic workforce plan** - A plan that sets out the long-term future for the workforce in relation to the strategic direction of the organisation (approx. 12 months to ten-year timeframe). It is conducted alongside wider business planning and identifies how the workforce mix must change to achieve strategic business outcomes.
- **Operational workforce plan** - A plan that supports the organisation to deliver against customer demand over the medium-term (one to 18 month timeframe) through identifying which levers the organisation must use to achieve a balance between the forecast demand and people supply. This is often linked to the organisations budgeting process.
- **Tactical workforce plan** - Actions which can be taken in the short-term to deliver on immediate customer and business demand. May be referred to as scheduling or rostering.

The Navy, CASG and ASC plans have been assessed against the Australian Standard below.

5.5.1.2 Navy and CASG

Navy and CASG have developed documents that most closely resemble a strategic workforce plan as they outline the workforce mix required between now and 2025 and 2035 respectively. Both documents take into account future submarine workforce considerations and also outline the change in workforce mix over the respective time horizons. However, neither document currently contains information relating to:

- Internal and external demand and supply data

- Workforce gaps

This limits the ability of both organisations to make informed workforce decisions and measure the outcomes.

The documents also contain varying levels of information relating to critical workforce segments, which are groups of employees that are critical to achieving business outcomes. Navy has quite rightly identified submariners as a critical workforce segment but the ashore based workforce has not been assessed and CASG's document contains no critical workforce segmentation. This opens both organisations to increased level of workforce risks as gaps may emerge in a critical workforce segment and mitigations for the risks will not be prepared.

Neither document contains information relating to attraction and retention strategies. However, Navy is in the process of approving the Submarine Deliberately Differentiated Package to attract and retain submariners and CASG informed the Review Team that this information exists informally and will be progressed into formal plans in the future.

The ability of CASG to attract and retain the required workforce will be critical to the Enterprise's ongoing success and the APS faces the greatest challenge of the Enterprise partners in achieving this. Navy is able to attract and retain staff based on a military employee value proposition supported by the new Submarine Deliberately Differentiated Package while ASC, as a commercial organisation, has the benefits of its purchasing power. While the APS can seek approval to remunerate outside of the standard packages, they will still not be able to meet the purchasing power of ASC or DCNS. As such they will need to maintain a specific focus on its attraction and retention policies and carefully monitor and adjust the success of current strategies.

In terms of succession planning, both Navy and CASG follow their respective organisations succession planning frameworks. These appear to meeting current requirements; the CASG appears to face the greater challenge.

5.5.1.3 ASC

ASC's plan most closely reflects an operational workforce plan and outlines planning for the period 2015 to 2018. This is reflective of ASC's current practice of undertaking 3 year rolling workforce planning. The plan clearly articulates workforce objectives, challenges, staffing requirements, critical role segmentation, associated interventions including attraction and retention strategies.

The ASC plan, due to its short timeframe (3 years), does not align with the ASC Strategy. ASC has noted that they aim to develop a strategic workforce plan that extends over multiple timeframes in the near future and this will be critical to effectively planning and managing the future workforce.

ASC has undertaken a large amount of work in relation to succession planning. Success plans exist for all critical roles and critical employees. In addition, high potential staff have been identified across the organisation and included as part of the succession plans.

5.5.1.4 Future workforce planning considerations

There is currently no enterprise-wide workforce plan for a total Collins and future submarine workforce. This is critical given that organisations within the Enterprise and DCNS (and associated suppliers/contractors etc.) will be recruiting from the same labour market. This is likely to impact CASG the most given the imbalance of purchasing power between CASG, ASC and DCNS.

In addition, careful planning will need to be undertaken across the Enterprise in order retain staff to sustain the Collins as the opportunity to work on the future submarines program will be an exciting prospect that may draw staff away from the sustainment of the Collins.

To support the Enterprise-wide workforce planning, the Review Team recommend that formal workforce planning forums be established to discuss:

- Emerging workforce requirements
- Identify workforce gaps and overlaps
- Workforce risks and issues
- Apply consistency in workforce planning approaches (AS 5620:2015)
- Support mutual workforce planning capability growth.

To support the Enterprise workforce planning, it is also important that Navy, CASG and ASC continue to mature their workforce planning capability. ASC have invested in the appropriately qualified staff to support them in this endeavour. Navy and CASG however are reliant on internal resources that support their wider-organisations.

