

Submarine Fleet Performance – ASC's Collins Experience

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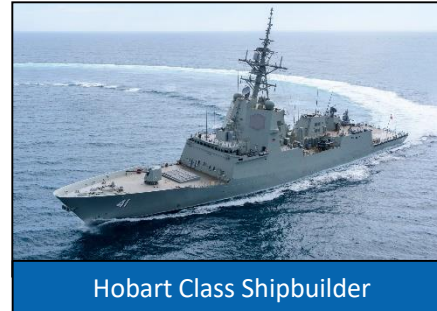
Outline

1. ASC Overview
2. Collins Class Submarines
3. Transition to Sustainment
4. Coles Review (2011 – 16)
 - Submarine availability
 - Key findings
5. Implementation of the Key Findings
6. Outcome



ASC Overview

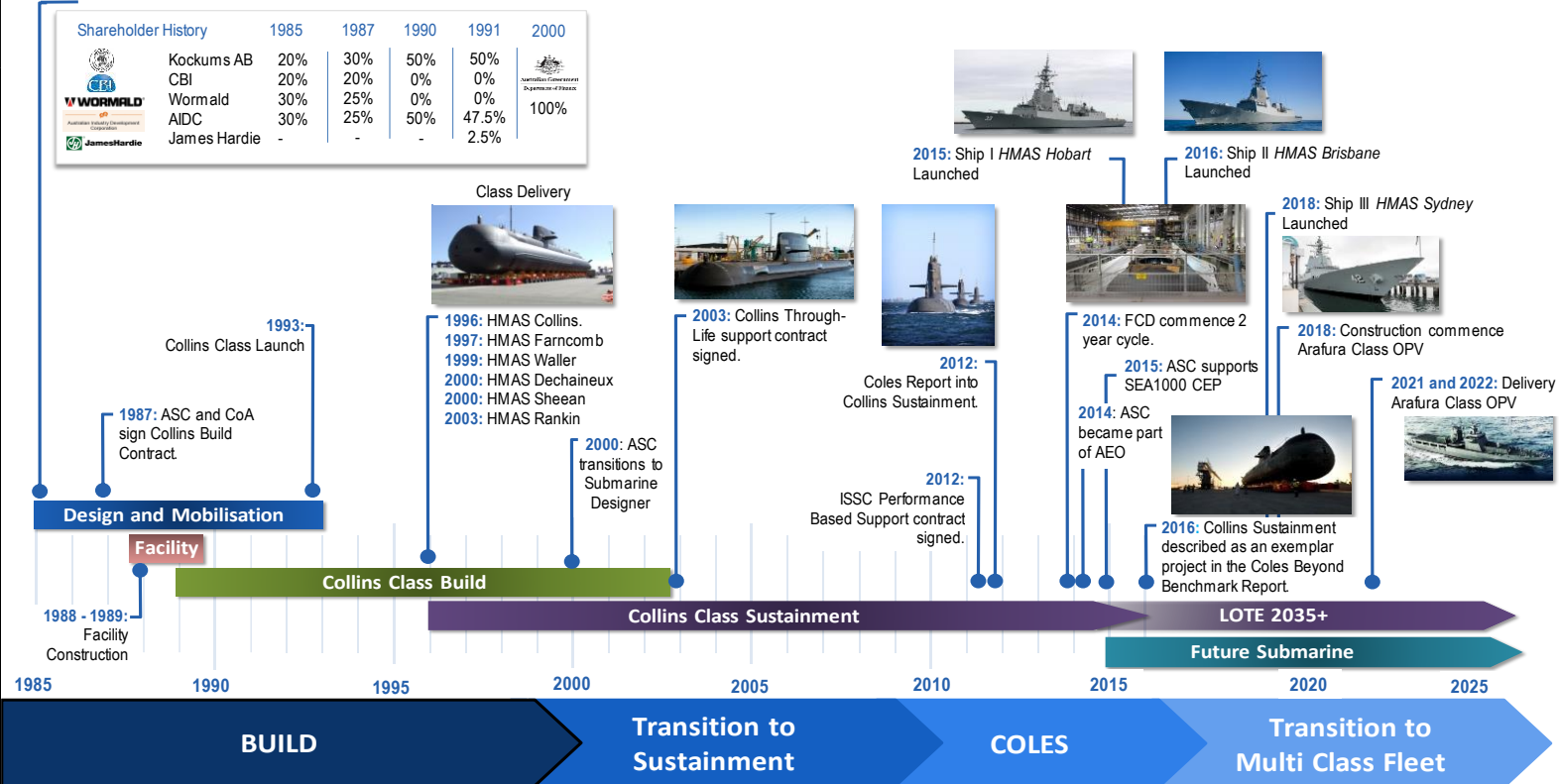
- Australian Submarine Corporation Pty Ltd founded 1985
- Owner
 - Commonwealth of Australia
 - Government owned Business Enterprise (GBE)
- 1,400 employees
- Operations in South Australia and Western Australia
- Annual Revenue – A\$765m



