

Jane's Defence Weekly

## **Briefing: Sailing apart**

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**Although Australia and New Zealand jointly procured their ANZAC frigates to a common baseline, the two nations are now following very different courses for their respective mid-life update programmes. Richard Scott reports**

It is now almost a quarter of a century since the prime contract for the Anzac Ship Project (named after the Australian and New Zealand Army Corps of the First World War) was inked by the Commonwealth of Australia and the AMECON consortium. This collaborative programme between the Australian and New Zealand governments resulted in the design, development, and construction of 10 ANZAC-class guided missile frigates - variants of the Blohm+Voss MEKO 200 design - for the Royal Australian Navy (RAN), which received eight ships between 1996 and 2006, and the Royal New Zealand Navy (RNZN), which commissioned its two ships in 1997 and 1999 respectively.

Both navies' ships were procured under a single joint project directorate, for which a treaty between Australia and New Zealand detailing management arrangements was signed in December 1989.

Designed as general-purpose surface combatants for worldwide operation, the 10 ANZAC ships were all assembled and integrated at the Williamstown, Victoria, Australia, shipyard of what is now BAE Systems. Ships for both Australia and New Zealand were delivered to an essentially common platform, propulsion, and combat system configuration.

On the propulsion side a highly efficient combined diesel or gas (CODOG) machinery arrangement was selected, using a single General Electric LM2500-30 gas turbine and twin MTU 12V-1163-TB83 diesels driving twin shafts with controllable-pitch propellers. This was designed to give the ships a speed of 27 kt at full load and a range in excess of 6,000 n miles at 18 kt.

At the hub of the ANZAC combat system was the 9LV 453 command and fire control system supplied by what is now Saab Systems (previously CelsiusTech) and based on the company's 9LV Mk 3 product. The 9LV 453 configuration comprised seven Type IIA dual-screen multi-function operator consoles (MFCs) interfacing to the key elements of the combat system through an Ethernet local area network. Saab also took responsibility for the combat system engineering required to integrate sensors, weapons, and command facilities into a unified combat system.

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### **RAN enhancements**

For Australia, Project SEA 1348 - the requirement that led to the ANZAC frigates - was originally conceived to deliver a so-called 'Tier 2' light patrol frigate for low- to medium-intensity missions. Given this limited role, and the 'fitted for but not with' philosophy of the time, the ANZACs were

delivered relatively lightly armed. Yet even before the first ship entered service, the RAN had begun to consider a raft of capability enhancement options to exploit the growth potential inherent in the platform and combat system.

Accordingly, the RAN's ANZAC fleet has benefited from a series of incremental update packages. One of the most important has been the replacement of the RIM-7P missile with the RIM-162 Evolved SeaSparrow Missile (ESSM), which offers improved kinematic performance and a significantly expanded engagement envelope over its predecessor. Furthermore, the greater packing density of ESSM (four quad-packed missiles can be accommodated in a single Mk 41 cell) significantly increases the defensive firepower available to a single ship.

The provision of ESSM capability, and integration into ANZAC frigates, is managed under Project SEA 1428; its scope has included design changes to combat system hardware and software elements, and design and modification of ship platform and weapon systems, shore facilities and logistic support. The combat system has been redesigned to interface directly to the Mk 41 VLS and to a new solid-state CWI (SSCWI) developed by CEA Technologies. The combat system software also incorporates Australian-developed 'engageability' data and exploits advanced operating modes of the missile during engagement to enable local-area defence, high-value unit protection, and crossing target capabilities to be exploited.

A first ESSM firing was conducted from HMAS *Warramunga* off Western Australia in January 2003. *Warramunga* was the first ANZAC frigate to receive the SSCWI transmitter.

Under Project SEA 1348 Phase 3A, all eight ANZAC ships have received the RGM-84L Harpoon Block II anti-ship missile as part of an Underwater and Surface Warfighting Upgrade Program. Two quad launchers have been installed in front of the bridge; below decks, the Boeing Advanced Harpoon Weapon Control System (AHWCS) is fitted to support mission planning, including automatic missile flight routing for coastal shoreline areas, selectable terminal trajectory and multi-target, multimissile engagement. Saab Systems, through the ANZAC Ship Alliance, developed new software to support the AHWCS combat system interface.

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### **ASMD upgrade**

During the mid-1990s the RAN and the Australian Department of Defence (DoD) considered an ambitious ANZAC Ship Warfighting Improvement Programme (WIP) under Project SEA 1443. This foresaw a substantive upgrade that would combine improved anti-ship missile defence (ASMD) with an air-warfare capability based on the retrofit of a 3D radar, additional Mk 41 VLS and the Standard Missile 2 (SM-2).

In the event the WIP was abandoned in late 1999 after studies showed it to be impractical within acceptable bounds of cost and risk. Instead, the DoD announced that it would pursue a less ambitious plan to enhance the ASMD capability alone so as to "provide a practical level of self-protection against anti-ship missiles".