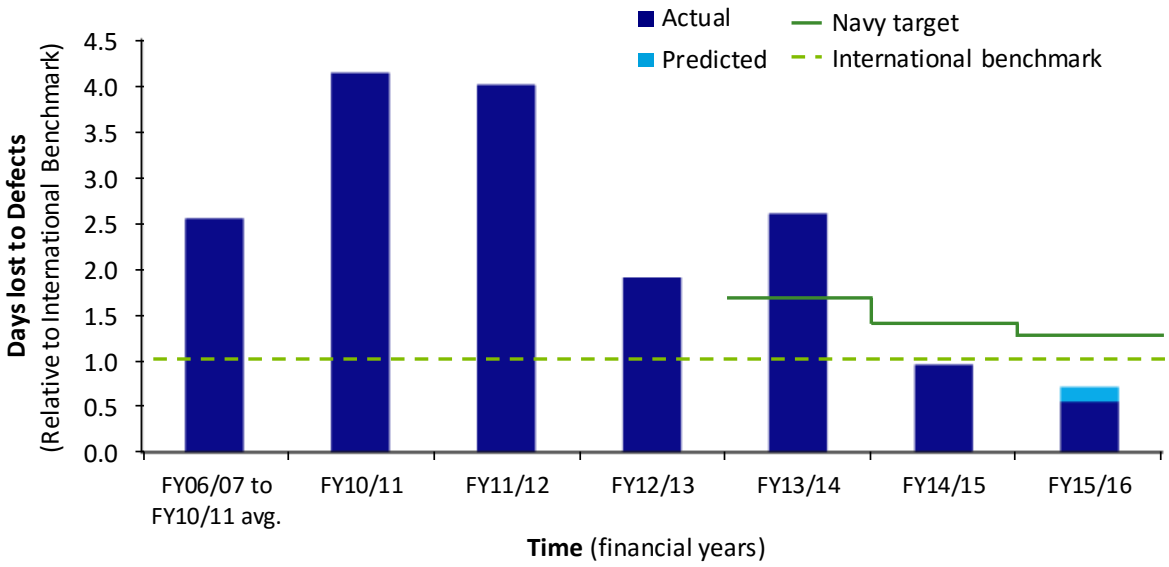
Relying on wider-Defence workforce planning services may not deliver the workforce planning capability and maturity required to manage the unique nature of the Collins and future submarine workforce. Navy and CASG should consider whether to invest in dedicated (and possible shared) workforce planning resources.

6 Annex C - Part C detailed analysis

6.1 Going beyond benchmark

Reduction in the number of days lost to URDEFs is a significant achievement. Figure 34 shows days lost to URDEFs was approximately 2.5 times benchmark in the period FY06/07 to FY10/11. This number is now predicted to be approximately 0.7 times benchmark at the end of this financial year in the worst case. Reducing this to 0.5 times benchmark corresponds to a defect rate of approximately 5% of planned availability - a level which is usually associated with strategic systems.

Figure 34 - Days lots to defects



The Review Team note that this performance is likely resulting from four primary drivers:

- Improvements in SAL completion, including identification of mission critical spares as shown in Table 11
- A reduction in P1 URDEFs from approximately ten arising per month to an average of less than one per month as shown in Figure 7 and Figure 35
- A reduction in time taken to receive stores in response to P1 defects of approximately 70% as shown in Figure 7
- An increase in the P1 demand satisfaction rate from an average of 50% to approaching 100% as shown in Figure 37.