ASC – Corporate Timeline

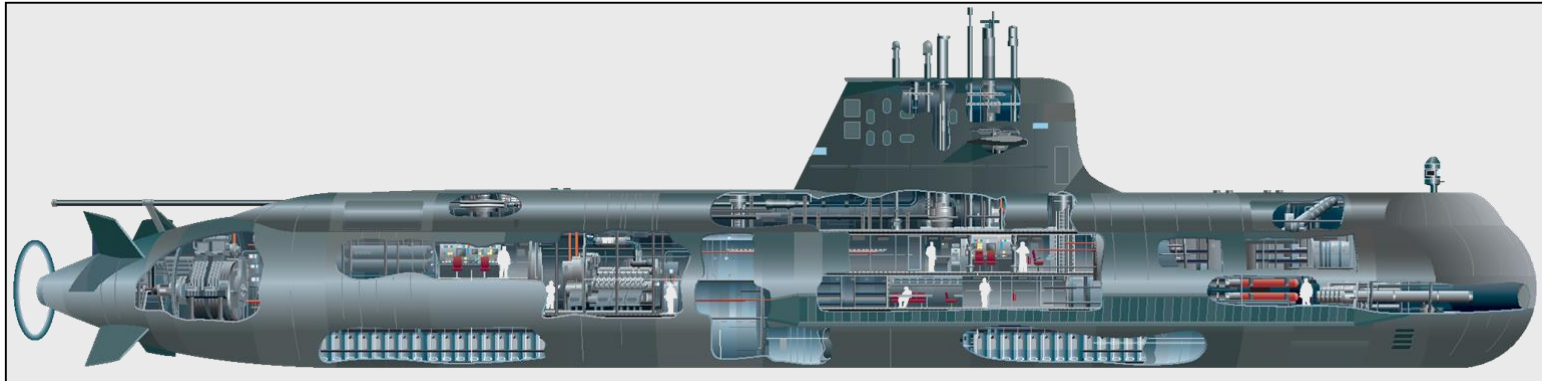
1985: ASC Established

Shareholder History		1985	1987	1990	1991	2000
	Kockums AB	20%	30%	50%	50%	
	CBI	20%	20%	0%	0%	
	Wormald	30%	25%	0%	0%	
	AIDC	30%	25%	50%	47.5%	100%
	James Hardie	-	-	-	2.5%	



The Collins Class Submarine

- One of the first modern era, long range conventional submarines
- 3,100 tonne surface displacement
- Construction by ASC in 16 years (1987 to 2003)
- SAAB Kockums AB design – based on the Västergötland-class



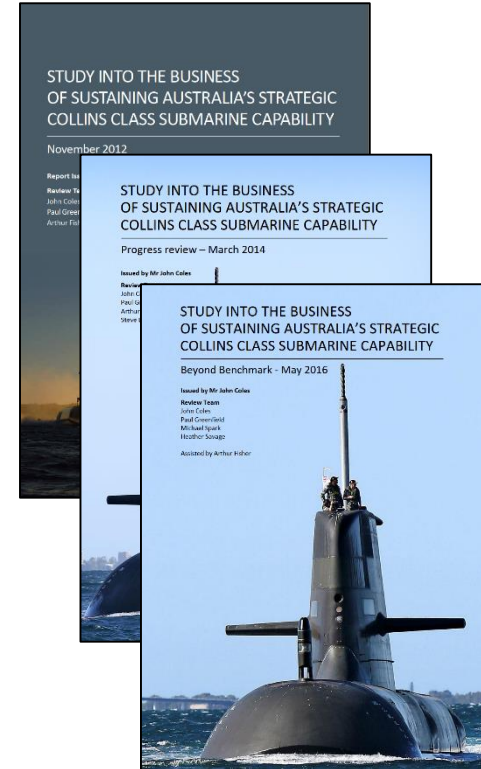
Transition to Sustainment

- Sustainment activities began upon the delivery of HMAS Collins in 1996.
- Industrial arrangements based on purchase orders for individual maintenance activities.
- A decade later saw the establishment of long term strategic industrial arrangements.
- Once the Fleet had been delivered, the Full Cycle Dockings (FCD) programme commenced.
- More comprehensive maintenance contracting arrangements were established however, factors progressively emerged that impacted submarine availability & the cost of ownership.