This programme, under the umbrella of Project SEA 1448 Phase 2, has set out to confer the ANZAC ships with a robust local area air-defence capability so as to defeat the latest generation of anti-ship

missile threats. Phase 2, in fact, comprises two distinct parts: Phase 2A embraces improvements to the combat management system (CMS) to shorten the detect-to-engage sequence and the introduction of an infrared search-and-track (IRST) system to provide improved detection and indication of low-elevation air threats in cluttered environments; Phase 2B addresses improvements to the ships' fire-control capability to expand the number of simultaneous ESSM engagements.

The CMS upgrade involves the introduction of the improved 9LV 453 Mk3E system and the complete remodelling of the operations room. This new action information organisation has been designed to reduce the time between detection and engagement of anti-ship threats and improve the overall tactical information flow among the command team.



*The CMS upgrade forming part of SEA 1448 Phase 2 involves the introduction of the improved 9LV 453 Mk3E system (with 10 new 30-inch widescreen operator consoles) and the complete remodelling of the operations room. (Australian Department of Defence)*

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From an external perspective the installation of the new PAR suite radically changes the ANZAC profile. A new mast is installed amid ships, atop which sits a distinctive cupola housing the CEAFAR radar and CEAMOUNT illuminator. The legacy TIR is removed and the AN/SPS-49(V)8 volume search radar antenna is re-sited to a new position atop the cupola.

Also introduced under SEA 1448 Phase 2B is a new navigation radar system based on two Kelvin Hughes SharpEye I-band radars. Video feeds from the two radars are combined into a single video output so as to prevent 'blind arcs' owing to above-deck obstructions. The system also provides a navigation tactical display in the bridge and operations room and feeds radar video output into the CMS and ECDIS system.



*HMAS Perth was the first ship to receive the ASMD upgrade under Project SEA 1448 Phase 2. The new PAR suite is housed in the distinctive mast fitted amidships. (Australian DoD)*

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HMAS *Perth* was used as a pilot ship to prove the ASMD modifications implemented under Project SEA 1448 Phase 2. A first firing trial, undertaken from the ship in May 2011 as part of Stage 1 trials, saw ESSM missile guidance exercised in home-all-the-way (HAW) mode. Initial operational release followed in August 2011.

The following year the ship participated in an advanced air warfare weapons event during a multinational firing serial at Exercise 'Rim of the Pacific' ('RIMPAC') 2012 off Hawaii. During this 'RIMPAC' serial, *Perth* fired a pair of ESSMs at two sea-skimming targets, again in HAW mode.

Operational test and evaluation performed at the Pacific Missile Range Facility (PMRF) in Hawaii in late August 2013 included a number of successful ESSM firings in a series of stressing scenarios to demonstrate full Stage 2 capability. Stage 2 consists of a software upgrade to both the PAR and CMS enabling missile guidance in interrupted continuous wave illumination (ICWI) mode.

A total of 10 ESSMs were launched in five live firing serials at PMFR to prove the new capability, with ICWI used in all live firing serials. Testing at PMRF included successful missile engagements against multiple sea-skimming targets, and demonstrated the successful implementation of the ICWI

capability by controlling two simultaneous ESSM engagements through the CEAMOUNT illuminator system.

Two separate engagements involving firings of ESSM were conducted against GQM-163A Coyote supersonic targets. Both were successful.

HMAS *Arunta*, the second of the RAN's ANZAC ships to receive the ASMD upgrade, began sea acceptance trials in late June 2014. Next in line is HMAS *Anzac*, which began Harbour Acceptance Trials in July, with the remaining five ships to be upgraded by the end of 2017; *Ballarat*, *Parramatta*, *Stuart*, *Toowoomba*, and *Warramunga* will all enter the ASMD upgrade and refit cycle during 2014-15.

With the RAN planning to run its ANZACs well into the 2020s, the ASMD modernisation is by no means the last major upgrade for the class. Indeed, a number of other updates are already under contract, including a new electronic surveillance capability under Project SEA 1448 Phase 4A (with the Exelis ES-3701 ESM system replacing Centaur) and a modernised communications suite under Project SEA 1442 Phase 4 (being delivered by Selex ES).

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### **FSU for New Zealand**



*HMNZS Te Mana sails alongside the Nimitz-class aircraft carrier USS Abraham Lincoln in the northern Gulf. New Zealand's two ANZAC frigates have participated in maritime security operations in the Gulf on a number of occasions. (US Navy)*

The ANZAC frigates HMNZS *Te Kaha* and HMNZS *Te Mana* today constitute the RNZN's Combat Force - in essence, the fighting arm of the navy. New Zealand's Defence Capability Plan notes that the ANZAC frigates and their integrated capability systems "represent the only maritime force element capable of operating across the spectrum of operations from constabulary and humanitarian tasks to combat roles as part of a multi-national response". It adds: "The frigates are also able to protect other ships including amphibious sealift and logistical support ships [and their embarked] naval helicopters provide extended reach, surveillance, and air-delivered weapon capabilities."



*The Royal New Zealand Navy ANZAC frigate HMNZS Te Mana, foreground, pictured in company with Australian ANZAC 'sisters' HMAS Parramatta and HMAS Perth. Visible behind is the Royal Navy destroyer HMS Daring. (US Navy)*

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During the course of their careers, and notwithstanding the force generation constraints inherent in a binary force, *Te Kaha* and *Te Mana* have both been deployed into the Gulf and the Indian Ocean in support of coalition maritime security operations. They have also been routinely deployed into the Asia-Pacific region.