Figure 35 - Annual defect rate breakdown since 1996

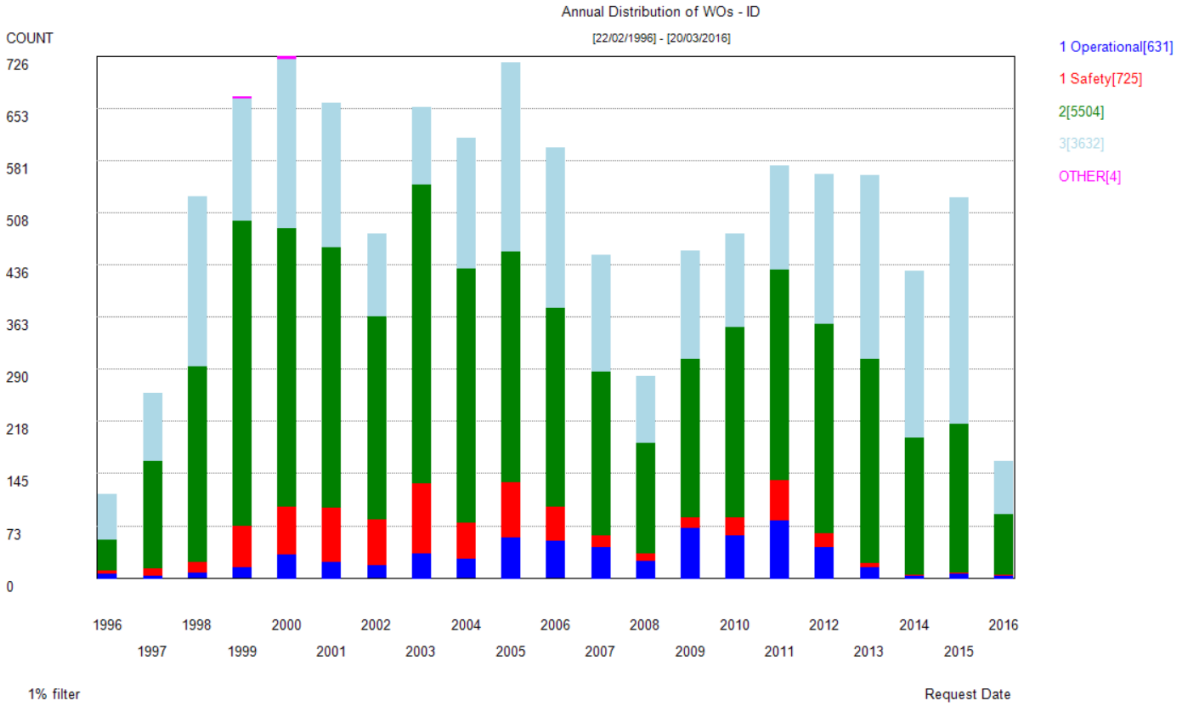


Figure 36 - Average response time to P1 defects

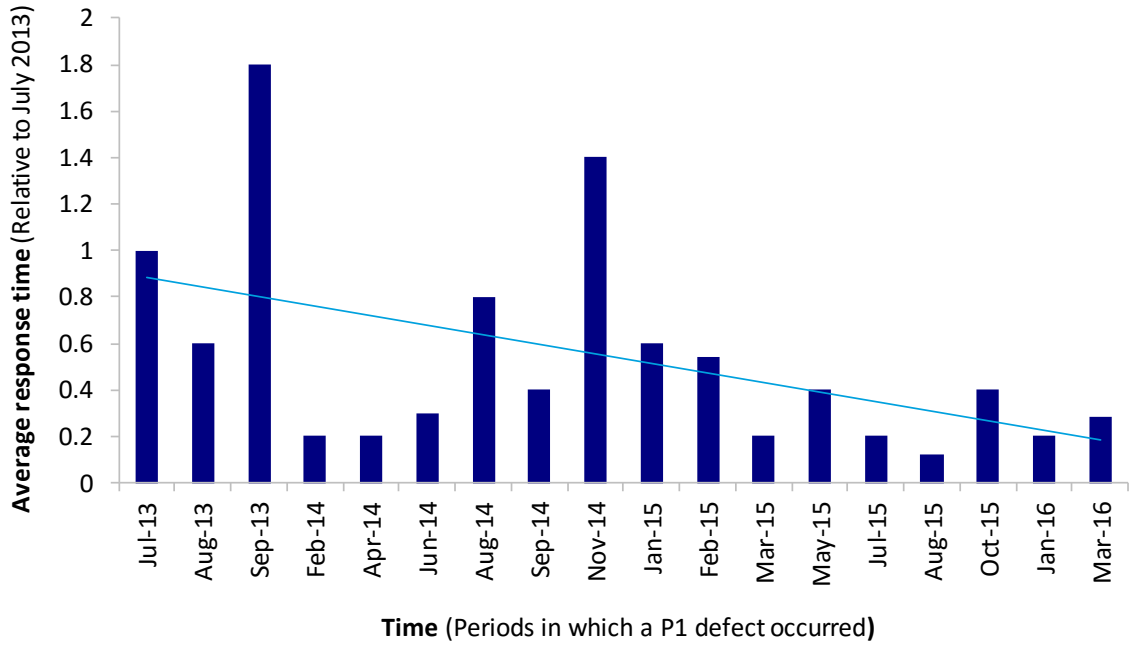
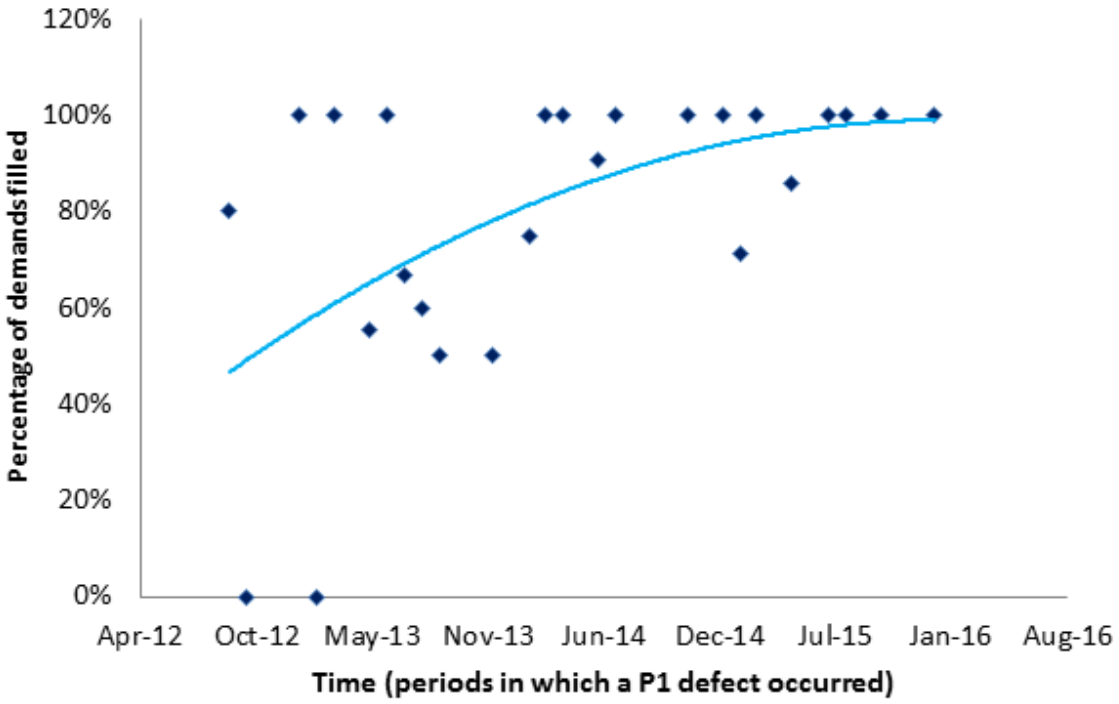