Coles Review - 2011 to 2016

- Australian Government commissioned a study lead by John Coles into the end-to-end business of the submarine fleet sustainment.
- The team reviewed the period from 2006 to 2010 which was characterised by declining submarine availability compared to international benchmarks.
- According to Coles, the decline in availability was a result of a combination of factors related to alignment of organisational responsibility and lack of clear performance objectives, ultimately impacting submarine reliability and availability.

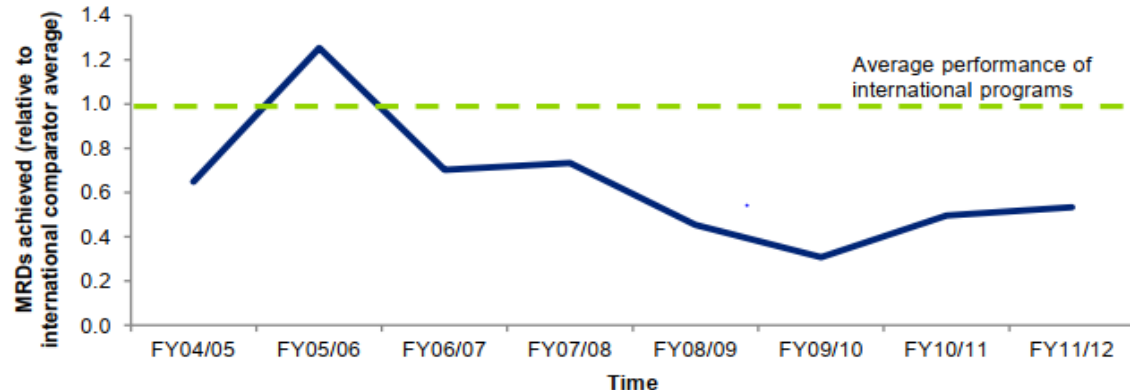


Submarine Availability (2006-12)

The review concluded that the factors driving the availability deterioration included:

- Growing Urgent Defects
- Unclear requirements
- Unclear lines of responsibility
- Lack of clearly stated strategic plan
- Lack of performance based ethos

Figure 3 - Comparative Availability



* Study Into The Business Of Sustaining Australia's Strategic Collins Class Submarine Capability, November 2012

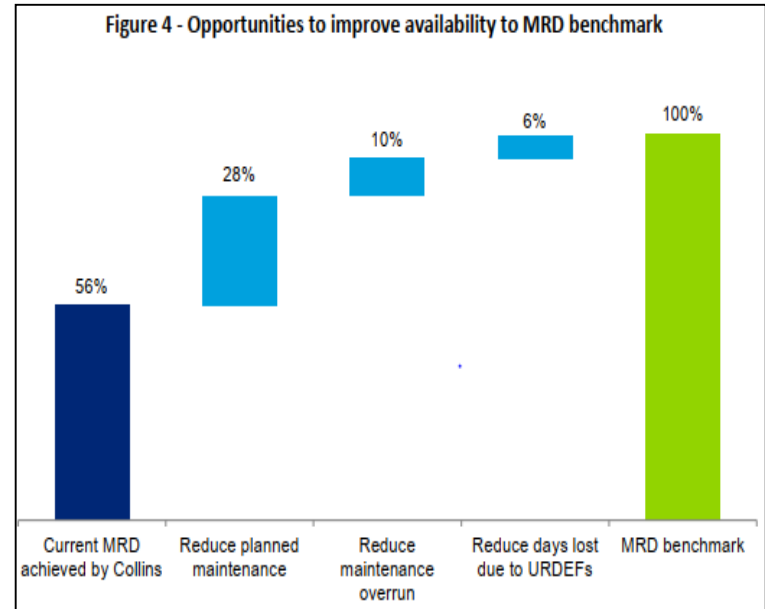
Relative Impacts on Material Ready Days*

Low levels of submarine availability against the benchmark were driven by 3 key factors:

1. Long planned maintenance periods (28%)
2. Overruns to planned maintenance periods (10%)
3. Defects outside of maintenance periods (6%)

Conclusion

Changing the Usage Upkeep Cycle, shortening maintenance periods & managing in a way that reduces overruns yields the biggest contribution to improving available Material Ready Days.