However, compared to their Australian cousins, the RNZN's two ANZAC ships have been the subject of only modest combat system upgrades during their careers; examples include the installation of the Phalanx close-in weapon system (CIWS) and the addition of the Mini-Typhoon/Toplite package for force protection against asymmetric threats.

## **Scope**

The FSU project covers the upgrade of the surveillance, combat and self-defence capabilities of the ANZAC frigates to match current and future threats, while addressing obsolescence in some of the current systems. The full scope includes the replacement of CMS hardware and software, new radars, electronic detection and other above-water sensors, improved anti-ship missile decoys, a torpedo defence system, an upgrade to the hull-mounted sonar, and the replacement of the RIM-7P NATO SeaSparrow point-defence missile system with a more capable Local Area Air Defence (LAAD) system.

Following a request for information process, the New Zealand cabinet approved the FSU Detailed Business Case in November 2012, authorising the Ministry of Defence's (MoD's) Acquisition Division to issue requests for tender (RfTs).



*MBDA's Sea Ceptor system - featuring the CAMM(M) effector - will meet the requirement for a new Local Area Air Defence capability as part of the FSU for New Zealand's ANZAC frigates. (MBDA)*

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The Detailed Business Case endorsed an active missile system to fulfil the role of LAAD; although not publicly disclosed at the time, the MBDA Sea Ceptor system and its associated Common Anti-air Modular Missile (Maritime) - CAMM(M) - were downselected at this point.

RfTs were issued to industry in March 2013, closing in May that year. Five proposals were received from potential combat system integrators (CSIs) and 19 from companies interested in other aspects of the project. From May through August last year the project team - supported by the Defence Technology Agency and RNZN subject matter experts - evaluated the totality of RfT responses.

In August 2013, following a detailed evaluation of the responses, Lockheed Martin Canada was selected as preferred CSI tenderer subject to the successful completion of due diligence. Its approach for the FSU was to leverage significant elements of the frigate upgrade package already being delivered by the company for the Royal Canadian Navy's 12-ship Halifax Class Modernisation (HCM) programme.

Cabinet approval came in April 2014 for the project to commit to contract at a total project cost of NZD446 million or USD375 million (including project management costs, contingency, introduction into service, and capitalisation costs). The project will manage a number of separate contracts including the prime system integrator (assuming the CSI role), preliminary design, missiles, sonar upgrade, torpedo defence system, and ASMD decoys.

Lockheed Martin Canada, as prime system integrator, was awarded a NZD207 million contract on 29 April for the design and supply of the CMS for the two ANZAC frigates, together with the supply and integration of various sensors, the missile system, and a combat system trainer for the Devonport Naval Base in Auckland.

The majority of the work will be completed in Canada and includes the procurement and integration into the ships' combat system of key sensors. *Te Kaha* and *Te Mana* will effectively 'slot in' after the 12 Halifax-class frigates from 2016. There will be about 70% commonality between the Canadian and New Zealand ships as far as the effort required to deliver the upgrade is concerned.

At the hub of the upgraded frigates' combat system will be a new Lockheed Martin Canada CMS based on that already being delivered for the HCM programme. Known as CMS 330, this will feature nine new multifunction workstations, each with three screens.

The legacy AN/SPS-49(V) search radar, TIR, and Ceros 200 radar/EO director are being removed as part of the FSU project. A Navantia gun control unit (GCU) will be provided by Lockheed Martin Canada that will interface with CMS 330 and the Mk 45 Mod 2 gun (the GCU is similar to those fitted on the Spanish Navy F-100 frigates).

Many other systems are common to the HCM programme. These include the Thales SMART-S Mk 2 3D surveillance radar, a Telephonics IFF suite (AN/APX-505(V) IFF interrogator and AN/APX-119 transponder), the Elisra NS9003A-V2NZ ESM system, an IBM-supplied datalink processing system (providing tactical data exchange via Link 11 and Link 16, with an option expanding to Link 22), and the Rheinmetall MASS\_DUERAS soft-kill countermeasures system (incorporating adjunct DUERAS chaff rockets alongside standard Omni-Trap ammunition).



A number of new-to-type sensor systems have additionally been selected for the FSU. These comprise SAGEM's Vampir NG IRST (with twin heads), Saab's Naval Laser Warning System, and the Kelvin Hughes SharpEye radar.

MBDA was in May 2014 contracted for the provision of the Sea Ceptor LAAD system and the associated CAMM(M) missile. Each frigate will have a capacity of up to 20 CAMM missiles using new standalone launchers sited in the same deck space as current occupied by the Mk 41 Mod 5 VLS.

ThyssenKrupp Marine Systems Australia (TKMSA) Pty Ltd was the same month taken on contract for the FSU preliminary design phase. In this role TKMSA is taking responsibility for the mast and upper deck design, compartment layout, and physical integration of the new and legacy systems.

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