Figure 37 - P1 demand fill rate from supply



Sustaining beyond benchmark performance depends on ensuring the reliability program is effective in managing defect rates and also having a supply chain that is able to satisfy short notice demands in response to defects.

The Review Team have already been shown that the Enterprise is capable of achieving this required performance but note there are key risks that should be addressed. The Team have outlined a significant number of CCPs have not been incorporated, of the 1051 CCPs that are approved, the number fitted to each submarine ranges between 404 and 639.

The Review Team note that a condition monitoring program is in place and there are plans to improve it. Currently the program encompasses vibration analysis for pumps and motors every six months resulting in identification of root cause faults for the air conditioning unit, oil analysis to detect early bearing failures, and motor circuit analysis used to detect impending failure for the high pressure air compressor on HMAS Dechaineux. The Review Team recommend that the condition based monitoring program be investigated for further enhancement to increase submarine reliability.

The Review Team conclude that the reliability program can be improved to increase the number of CCIs fitted during maintenance periods and to enhance the condition monitoring program to detect incipient failures.

Risks identified in the supply chain involve a predicted $22.4M shortfall for FCD rotable items, a predicted shortfall in $17.2M in operational rotable items, and a predicted shortfall of $4.6M in the IIP for FY16/17 (Submarine program review, 29 April 2016). These shortfalls may result in an increase in delivery times, reduction in Ships Allowance List (SAL) fill rates, or a decrease in P1 demand fill rates. This effect could become starkly apparent now that five submarines are in the operational cycle. These risks should be addressed by the Enterprise to ensure sustainment of performance beyond benchmark.

7 Annex D - Covaris report summary

Covaris was engaged to provide analytics support to the Review Team into the performance and risk management of the Collins submarines. This work follows on from two previous reviews completed in earlier years.

The report has been completed within the timeframe available for this review. What has been reported is supported by the data and the analysis, however the Team recommend further work to confirm some of the findings of this report.

7.1 MCRs

SIMS/SIS data is incomplete where for example, the system is not used for scheduling and hence the scheduled start and finish dates of the work are not updated. Hence SIMS/SIS cannot be used to inform standard maintenance work performance KPIs such as schedule compliance.

If the Commonwealth systems do not have a true record of all work undertaken on RAN ships and submarines, then the Commonwealth is hampered in its intent to undertake continuous improvement and deliver effective naval engineering.

A balance of work type study was completed comparing preventive to corrective maintenance across different categories of work. Despite limitations with the data, it was found that Collins maintenance was reasonably well balanced in levels of different kinds of maintenance.

Studies of the work history of in-service submarines picked up a high degree of variability in O-level maintenance recorded in SIMS/SIS to the extent the Team are not confident that all shipboard maintenance is being recorded.

The Team consider the MCR backlog as a possible risk to submarine reliability. Some form of backlog risk reporting would be considered good practice if taken up by the Enterprise.

7.2 URDEF Trends

P1 URDEFs should be used as a KPI of the technical performance of MCD and FCD External Maintenance Periods, and should also result in a challenge of an ID's scope if arising within 3-4 months after the completion of the ID. This severity of failure should not be incurred after a major External Maintenance Period.