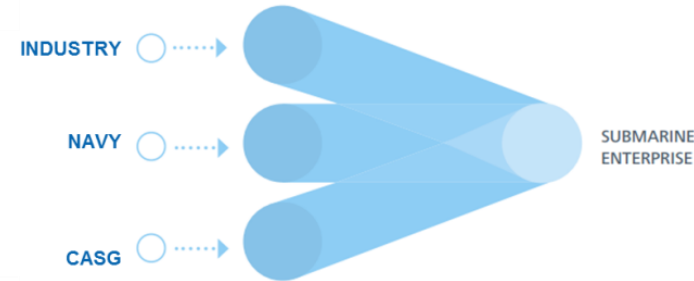
Coles Review*: Key Findings

1. Establish a Submarine Enterprise oversight group comprising Navy, Department of Defence - *Capability Acquisition & Sustainment Group (CASG)* and ASC with a clear and aligned set of submarine performance requirements.
2. Clarify and re-align the key roles within the Value Chain.
3. Establish a 10+2 year Usage Upkeep Cycle (*from 8+3*) and a new whole-of-life Integrated Master Schedule while minimising schedule overrun for maintenance activities and reducing in-service defects.

Implementation: Submarine Enterprise

'Australian Submarine Enterprise' established

- Included
 - Royal Australian Navy
 - DOD – Capability Acquisition & Sustainment Group (CASG)
 - Industry - ASC
- Shared long term vision
- Alignment of objectives and outcomes
- Governance & joint management of the Transition Plan



Implementation: Value Chain principles*

- Clarification of roles and responsibilities:
 - An Informed Customer, Owner and Operator
 - Supportive Industry; and
 - An Intelligent Buyer
- Transition to 'Good Practice'
- Remove duplication/confusion
 - Particularly with suppliers
 - Singular accountability



Implementation: Value Chain roles

Value Chain	Functions	Develop capabilities				Preparedness			Strategy					
	Activities	Define needs	Define requirements	Develop Business Case	Acquire capability	Preparedness obligations	Develop Master Plan	Govern sustainment program	Manage materiel strategy	Establish standards				
Outputs		•Operational needs	•Required capability defined •Through-life support strategy	•Developed and quantified options	•Preferred option selected •Capability upgrade acquired	•Advise on achievable preparedness obligation •Asset management policy	•Capability plan •Revised MSA •Updated IMS	•Managed performance •Managed risk	•Sustainment objectives •Asset management strategy (consistent with overall Enterprise strategy) •Strategic contracting	•Material Standards •Technical Regulations •Certification basis •Configuration change proposal				
Current responsibility		RAN	CDG	CDG	DMO	RAN	DMO	DMO	ASC DMO RAN	RAN				
Good practice responsibility		RAN	CDG	CDG	DMO	RAN	RAN	DMO	DMO	RAN				
Value Chain	Functions	Planning				Sourcing & materiel supply			Upgrade & maintenance			Testing & certification		
	Activities	Establish asset plan	Perform engineering	Develop maintenance scope	Develop schedule	Source & Procure	Manage in-bound/outbound supply	Manage storage	Product configuration management	Install capability	Conduct maintenance	Conduct contractor trial	Accept & Certify	Conduct sea trial
Asset management plan		•Design document •Drawings •ILS products	•MRRs defined •COIs recorded •Alternatives to obsolete items identified (includes O-level)	•WBS for all maintenance and upgrade activities including material and labour requirements	•Preferred supplier selected •Contracting arrangements established •Raw material, services, consumables and spares (e.g. parts, GPE) ordered	•Raw materials consumables & spares received from suppliers	•Raw materials, consumables & spares in storage (warehouse or on-board)	•Updated Functional, Allocated & Product Configuration Baselines	•New capability installed	•Completed MCR •MURDEFs repaired	•STW plan developed and conducted •Present OQE •Contract sea trials	•Acceptance of contracted work scope •Certification of materiel readiness •Change of materiel control •MRDs commence	•HAT/SAT trial plan developed and conducted •Certified by COMFLEET	
		DMO	ASC	DMO	ASC	DMO	ASC	DMO	ASC	ASC	ASC	ASC	DMO	RAN
		ASC / Industry	ASC / Industry	ASC / Industry	ASC	ASC / Industry	ASC / Ind / RAN / (OLM)	ASC / Ind / RAN / (OLM)	ASC	ASC / Industry	ASC / Ind / RAN / (OLM)	ASC / Industry	DMO	RAN

