

Technical Meeting — 2 June 2021

Ian Moon, Head of Engineering, Naval Ship Management (Australia) (known as NSM), gave a presentation on *An Inclusive Approach to Naval Sustainment* as a webinar hosted by Engineers Australia using the WebEx software platform with IMarEST ACT & NSW Branch Committee Member, Simon Wong, as MC on 2 June. This presentation attracted 118 participating on the evening.

Introduction

Ian began his presentation with some background on NSM, which was established in 2012 as a joint venture between Babcock Australia Pty Ltd (a wholly-owned subsidiary of Babcock International PLC) and UGL Ltd and is Australia's only dedicated warship sustainment company and a steward of multiple classes for the Royal Australian Navy. Their team of sustainment experts, strategically located across Australia, work with their broad Australian and international supply chain to provide cost-effective and responsive solutions which optimise the availability, capability and seaworthiness of critical maritime assets.

Their capability spans the full spectrum of naval sustainment services:

- Asset management
- Ship repair, refit and refurbishment
- Maintenance support
- Engineering support
- Supply chain management
- Procurement and logistics support

Headquartered in Henderson, Western Australia, NSM's national footprint and highly-responsive local Australian supply chain was created and continues to evolve, to support their customers' critical assets wherever and whenever the need may arise.



NSM presence around Australia
(Map courtesy NSM Australia)

NSM provides long-term sustainment contracts in partnership with the Royal Australian Navy (RAN), notably:

- The Anzac (FFH) class frigates as a member of the Warship Asset Management Agreement (WAMA). Awarded in 2016, WAMA represents an Alliance between NSM, BAE Systems Australia, SAAB Australia and the Department of Defence's Capability Acquisition and Sustainment Group (CASG), for the total asset management of the RAN Anzac -class frigates through to the end of operational life. Together, the WAMA Alliance delivers materially seaworthy warships, driving long-term efficiencies for the Royal Australian Navy, at an optimal cost of ownership.
- As the Canberra-class Landing Helicopter Dock (LHD) Asset Class Prime Contractor (ACPC), NSM provides the support and sustainment program for both Canberra-class LHDs, HMA Ships *Canberra* and *Adelaide*, along with 12 LHD Landing Craft (LLC). The ACPC contract includes the Through-life Support Facility and Navy Training System Centre based at Randwick Barracks in NSW.



HMAS Anzac
(RAN photograph)



HMAS *Canberra*
(RAN photograph)

Key Building Blocks

NSM provides naval sustainment and support across the In-service and Disposal phases of the capability life cycle. Naval sustainment and support are built upon the Inclusive Prime model, an evolution of NSM's successful Thin-Prime model which provides industry with opportunities to contribute to naval sustainment and to develop their capability. Rather than simply integrating industry, NSM incorporates four key building blocks to deliver effective and efficient sustainment outcomes.

The Right Partnerships

Establishing the right partnerships with shipbuilders, system and sub-system manufacturers, industry and, of course, the Royal Australian Navy is paramount.

As an example, HMA Ships *Adelaide* and *Canberra* were required to be recalled from their Reduced Activity Period (RAP) at short notice. These assets were needed for Humanitarian Assistance and Disaster Relief (HADR), joining HMAS *Choules* and MV *Sycamore* which were already deployed in support of the newly-declared *Operation Bushfire Assist*. Before her deployment, HMAS *Adelaide* required several outstanding maintenance activities to be performed which were identified after her last overseas deployment late in 2019. HMAS *Canberra* was also in RAP and was undergoing continuous maintenance with multiple systems requiring reactivation and certification before she could be deployed.

In addition to logistics, NSM arranged for several local small-to-medium-sized enterprises (SMEs) to accelerate scheduled maintenance activities to support this mission. Specifically, maintenance on HMAS *Adelaide*'s gas turbine, which was scheduled for January 2020, was performed before Christmas 2019 thanks to the responsiveness of General Electric (GE) Marine.

Following HMAS *Adelaide*'s deployment, HMAS *Canberra* also required preventive and corrective maintenance across the critical systems to be completed by NSM and our approved repair agents, ranging from flight-deck systems, surveillance systems, cranes and davits, and propulsion systems.

HMAS *Adelaide* was reactivated earlier than expected, less than 48 hours after being notified of the requirements to support the deployment for *Operation Bushfire Assist*, as directed by the Commonwealth of Australia.

NSM arranged for our contractor GE Marine to sail with HMAS *Adelaide* and remain on board to facilitate final set-to-work on the gas turbine system. Shadbolt, another of NSM's major local partners, also sailed with HMAS *Adelaide* to provide fitting and set-to-work of mechanical systems. HMAS *Canberra* was also made available for deployment on schedule, within three weeks of notification after undergoing her maintenance.

