

ARCHIVED REPORT

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ASQ-504(V) AIMS

Outlook

- No further production seen
- System being replaced with the more advanced ASQ-508 model
- Upgrade kits available to transform the unit into the ASQ-508 configuration
- CAE will continue to service the ASQ-504
- This report will be archived in the near future

Orientation

Description. The ASQ-504(V) is an airborne Advanced Integrated MAD (magnetic anomaly detection) System (AIMS). The ASQ-508 is an upgraded version of the ASQ-504. (See separate report on the ASQ-508.)

Sponsor

Canadian Minister of Supply and Services
Place du Portage
Hull, Ontario
Canada

Status. In operational service with several world navies. Enhanced software upgrade available. According to manufacturer CAE, the ASQ-504 is no longer being produced for the market, as it is being replaced by the ASQ-508. However, CAE continues to support the market for ASQ-504 spares and repair work.

Application. Detecting and locating enemy submarines under water by analyzing differences in the Earth's magnetic fields.

Platform. Anti-submarine warfare (ASW) fixed- or rotary-wing aircraft. The Sea King and EH101 Merlin helicopters are common platforms for this system, as are the P-3C Orion ASW aircraft and the Nimrod MRA4 maritime patrol aircraft.

Price Range. Indeterminate. Early in the system's history, a per-unit cost of approximately \$1 million had been mentioned. In recent years, however, it has been difficult to determine a probable cost because no information has been publicly released.

Contractors

Prime

CAE Inc

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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Detection Head (length/dia)	813 mm/178 mm	32 in/7 in
Computer Assembly	193 x 257 x 559 mm	7.6 x 10.1 x 22 in
Weight		
Detection Head	6.1 kg	13.5 lb
Computer Assembly	17.7 kg	39 lb
Characteristics		
Detection Head	Optically pumped caesium	
Sensitivity	0.01 gamma (in-flight)	
Outputs		
Visual	Contact alert/estimated slant range	
Analog	Adaptive MAD signal	
Digital	Control and display interface to MIL-STD 1553B	

Design Features. The system comprises four modular units: detection head, control indicator, amplifier computer, and vector magnetometer. BITE (built-in test equipment) features can isolate faults to a Shop Replaceable Assembly (SRA) or Weapon Replaceable Assembly (WRA) level and show them on an alphanumeric display. Mean time between failures (MTBF) is 1,000 hours.

When compared with previous CAE MAD systems, the ASQ-504(V) Advanced Integrated MAD System (AIMS) has an improved detection range – reportedly 3,000 feet. It also has continuous automated feature recognition. The ASQ-504(V) can compensate within 8 minutes for 18 interference terms, even in hover mode and at any altitude.

Operational Characteristics. The benefit of an onboard-installed MAD system is the rapid reaction time it offers in comparison to a towed system. In helicopter installations, with the detection head inside the aircraft, the system delivers a true "on-top" contact when over a target, thus eliminating the delay that occurs in towed solutions.

When used in combination with a dipping sonar, the transition from dipping sonar to MAD search can be carried out rapidly. Contact alerts are visual and audible, and an estimated slant range advises the operator if he or she is within acquisition range.

The system can operate independently or accept and execute commands from common control/display units, using a 1553 databus.



U.K. Royal Air Force (RAF) Nimrod MRA4 MPA produced by BAE Systems.
This aircraft is one of the ASQ-504(V) MAD platforms.

Source: BAE Systems

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ASQ-508 AIMS Detecting Head

Source: CAE



ASQ-508 AIMS Amplifier Computer

Source: CAE



ASQ-508 AIMS Magnetometer Assembly

Source: CAE

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Variants/Upgrades

Over its lifetime, this system has undergone various upgrades and reconfigurations. Advanced software upgrades were initiated in October 2000.

ASQ-508 Advanced Integrated MAD System (AIMS). Built on the ASQ-504 foundation, the

ASQ-508 is an upgraded and enhanced version of the ASQ-504. A number of hardware and software changes to the amplifier computer and the detecting head resulted in an enhanced MAD system that warranted a full change in nomenclature. The ASQ-508 is replacing the ASQ-504 in the marketplace.