In general, there was good alignment between areas of the submarine which had the highest rate of corrective maintenance MCRs and URDEFs. The area where there was no alignment was the frequency of earth faults in the 24V system plus URDEFs in FGCs such as the Power Conversion Cabinets.

In response to field feedback, the Freon units were assessed for rate of URDEFs. In keeping with the MCR history, Freon unit reliability has fallen, but Freon unit concerns are not seen as significant as the key areas listed above.

7.3 Map Analysis

The bulk of the MAPs processed as a result of UUC changes were between 7/2014 and 12/2014. This demonstrates that the Enterprise acted effectively on the past Coles recommendations for improvement of the UUC.

There is a fair proportion of MAPs which have been sometime in backlog. The key areas of interest are Hull, Propulsion, Power and Combat Systems plus Weapons Discharge and Handling. Long term MAPs longer than 12 months in these FGC areas should be reviewed.

7.4 DMDR Analysis

There are long term delays in implementing recommendations to address DMDRs suggest that this process may not supported by sufficient resources.

7.5 CCP Analysis

Few CCPs have progressed to the review stage. This suggests that the CCP process for the class has slowed between 2013 and 2016. Hence there is little progress on capability improvement of the submarines using this controlled process.

7.6 External Maintenance Periods

ID periods are well poised for remediation of significant reliability problems encountered in the lead up to the period. This was shown for HMAS *Sheean* diesel issues. Secondly, time is needed to allow for emergent work as the tanks are opened up and a first look of any material loss is undertaken.

FCD periods need to address persistent reliability problems and also allow for capability improvements. In the case of HMAS *Farncomb*, the capacity to resolve half of the outstanding CCPs were included the scope of work.

The MCD which was studied finished on time and included small periods where labour activity had dropped down before a final intense period to ready for the submarine for return to service. This MCD included plenty of work on CCPs which was obviously well scheduled and did not impact the return to service date.

7.6.1 HMAS *Farncomb* FCD 225

The work scope of the HMAS *Farncomb* FCD 225 is correlated with the reliability history of the submarines established from just the last 3 years of corrective maintenance and URDEF history. This showed that the FCD work scope was well posed to address the known problem areas: the ASC planners understand what work needs to take place on the submarines during major maintenance.

7.6.2 HMAS *Dechaineux* MCD 212

The Review Team consider that the MCD scope covered considerable CCP work and there would be risk to attempting to fit more in. The Review Team noted a lull midway in the period where labour was withdrawn and this may be a reasonable expectation as the WA labour force covers other submarine maintenance work outside the MCD.

While the MCD scope covered a number of key areas of concern for submarines, areas including the diesel engines, towed array and HP air systems did not exhibit a measureable increase in the subsequent reliability trends.

The Review Team do have concern with the integrity of hours and labour data contained in the Prima Vera resource tables, but presume this does not impact on the sense gained of the work loading through the period.

7.6.3 HMAS *Dechaineux* ID 220

The ID was analysed in terms of the schedule. Like ID 208, the schedule was tight and focused with no room for additional work.

Unlike MCD 212 and ID 208 data, the labour hours extracted from the Prima Vera files looked reasonable.

7.6.4 HMAS *Sheean* ID 208

An overrun of about 20 days from the scheduled finish of the ID was detected in an analysis of the work loading in the schedule.

The remediation work on the diesels in this ID was an example where the Enterprise was well aware of a significant problem with this specific submarine and adjusted the scope of an External Maintenance Period to cover both the PM schedule (i.e. the tanks and compartments) and remediation of a problem area. It was good that the work was applied across all three diesels and not allocated to just one set, since the reliability was deteriorating for all three sets. It is now important that the enterprise monitor the success of this work and see if the reliability performance lifts.

The Review Team do have concern with the integrity of hours and labour data contained in the Prima Vera resource tables, but presume this does not impact on the sense gained of the work loading through the period.

7.6.5 Capacity for additional work

The Review Team requested whether the submarine External Maintenance Periods would have some capacity for additional capability improvement work. This analysis suggests the following.

7.6.5.1 IDs

A 3-month ID has no capacity for capability improvement work and should be reserved for:

- PM compliance
- Emergent work associated with opening up the tanks
- Defect remediation of persistent defects in the period leading up to the ID.

As the IDs extend to a 6-month period the opportunity to introduce submarine improvement work is then possible, potentially pro rata in terms of labour expended on improvement over a 6-month period as compared to that expended in a 12-month MCD period (i.e. approximately 50% of the potential hours).