Notable achievements across both platforms include rectification of over 40 high-priority defects along with the conduct of preventive and corrective maintenance to critical systems including propulsion and fire-main and fixed firefighting systems.

Australianised Supply Chain

NSM is Nationally recognised for their support for Australian SMEs and their engagement in the sustainment and support of Australia's naval assets. We recognise that development of Australian industry capability is more than a simple headline number on supply-chain participation. We support this development through:

- providing suppliers with assurance, stability and an environment which encourages investment in training, systems, equipment and facilities;
- facilitating engagement with the Centre for Defence Industry Capability (CDIC) and access to Commonwealth development grants; and
- identifying and supporting specific capability development opportunities for Australian SMEs.

As an example, NSM conducted preliminary investigations of alternative coatings with the Australian SME Echo Yachts. This work identified the Tefroka EP® deck-coating system developed by GTF Freese from Germany as the preferred product. Tefroka is a self-levelling mortar polymer system which seals the deck, is jointless, hard wearing, abrasion resistant, watertight, and International Maritime Organization (IMO) approved. Application of the product required suitably-trained and competent personnel. NSM worked with the Commonwealth, GTF Freese and Echo Yachts, with matched funding from the Sovereign Industrial Capability Priority (SICP) Grant to:

- deliver a proof-of-concept application to HMAS *Ballarat*; and
- upskill Echo Yachts' staff and secure original equipment manufacturer (OEM) approval for the company for the application of the Tefroka EP® deck-coating system.

Following the proof-of-concept, Tefroka was approved for use across the RAN Anzac class with more than 420 m² laid in 2020 across five platforms.

Effective Collaborative Relationships

In a complex alliance or enterprise, the provision of seaworthy materiel requires strong collaboration across all participants. Furthermore, the dynamic nature of naval ship sustainment requires a level of responsiveness which can only be achieved through effective collaboration. Without effective collaboration, there is a danger that accountabilities and requirements can be interpreted in isolation.

NSM is aligned to ISO44001:2017, Collaborative Business Relationship Management Systems, because:

- NSM provides a clear framework for collaboration which enables specific strategies to be established and supported by a common set of tailorable resources defined in the standard.
- NSM recognises the role of individuals and supports the development of individual competencies as well as organisational development.
- Babcock International PLC (one of NSM's joint-venture partners) is a founding member of and ambassador for the Institute of Collaborative Working (ICW), sponsors of the ISO44001 standard, and supported the benefits of aligning with the standard.

ISO 44001 is built around a collaboration lifecycle of eight stages. The earlier stages are primarily focused on internal alignment with the benefits of business collaboration, whereas the latter stages are related to the mechanics of actual collaboration with your partners. The application of the standard in NSM's context, is focused on three stages:

- Working Together—Governance, management systems and processes.
- Value Creation—Continual improvement processes.
- Staying Together—Team management monitoring, measurement, and behaviour.

A recent paper on Defence Industry Collaboration (Lomas et al. 2019) highlighted three critical elements for this collaboration:

- Core Values and Culture: As with other enterprises established in support of the RAN Fleet, sitting above how we and all enterprise participants will work together is the enterprise charter.
- Communication: It is important to create a psychologically-safe environment for communication. 'Psychological safety' is a belief that one can openly speak up with ideas, questions, concerns, or mistakes without fear. Research by Google and the Harvard Business School has highlighted that as having the largest impact on a team's success. Fostering psychological safety requires:
 - Leading by example — leaders within the team will be open to opinions, approachable and encouraging of questions, and will acknowledge their mistakes.
 - Encouraging active listening by, for example, showing an understanding by repeating what has been said or communicated and discouraging phones in meeting rooms.
 - Creating a safe environment by ensuring that people aren't interrupted, not placing blame and not being judgemental of ideas.
 - Developing an open mind-set by encouraging the sharing of feedback.
- Trust: Trust is nurtured through working in accordance with the processes, principles and responsibilities set out in management plans. However, the measurement of this trust is more challenging — in part because of the broad range of potential trust indicators based on performance, communications, honesty and problem resolution, etc. An example is to identify a small set of trust indicators for collaboration:
 - prompt response to queries;
 - openness and transparent communications; and
 - declaring lack of capability/resource.

As an example, the current repair procedure to change out the aft stern-tube seal on a vessel starts with dry docking. Docking facilities are located on both the west and east coasts of Australia. Once the ship is docked, the stern tube is drained, the seals are removed and replaced. On completion, the stern tube is refilled and the ship undocked and returned to the water.