Transition from
'Current Responsibility'
to **'Good practice'**



1. ASC becomes solely responsible for Supply Chain and Engineering

2. Removes opportunity for excuses due to the performance of others






Indicates all three organisations have indicated that they are responsible

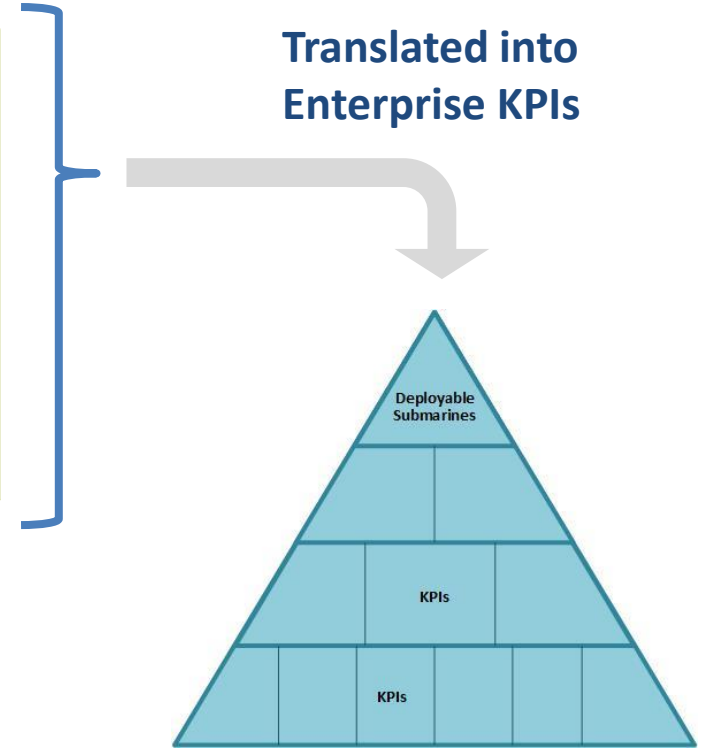


Indicates that two organisations have indicated that they are responsible

Implementation: Enterprise KPIs

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.



- Deployable Submarines
- Material Readiness Days
- Material Capability Days
- Material Ready Days lost to P1 urgent defects
- Material Ready Days lost to maintenance overruns
- Submarine days spent in planned maintenance
- Submarines available to Fleet Commander

Measures of Success*

* Study Into The Business Of Sustaining Australia's Strategic Collins Class Submarine Capability, November 2012

Implementation: ASC Transition Projects

ASC aggregated transition activities into 7 projects:

1	Usage Upkeep Cycle redesign	From 8+3 to 10+2 years, realign maintenance baseline.
2	HMAS Collins Pre FCD	First circumferential hull cut, tank paint & other initiatives.
3	Supply support	Supply consolidation, inventory of spares, rotatable pool.
4	Core production change initiatives	Over 14 significant change tasks, Maintenance Support Tower etc.
5	HMAS Farncomb FCD 225	First 10+2 Full Cycle Docking.
6	Submarine Engineering development	Evaluation of new maintenance baseline, Authorised Engineering Authority arrangements, Logistics.
7	Class safety & certification	Assurance of technical integrity, safety after revised Usage Upkeep Cycle and maintenance baseline.

Implementation:

ASC Transition Project 1 - Usage Upkeep Cycle (UUC) redesign

Increase availability by:

- Simultaneous extension of the operational cycle to 10 years while reducing Full Cycle Docking duration from 3 to 2 years
- Ensure no future overlapping of Full Cycle Dockings
- Establishing a new fleet Integrated Master Schedule
- Re-aligning the maintenance baseline

Implemented by:

- Set period codes of over 4,000 Maintenance Requirements (MRRs) were reviewed to understand the viability of moving to the new UUC.
- MRRs were moved to either an earlier or later SPC aligning with the new UUC.
- Mid Cycle and Intermediate Docking durations were extended to accommodate tasks which due to safety or reliability reasons were unable to be moved to FCD.
- Delivering multiple Production efficiency initiatives to shorten the critical path & reduce the production hours by over 300,000 hours to deliver a Full Cycle Docking in a 2 year period.
- Activity was successfully managed across the CCSM fleet which required the individual management and migration of each platform through the process.