There remain significant constraints on the improvement work which may be factored into an ID:

- Such work is undertaken in the WA precinct and available labour may from time to time be limited as compared for example, to the SA work which has a dedicated task force on FCDs
- Commitment to improvement work should not place the return to service data at risk since even though the IDs are extended to 6 month periods, the risk of impact to submarine operational schedules is significantly higher than the MCD or FCD periods
- There remains a concern of legacy defects introduced by such work and strict controls are needed on the commissioning checks to ensure no latent URDEFs are created. While technical integrity considerations should assure that no such latent defects are initiated, the work in this project has identified Priority 1 URDEFs soon after work in MCDs and FCDs. Under the tighter schedule of the ID, quality control considerations need to take on a higher level of focus in the scheduling.

7.6.5.2 MCDs

An MCD may have some potential to achieve this, based on the following rules:

- All initial work in the MCD is associated with inspection and repair and an allowance of condition-based remediation
- During a period after an initial peak of work on the submarine it is conceivable a that a small window of around 4 months (16 weeks) may open up to allow additional improvement work to be inserted into the schedule
- Such improvement work must be well finished before the ramp up of work necessary to close out the submarine, test all work and return it to service.

7.6.5.3 FCDs

The only limitation on the capacity of an FCD to support capability improvement work is the maturity of planning and specification of the work packages in sufficient time before the commencement of the period to allow the work to be integrated into the FCD work schedule.

A lock date has to be observed, after which improvement work cannot enter the scope.

Note: The Review Team has provided an extract of the Covaris report above. As part of this review, Covaris analysed information contained in SIMS/SIS and Prima Vera. Data limitations prevented a schedule compliance analysis being undertaken. The Review Team suggests that it would be worthwhile doing this analysis external to this review to verify that the planning improvements observed are systemic and not a result of heroic efforts.

8 Annex E - Approach to the study

8.1.1 Phase 1. December 2011

In Phase 1 of the Study, the Review Team visited the prime locations for submarine support in late 2011. The Team conducted a series of interviews and limited investigations to determine the primary issues for further investigation in Phase 2.

In December 2011 the Phase 1 report identified the following 10 critical causes of poor sustainment performance:

- Poor availability caused by a crew shortfall, lack of spares and unreliable equipment
- Strategic leadership lacking cohesion
- Finance, DMO, Navy and Industry not acting collectively as an 'Enterprise'
- A lack of clarity of accountability, authority and responsibility
- Submarine domain knowledge thinly spread
- A lack of robustness of Navy's contribution to manning and sustainment
- DMO tending to seek direct involvement at the tactical level
- Performance based ethos yet to be embedded in the ASC
- No long-term strategic plan for efficient asset utilisation
- An unclear requirement and unrealistic goals.

8.1.2 Phase 2/3. November 2012 – Study into the business of sustaining Australia's Collins Class Submarine Capability

In Phase 2 the Team gathered evidence to measure performance and compare to best practice, identifying gaps and impacts. It answered the following questions:

- What is wrong now with the Collins fleet sustainment performance?
- What caused the current problems with sustainment performance?
- Will improvement initiative address these issues?
- What are the recommendations to resolve the remaining issues?

In Phase 3 the Team developed international benchmarks for best practice of comparable submarine fleets worldwide, then measured the Collins sustainment performance against these benchmarks. The Team also considered the Collins Class Service Life Evaluation Program and many other initiatives of the RAN, DMO and ASC that were underway at the time. Analysis identified 21 key issues leading to poor performance and traced them back to five root causes:

- **Unclear requirements** - that could not be translated into drivers for the sustainment program
- **Lack of a performance based ethos** - between the major parties in the Collins Class Sustainment Program (CCSP)
- **Unclear lines of responsibility** - resulting in blurred lines of accountability, duplications and gaps in responsibilities

- **Poor planning** - the lack of a clearly stated long-term strategic plan prevents accurate lower level plans and targets being established and achieved
- **Lack of a single set of accurate information to inform decision making** - means decisions are unlikely to be consistent or accurate.

The Team made 25 recommendations to address these root causes.

Following the acceptance of the November 2012 report an Implementation Strategy was developed to guide the implementation of the recommendations and supporting initiatives.

8.1.3 Phase 4. March 2014 progress review

In Phase 4 the Team revisited the sustainment environment 15 months on from the November 2012 report to gauge progress along the transformation path.

The approach taken in the 2014 report was more forward-looking and recognised that the sustainment business had embarked on a major transformation program towards benchmark performance as recommended in the 2012 report, and that positive results had been achieved across the Enterprise.

The review assessed progress against the 25 recommendations and found:

- Nine of the recommendations had been **completed** and the objective achieved (Green assessment)
- Eleven recommendations were **still underway** but were expected to meet the intent expressed in Phase 3 on time (Amber assessment)
- Four recommendations were **at risk** (Red assessment), because the intent of the recommendation had been misinterpreted; or implementation is too slow or has not commenced.
- One recommendation had **not been accepted**.