Through advances in technology, Wärtsilä were able to offer an in-water repair option to replace the aft stern-tube seal on HMAS *Toowoomba* without the need for dry docking. This involved erecting a hyperbaric chamber (habitat) in the water around the shaft line and stern tube. Once the habitat was in place the stern tube was drained of oil, the oil seal assembly was removed, cleaned, refurbished and replaced. On completion, the stern tube was refilled with oil and the habitat removed.



Aft stern-tube seal on HMAS *Toowoomba*
(Photo courtesy iKAD Engineering)

Robust Digitally-enabled Asset Management

Asset management is like the ‘keel block’ of naval sustainment — providing a solid platform for the effective delivery of all the associated services which work together to maintain ship availability, capability and seaworthiness.

NSM’s asset-management capability focuses on balancing costs, opportunities and risks, against the desired asset performance throughout the naval vessel lifecycle, and is founded on our:

- Processes, which are aligned to the ISO 55001 standard for complex and critical equipment and tailored to the needs of all stakeholders.
- People, who provide the ‘know how’ and ‘know why’ required to develop an effective long-term asset management strategy. Competencies, our ability to apply knowledge and skills to achieve intended results.
- Technologies, with a particular focus on ‘know what’ to deliver a single, accurate and complete source of truth for the delivery of asset management services. This ensures that asset management decisions and planning are not compromised by a poor knowledge of the ships and their systems.

NSM has implemented a digitally-enabled asset-management approach which combines ISO standards with Industry 4.0 technologies such as big data analysis and predictive modelling. In November 2019 NSM was formally awarded certification of its asset-management system capability for the provision of sustainment services for maritime asset sustainment of complex assets under the global standard ISO 55001:2014.

As an example, in 2017 the east coast NSM team was instrumental to the planning and delivery of the first Major Fleet Unit Extended Maintenance Period delivered overseas, for HMAS *Arunta* in Bahrain. Our planning strategy included bringing high-risk works forward to earlier maintenance periods and engaging with the local industry in Bahrain



HMAS *Arunta* undergoing maintenance in Bahrain
(RAN photograph)

Another example was the recently completed five-year maintenance period for HMAS *Canberra* which was particularly complex and important. The five-year maintenance:

- was the first for the LHD class delivered by the LHD Enterprise team comprising Amphibious Combat and Sealift Systems Program Office (ACSSPO), Amphibious and Afloat Support Group (AASGRP) and NSM;
- required effective collaboration with Navantia as the ship designer and major OEMs, particularly Siemens for the replacement of the propulsion pods; and
- was completed during the global COVID-19 pandemic and the restrictions which this posed.

The largest single achievement from HMAS *Canberra*'s first five-year maintenance period was the replacement of the 12 t propulsion pods which required an unprecedented level of engineering and local supply-chain support for their transport, loading and installation. For example, it required the following support structures to be designed and constructed locally:

- new A-frames and double beams to support the mass of the propellers and pods;
- a self-propelled modular transporter to move the pods and frames into position;
- new auxiliary cradles to support the bulkier propellers; and
- a 400 t crawler crane to provide reach and lifting capabilities.

The Microsoft technology, Hololens, was used to provide a live link between the waterside crew and the Siemens team in Germany when specific technical support was required.

Other highlights which show how these dockings are so much more than these big-ticket items included:

- 190 000 hours of maintenance activity delivered by more than 50 NSM-approved Australian repair agents;
- a complete colour change of the LHD platform using more than 60 000 L of paint; and
- the application of a new underwater coating system in collaboration with the Defence Science and Technology Group (DST Group)-supported anti-fouling trials.



HMAS *Canberra* completing her five-year maintenance period
(RAN photograph)

Conclusion

Naval Ship Management (Australia) is a leading provider of complete maritime sustainment solutions across the In-service and Disposal phases of the capability life cycle of Royal Australian Navy ships. Naval sustainment and support are built upon NSM's Inclusive Prime model, which incorporates four key building blocks to deliver effective and efficient naval services: the right partnerships, an Australianised supply chain, effective collaborative relationships, and robust digitally enabled asset management. This model has been shown to be successful in practice.

Questions

Question time was lengthy and elicited some further interesting points.

The certificate was subsequently posted to Ian, and the "thank you" bottle of wine delivered via an eGift card.

Ian's presentation was recorded and is now available on the RINA YouTube channel (see *The Internet* column).

Reference

Lomas, I., Puttergill, R., Humphrey, A. and Stoker, C. (2019), South Australian Defence Industry Leadership Program 2019, *Defence Industry Concept Paper*, December.