**Overview**

Thales Australia has developed a comprehensive upgrade program for the Royal Australian Navy’s (RAN) FFG Class which substantially improves both the offensive and defensive capabilities of the vessels.

The upgrade includes the installation of the vertically launched Evolved Sea Sparrow Missile (ESSM), a new fully integrated active/passive under water warfare system suite, enhanced electronic surveillance and decoy defence solutions and the provision of TADIL Link 16.

These systems have been integrated with the existing sensors and weapons through the development of a new command and control system (C2) – the Australian Distributed Architecture Combat System (ADACS).

Thales Australia have successfully integrated the latest technology into the FFG to provide an enhanced capability for the RAN that will ensure it remains an effective force over the next decade.

**Command and control**

- The capability of the C2 system is improved, to facilitate the effective integration of new and existing sensors and effectors
- Modern Q70 consoles will replace existing consoles to alleviate supportability problems, provide new computing resources and offer an improved human machine interface (HMI)
- A local area network (LAN) architecture permits effective integration of new and existing sensors, effectors and increased C2 functionality
- A sensor data fusion system provides significant functionality to allow improved reaction time against targets, improved track quality and the formation of a coherent air and surface picture even in dense target rich environment
- The automatic detection, tracking and sensor data fusion implementation makes use of improved radar detection and tracking functions in all search radars to give earlier detection of targets and improved track declaration. The sensor data fusions system is an Australian development that is in service with the United States Navy.
Air surveillance capability
• The long-range air surveillance, target indication and Automatic Detect and Track (ADT) functions are upgraded
• The AN/SPS 49A(V)1 long-range air surveillance radar provides improved low elevation small target performance and increased detection range
• The Electro Optical Tracking System (EOTS) is integrated into the combat system and provides a new fire control channel
• The Electronic Support (ES) function is replaced by a modern high performance system.

Air search radar AN/SPS-49A(V)4 radar to the A(V)1 configuration provides:
• Automatic target detection
• Improved waveform and signal processing for low altitude/small radar cross section (RCS) targets
• Coherent side lobe cancellation giving considerable electronic protection capability
• Two scan threat alerts
• Improved reliability.

Platforms Changes
- 4200 Ton Upgrade
- Signature Reduction
- Habitability (power/cooling) Upgrade

Legend
- Existing Modified Equipment
- New Equipment
Mk92 Mod 12 fire control system

The Mod 12 is a further enhancement of the Mod 6 system currently in service in the US, Spanish and Taiwanese FFGs. The introduction of the Mod 6 to the United States Navy on FFG 61, incorporated a coherent receiver and transmitter (CORT) specifically to improve detection and prosecution of anti-ship sea skimming missiles.

The Mod 12 system builds on the enhanced performance of the Mod 6 by including improved signal processing, further use of solid state electronics and further extensions of the reliability and maintainability. Integration of Mk92 Mod 12 and the Mk41 VLS/ESSM provides a further layer of anti-ship missile defence (ASMD).

To support both SM-1 and ESSM missile engagements, new solid state CWI transmitters have been designed and built for the FFG upgrade. These transmitters provide additional improvements in system reliability and a significant reduction in routine maintenance requirements and the growth path to SM-2.
**Air and surface warfare capability**

- The upgrade to the Fire Control System (FCS) Mk92 Mod12 provides improved performance against very small RCS sea skimming missiles in high clutter conditions and greater reliability and maintainability.
- The existing functionality in anti-surface warfare (ASuW) is retained including the integration of the Harpoon weapon system.
- The short-range self defence systems are upgraded and SM-1 is retained. The enhancement of ASMD capabilities is provided by the addition of the ESSM and a vertical launch system (VLS) to provide a layered defence capability.
- Soft kill systems have been improved. Additional decoy launchers are provided. Acoustic, long-range chaff and passive infrared (IR) decoys are provided.

**Underwater warfare capability**

The existing hull mounted sonars (HMS) have been replaced. A multi-layered approach to the detection and classification of torpedoes is provided by the use of both active and passive capabilities of the new HMS and the addition of a passive towed array. Expendable decoys are part of an integrated torpedo defence system.

The requirement to detect floating mines has been achieved by a combination of electro-optical sensors, visual means and dedicated mine and obstacle avoidance sonar.

Petrel is the high frequency mine detection sonar, which has been developed in conjunction with the RAN. Petrel also provides a navigation capability for poorly charted areas of operation.
**Effectors**

The upgraded weapons suite provides an effective four layer hard kill capability, which together with an extensive soft kill capability, assures significant protection in air warfare.

The effectors and weapons are:

- SM-1 missiles with a growth path to SM-2
- ESSM deployed from Mk 41 launchers
- Harpoon
- 76 mm gun
- Phalanx CIWS 20 mm gun
- Nulka active off board decoy
- Infra-red decoys
- Long range chaff rockets (LRCR)
- RF decoys
- Expendable acoustic decoy
- Surface launch torpedoes (SLT).
Platform capability

The ship platform systems have been modified to incorporate the upgraded combat system, increase platform systems reliability and to reduce electromagnetic and acoustic signatures.

- **4200 ton upgrade**: The FFG limiting displacement has been increased from 4100 tons to 4200 tons. This involves increasing the longitudinal, deck and bulkhead strength and raising the V lines.

- **Chilled water**: The ships’ chilled water systems has been upgraded to accommodate the additional heat loads from the upgraded combat system.

- **Static frequency converters**: New solid state 400 Hz static frequency converters significantly increase the reliability of the power system and reduce the number of man-hours expended on maintenance.

- **Ship service diesel generator (SSDG) prime movers**: New SSDG diesel engines increase performance, reliability and maintainability, with a significantly reduced running cost.