8.2 May 2016 - Beyond Benchmark review

This report reviews the progress made to date since the release of the 2014 report and makes an assessment of the enterprises capability to improve the materiel availability of the Collins submarines beyond the international benchmark, whilst maintaining regional superiority and reducing sustainment costs.

This review has been conducted by a small team over a seven-week period and has reviewed in the detail the progress made since the release of the 2014 report. The Team began initial evidence collection and interviews in Canberra following which they progressed their assessments with visits to ASC facilities in SA and WA as well as Fleet Base West. Visit de-briefs, in-depth analysis and report writing was then completed in Canberra. Over the course of the review, interviews were conducted with key personnel from RAN, CASG, ASC and Finance.

The Review Team utilised a hypothesis tree to undertake the analysis for the report. The hypothesis tree is a structured approach to answering ambiguous problems. By structuring the answer as a series of hypothesis, which can be broken down into deeper layers, analysis can be conducted and questions posed to prove or disprove the top level hypothesis. The

tree allows the focus of the investigation and the results to be clearly communicated to interested stakeholders.

The analysis, findings and recommendations have been outlined in three sections within this report. Part A outlines the current Collins sustainment performance measured up until FY15/16, which included a progress assessment of the 25 recommendations made in Phase 3. Part B focuses on the Enterprise's ability to sustain performance into the future taking into account the demands of the SEA1000 program. Finally, Part C outlines recommendations for the Enterprise to improve performance beyond benchmark. Detailed evidence is included in the annexes to provide additional rigour.

The Review Team believes that this report contains no classified information and is therefore suitable, should the Commonwealth wish it, for publication.

9 Annex F - Glossary

9.1 Glossary of Terms

Table 16 - Glossary of terms

Term	Definition
ABR	Australian Book of Reference
AEO	Authorised Engineering Organisation
AMS	Asset Management Strategy
APS	Australian Public Service
ASC	ASC Pty Ltd (formerly Australian Submarine Corporation Pty Ltd)
BIR	Business Improvement Request
BoM	Bill of Materials
CASG	Capability Acquisition and Sustainment Group
CCI	Configuration Change Item
CCB	Configuration Control Board
CCP	Configuration Change Proposal
Collins	Collins Class Submarines
Collins RAM Plan	Collins Class Submarine Reliability and Asset Management Plan
CCSP	Collins Class Sustainment Program
CEO	Chief Executive Officer
CEP	Competitive Evaluation Process
CMP	Capability Management Plan
CN	Chief of Navy
CN10 PdS	Chief of Navy - 10 - Product Statement (includes sustainment budget)
COLSPO	Collins System Program Office
CSMP	Collins Submarine Program
CSSG	Combat Sustainment Steering Group
CSSC	Collins Submarine Supply Support Council
CTP	Collins Transformation Program
CYXX	Calendar Year, where XX denotes year.
DCNS	Direction des Constructions Navales Services (SEA 1000 design partner)
Defence	Australian Department of Defence
DGSMC	Director General Submarine Capability
DIFOTQ	Delivery In Full, On Time to Quality
DMDR	Design and Material Deficiency Report
DMO	Defence Materiel Organisation
DRN/DPN	Defence Restricted Network/Defence Protected Network
DSME	Director Submarine Engineering
ELG	Executive Leadership Group

Term	Definition
ETSM	Electronics technician Submarines
FCD	Full Cycle Dockings
FCDMI	Full Cycle Dockings Maintenance Instructions
FIC	Fundamental Inputs to Capability
Finance/DoF	Department of Finance
FPT	Forward Planning Team
FSM	Future Submarine
FYXX/YY	Financial Year, where YY denotes the end year of the period covered. For example, the financial year 2010/2011 is represented as FY10/11.
GM Submarines	General Manager Submarines
HMAS	Her Majesty's Australian Submarine
HPLT	High Performance Leadership and Management Team
ID	Intermediate Docking
IIP	Inventory Investment Plan
IMP	Intermediate Maintenance Period
IMS	Integrated Master Schedule
Industry	All industrial elements contributing to the Collins Class capability
ISSC	In-Service Support Contract
ISCMMS	Integrated Ship Control Management and Monitoring System
ISO	International Standards Organisation
ISSC	In-Service Support Contract
IT	Information Technology
KHI/KPI	Key Health Indicator/Key Performance Indicator
Long-term	Time period greater than four years
LOTE	Life of Type Extension
MACP2	Maintenance Amendment Change Proposal 2
MAP	Maintenance Amendment Proposal
MCD	Materiel Capable Day
MCD	Mid Cycle Docking
MCR	Maintenance Control Record
Medium-term	Time period between one and four years
MER	Maintenance Efficiency Review
MILIS	Military Integrated Logistics Information System
MRD	Materiel Ready Days
MSA	Materiel Sustainment Agreement
MST	Maintenance Support Towers
MTSM	Marine technician Submarines
NTRS	Naval Technical Regulatory System