Implementation:

ASC Transition Project 2 – HMAS COLLINS Pre Full Cycle Docking

HMAS Collins placed into a pre-FCD activity

- A key enabler to the 10+2 migration.
- Provided the opportunity for organisation to focus upon development of new 2 year FCD execution philosophy.
- Equipment normally refurbished as part of an FCD that impacted critical path was removed for refurbishment, supporting a UXE/rotatable pool philosophy e.g:
 - Main propulsion motor
 - Diesel Generators
 - Induction and Exhaust valves; etc.
- Enabled the early testing and development of new production methods ahead of the first 2 year FCD such as single coat paint scheme.
- Initial pressure hull cut process trialled and proven.

Implementation:

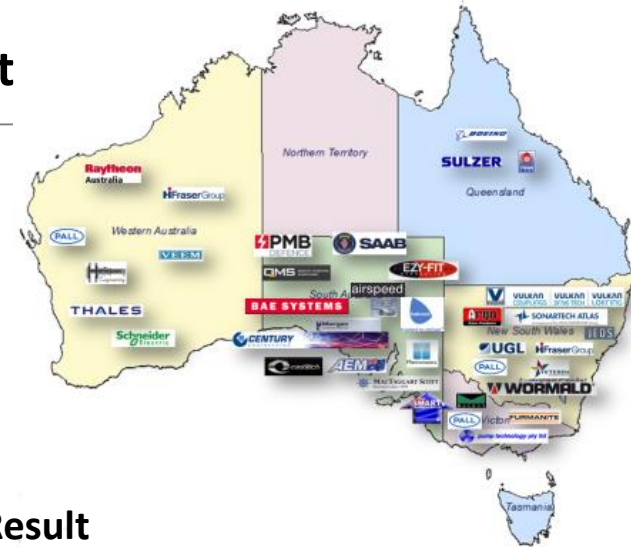
ASC Transition Project 3 – Supply Support

Coles identified

- Split of responsibility between ASC & Defence stores system a target for improvement, material availability issues

Supply Improvement actions included

- Consolidate the supply chain responsibility around ASC, using ASC's existing supply chain & materials management systems
- Additional material funding provided through the Inventory Investment Program (IIP) enabled the identification and procurement of an optimum spares holding and established purchasing routines to maintain material levels for the new UUC.



Result

- Material availability improved from mid 60% to mid 90%
- Improved certainty & ability to execute maintenance to plan
- Ability to implement 'repair by replacement' strategies

Implementation:

ASC Transition Project 4 – Core Production Change Initiatives

The challenge

Transitioning to a 2 year Full Cycle Docking in one step required the development and implementation of numerous strategies to:-

- shorten the critical path,
- reduce the production hours,
- de-conflict critical activities; and
- provide certainty over execution.

Approach

30 complex improvement initiatives targeted significant cost & time reduction.



Implementation:

ASC Transition Project 4 – Core Production Change Initiatives

Hull cuts

- Cutting and reinstating the Pressure Hull without impact on Deep Diving Depth or fatigue life.
- Exploiting the 1, 5 & 8 rule of thumb.
- Enabled critical equipment to be removed from the submarine (3 x DGs & MPM) to be either replaced from the rotatable pool or for off boat refurbishment & test.
- Provide improved access for on board activities including metal loss repairs.

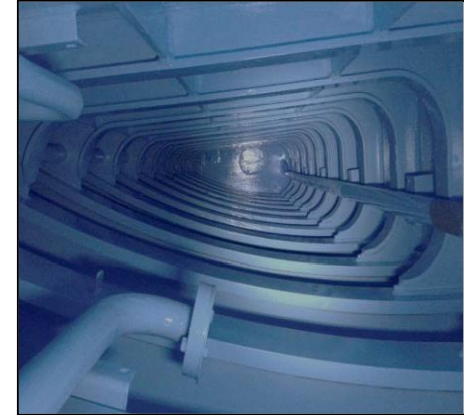


Implementation:

ASC Transition Project 4 – Core Production Change Initiatives

Single coat paint system

- Introduction of a single coat paint scheme significantly reducing processing time.
- Careful sequencing of paint zones for optimum execution.
- Implementation of a three shift production routine.



