



## ACTIVE PHASED ARRAY RADAR (APAR)

The Active Phased Array Radar (APAR) project is a showcase of the abilities of Thales Canada, Systems Division to efficiently produce real-time mission-critical software for a complex, leading-edge technology weapons system. APAR is a search, track, and fire-control radar which is to be used as part of a naval combat system, and is being developed as part of an international cooperative effort involving Canada, Germany, and the Netherlands. It will form the cornerstone of the Anti-Air Warfare (AAW) system for the German Navy's F124 frigates and for the LCF frigates of the Royal Netherlands Navy, and is being considered by the Canadian Armed Forces for the Mid-Life Update of its CPF frigates.

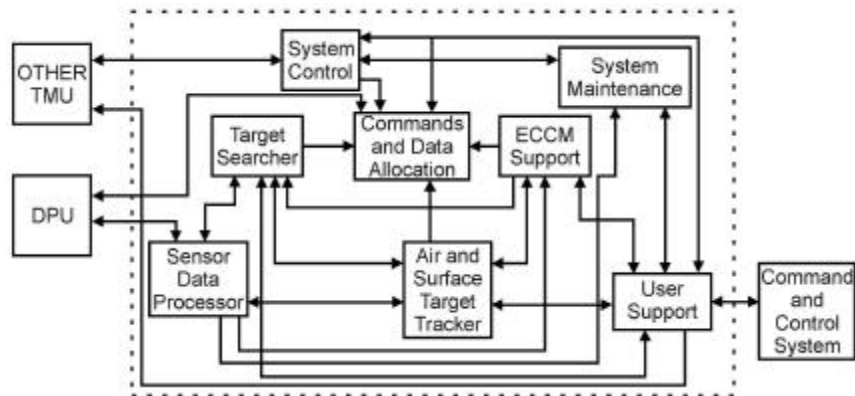
Thales Nederland B.V. of the Netherlands, is the prime contractor for APAR and has contracted Thales Canada, Systems Division as a first-tier subcontractor to produce the software for APAR's Tracking and Management Unit (TMU), based on a requirements specification co-authored by the two companies. The TMU is the "brain" of the APAR system: its inputs include high-level control messages from the ship's command and control system and digital radar plot information from the APAR antenna faces. It provides exceptional search and track capabilities, directs extensive and advanced Electronic Counter Counter Measures (ECCM) techniques, provides accuracy assessment of ownship gunfire missions, supports

scheduling and guidance for missiles such as the Standard SM-2 Block IIIa and the Evolved Sea Sparrow, and performs kill assessment on their targets.

APAR represents a quantum leap in naval radar technology: its horizon search capability allows it to find small sea-skimming missiles and aircraft; its volume search capability can supplement a ship's long range search radar; its target designation and cued search abilities allow long range search radars and passive angle-only systems to "hand-off" their targets to its unmatched air and surface target track capabilities; while its integral fire control capabilities can simultaneously support a large number of missile engagements to neutralize even the most serious threat scenarios. At its heart is the TMU software written by Thales Canada, Systems Division.

The TMU software constitutes a mission-critical real-time system that:

- is written entirely in C for a VxWorks environment;
- implements a complex high-tech weapons system functionality in an efficient, maintainable, elegant design;
- showcases Thales Canada, Systems Division's ability to provide value-added software design and implementation:



**APAR TMU Architecture**

our weapons system domain knowledge allows us to provide significant improvements that advance the performance of the weapons system as a whole; and

- is proof that a rigorous, yet optimized software development process, both safeguards against program delays and results in high quality software.

Conventional AAW suites comprise a mechanically-steered, medium-range search radar, combined with separate tracking and illumination radars. APAR replaces all of these components with a single Multi-Function Radar (MFR) comprising four fixed antenna faces which use electronic phase shifting to steer radar beams to the desired direction. Some of the basic advantages of this solution include:

- superb tracking angular resolution;
- very high track update rate capability;
- update rates that can be customized for each track; and
- the capability to sustain a high number of simultaneous missile target engagements, including the capability to guide multiple missiles during a single engagement to a single target.

Passive phased array MFRs include only a single transmit element for each antenna face, whereas each of APAR's antenna faces consists of over 3,000 receive and transmit-capable elements, providing it with the following advantages:

- wider frequency bandwidth;
- reduced sidelobe radiation levels;
- more efficient use of available power;

- the capability to simultaneously generate multiple beams on a given antenna face;
- higher reliability and graceful degradation of capability in the case of transmitter failure; and
- improved tracking performance for sea-skimming targets due to reduced multipath effects.

APAR is truly a state-of-the-art weapons sensor system - but for Thales Canada, Systems Division it has been even more: it's been an opportunity to showcase our software development capabilities. Seldom does software have more complex or demanding requirements than those of APAR, so our ability to deliver APAR, while exceeding all expectations, demonstrates that we can handle any software need. Whether it's building command, control, and communications software, or whether it's developing real-time weapons system software, our team has the people and the "know-how" to deliver. Customers that contract us to develop and integrate a complex system may rest assured that our software team will incorporate into it the best quality software. Customers building their own mission-critical weapons systems, advanced communications systems, or other demanding systems, can count on Thales Canada, Systems Division to deliver efficiently-produced, high-quality software, incorporating all the value-added domain expertise that more than 15 years of systems integration experience has earned.

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