Term	Definition
OEM	Original Equipment Manufacturer
O-level	Operational Level Maintenance
OM tablets	Operational Maintenance tablets (?)
OQE	Objective Quality Evidence
P1 URDEF	Priority 1 URDEF
PACA	Pre-Availability Condition Assessment
Participants	The four organisations responsible for the Collins; the RAN, CASG, Finance and ASC
PCA	Physical Configuration Audit
PLM	Product Lifecycle Management
PMMP	Planned Maintenance Management Program
PSSG	Platform Sustainment Steering Group
PWD	Planned Withdrawal Date
RAN	Royal Australian Navy
RCA	Root Cause Analysis
SA	South Australia
SAL	Ship Allowance List
SAT	Sea Acceptance Trial
SEA 1000	RAN Future Submarine Acquisition Project
Short-term	Period of time up to one year
SIMS	Submarine Information Management System
SIS	Submarine Information System (deployable version of SIMS)
SLEP	Service Life Evaluation Program
SM	Submarine
SMCIP	Submarine Capability Improvement Program
SMP	Self-Maintenance Period
SPO	System Program Office
SUBFOR	Submarine Force
TPB	Transformation Program Board
TPO	Transformation Program Office
URDEF	Urgent Defect
UUC	Usage and Upkeep Cycle
VMI	Vendor Managed Inventory
WA	Western Australia

9.2 A Review Team guide to sustainment

Throughout this Review report there are frequent references to details of the new Collins Operating Cycle - the "10+2". Below is a simple guide.

Term	Definition
UUC	Usage and Upkeep Cycle. The specific periods of planned maintenance over a whole operating cycle
Update	Update is the term used to capture obsolescence – necessary as equipments or their spares are no longer available from original suppliers
Upgrade	Upgrade is the term used for new capability insertions and can refer to ship equipment (hull, mechanical and electrical) as well as weapon systems
FCD	Full Cycle Docking – the long two-year maintenance period during which deep maintenance is conducted – including the removal and repair of large items of equipment normally inaccessible. Also because of the long duration, new capability can be inserted During this period the submarine is docked to inspect, survey, and repair underwater structures and fittings that are under water. 90% of a submarine is underwater and not therefore visible
MCD	Mid Cycle Docking – The submarine is docked – taken out of the water – during this period A long one-year maintenance period that occurs mid-way between FCDs. Preventative maintenance and the less intrusive deep maintenance is conducted
ID	Intermediate Docking – typically a several month preventative maintenance period during which time the submarine is docked
IMP	A short Intermediate Maintenance Period conducted alongside undertaken by ships staff and base support including contractors typically several weeks duration
IMS	Integrated Master Schedule – a classified program that specifies when each submarine is programmed to be in planned maintenance – extends for several years
10+2	The new Usage and Upkeep Cycle The "10" is ten years – the operating interval between FCDs or Full Cycle Dockings. The "2" is two years for the duration of the new FCD
Availability	Normally expressed as a percentage of time during the whole operating cycle that the submarine is planned or expected to be available for military tasking A submarine will be unavailable if it is undergoing planned maintenance (and if its planned maintenance exceeds its scheduled duration, i.e. overruns) or it suffers from a defect which results in loss of sea-time
Benchmark Availability	A level of availability established by the "Coles Review" representing the average availability of several navies each with a small number of submarines

Term	Definition
Intrinsic Availability	The maximum availability for a given UUC and the associated planned maintenance intervals that could be achieved with strict adherence to planned maintenance periods and no loss of time for the rectification of defects
Unreliability – Also known as days lost to defects	A measure to express the percentage time lost when a *submarine was not in planned maintenance (or overrun)* due to a defect. The CN10 represents the days lost to defects as a fixed percentage of time. Care is needed when using this to express unreliability, in which case it should be calculated retrospectively for a period as: $$Percentage\ days\ lost\ to\ defects = \frac{days\ lost\ to\ defects}{days\ lost\ to\ defects + actual\ MRDs} \times 100$$
Overruns	All planned maintenance periods have a defined duration. The CN10 represents overrun as a fixed percentage of time
MRD	Materiel Ready Days – an important metric (see availability). Usually expressed as a number of days in a year a submarine is not in planned maintenance or suffering from defects which prevent it proceeding to sea
P1 URDEF	A Priority 1 urgent defect that may cause a loss of MRD
P2 URDEF	A Priority 2 urgent defect – a defect that needs attention
P3 URDEF	A Priority 3 urgent defect – a minor defect