Specialised repair & test facilities

- Establish specialised off boat repair & test facilities.
- Extracting the Main Propulsion Motor & Diesel Generators for repair & test reduce cost and remove main critical path.

Implementation:

ASC Transition Project 4 – Core Production Change Initiatives

Maintenance Support Towers (MST) – a ‘New Way of Working’

- Multi-storey facility which encapsulate the submarine providing workforce direct access to all levels.
- Developed to provide the necessary facilities that surrounds the submarine at all levels; including:
 - Provides workshops,
 - Material stores
 - Canteen and employee services
 - Supervisory support
- Greatly reduces downtime and improved utilisation.
- Designed, built and installed in 9 months
- Return on investment achieved in the first Full Cycle Docking.



Implementation:

ASC Transition Project 5 – HMAS FARNCOMB FCD 225

Overview/Approach

- First attempt at a 2 year FCD employing newly developed methods & maintenance baseline.
- Revolution over Evolution - transition in one step.
- Allowed for a singular focal point for the Enterprise.
- Main motor & diesel generator exchange initiatives met accelerated schedule expectations.
- Improved material availability supported schedule adherence & reduced impact of emergent defects on critical path.
- Established work zones successful in de-conflicting concurrent work activities.



Results:

- First 2 year FCD completed on time (2016)
- Production hours reduced by over 30%
- Integrity of platform performance & safety maintained

Implementation:

ASC Transition Project 6 – Submarine Engineering Development

Overview/Approach

- ASC became accountable for all major platform engineering and technical changes.
- Required the development of further engineering/asset management capability to support the platform through to the Planned withdrawal date.
- Reviewed entire maintenance baseline to support the new UUC and critical assessment of systems to ensure platform and safety.
- WA engineering capability and platform knowledge base grew to support the operational maintenance organisation.
- ASC ultimately established 13 of the 15 level 2 engineers in the Enterprise.

Implementation:

ASC Transition Project 7 – **Class safety & certification**

Overview/Approach

- Ultimately accountable to the Submarine Enterprise Board and the Chief Naval Engineer for the assurance of technical integrity.
- Ensure entire change program did not undermine the submarine safety case.
- Reviewed the cumulative impact of the entire 10+2 transformation plan across the platform and delivery organisations from a safety perspective and to provide assurance of delivery.
- Included independent validation and verification of hull cut process and solution.

Results:

- Outcome and project deliverables delivered to Chief Naval Engineer for acceptance.
- Executed and delivered in parallel with all other outcomes.

Outcome:

The Coles Review:

- Provided the catalyst for a new phase of improvement across the Submarine Enterprise comprising Navy, CASG and Industry.

Through a strategy of:

- Establishing the 'Australian Submarine Enterprise'; aligning objectives.
- Moving to Usage Upkeep Cycle optimised for 6 platforms.

Implementation achieved by a program focused on:

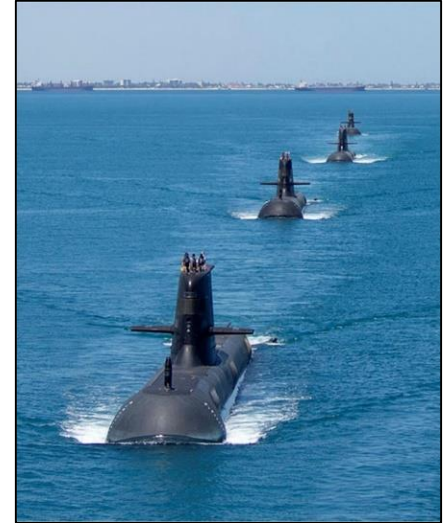
- Extending the operational cycle from 8 to 10 years.
- Reducing Full Cycle Docking duration from 3 to 2 years.
- New optimised delivery Infrastructure.
- Consolidating management of the supply chain.
- Establishing ASC as the Engineering Authority for the class.



Outcome:

Results

- Implementing Coles recommendations has seen tremendous improvement in the delivery of Collins Class Submarine sustainment.
- After successfully completing two FCDs under the new UUC, the Enterprise is now delivering submarine maintenance to the Royal Australian Navy's requirements.



John Coles (May 2016)

- *“A program once that was considered a **“Project of Concern”** should perhaps be now 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 resilience that as a Strategic System it should have had when it entered service”.*

Questions?