Program Review

Background. CAE Electronics has been developing MAD systems for a number of years. The ASQ-504(V) AIMS has overcome several limitations of earlier systems. Previously, detecting head magnetometers required helicopter MAD systems to be deployed in a towed configuration, avoiding the interference field generated by the helicopter itself. The ASQ-504(V) AIMS overcame this problem. It was developed with funding from the Canadian Department of National Defence, primarily as equipment for the ASW program, for which most systems have been developed indigenously.

The Royal Australian Navy ordered 16 Sikorsky S-70B-2 Seahawk helicopters equipped with UYS-503 acoustic processors. In July 1987, the U.K. Ministry of Defence selected the ASQ-504(V) for the U.K. Royal Navy's Westland Sea King HAS.Mk 2A/5 and Westland Lynx HAS.Mk 2/3 aircraft, and for the U.K. Royal Air Force's BAe Nimrod MR Mk 2 aircraft. In 1987, the U.S. Navy evaluated the ASQ-504(V) AIMS under the Foreign Weapons Evaluation (FWE) program at the U.S. Patuxent River Naval Air Station to compare the system to one proposed by Texas Instruments (TI was later acquired by Raytheon). The tests were completed in 1990. In November 1994, the Royal Australian Navy placed

another order, this time to upgrade its P-3C Orion ASW aircraft.

Training Simulators Offer Potential Business

Boeing Operations International awarded a subcontract to CAE in October 2000 to upgrade the Avionics Submarine MAD systems on the U.K. RAF Nimrod MRA4 maritime patrol aircraft (MPA). The operational and performance improvements to the MAD equipment allow the Nimrod MRA4 to fly with the latest software version of the ASQ-504(V) AIMS. The upgrade reportedly increases the aircraft's computing processing capacity, improves magnetic environmental compensation, and reduces component obsolescence. In part, this upgrade improves the aircraft's target detection capability and improves its tactical operational performance during search patterns. It also improves MAD performance in shallow water areas and enhances the capabilities of the Nimrod MRA4 in ASW.

In January 2001, CAE was awarded a contract valued at CAD1.5 million (\$0.942 million) by Thales to design and develop a training simulator for the ASQ-504(V) AIMS used to train crews in operation of the U.K. RAF Nimrod MRA4 aircraft. (Thales is a subcontractor to BAE Systems and produces the Nimrod MRA4 for the U.K. RAF.)

Funding

Originally funded by the Canadian Minister of Supply and Services.

Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
CAE/Boeing	N/A	Oct 2000 – Contract from Boeing for software upgrade to the U.K. RAF ASQ-504(V) AIMS installed on Nimrod MRA4 MPAs for improved performance and capabilities.

ASQ-504(V) AIMS

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
CAE	0.942 (CAD1.5)	Jan 2001 – Contract from Thales to design and develop a training simulator for the ASQ-504 AIMS. Thales is a subcontractor to BAE Systems and provides the Nimrod MRA4 aircraft to the U.K. RAF.

N/A = Not Available.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1984	Australian Navy selects ASQ-504(V)
	1986	U.K. Royal Navy announces requirement for ASQ-504(V)
	1986	Canada selects ASQ-504(V)
	1987	U.S. Navy evaluates ASQ-504(V)
	1987	DND selects ASQ-504(V) for possible installation
	1988	U.K. MoD selects ASQ-504(V) MAD for ASW Tracker update
	1989	Taiwan selects ASQ-504 for ST-2T upgrade program
	1993	Canada cancels EH101 program
	1994	Australian contract for Airborne MAD P-3C upgrades
Oct	1997	Canada announces order for SAR helicopters, re-selects EH101 platform
Oct	2000	U.K. RAF upgrades ASQ-504 AIMS software on Nimrod MRA4 MPAs

Worldwide Distribution/Inventories

The following countries are known operators of the ASQ-504:

Australia. RAN S-7B-2 Sea Hawk helicopters and S-2 Trackers; RAAF P-3C Orion aircraft

Canada. DND Sea King helicopters and CP-140 aircraft

Japan. Maritime patrol aircraft

Singapore. Maritime Enforcer aircraft

South Korea. Lynx helicopters and P-3C maritime patrol aircraft

Taiwan. Taiwanese Navy S-2T Turbo Trackers

Turkey. Turkish Navy CN235 maritime patrol aircraft

U.K. Royal Navy Sea King HAS.6 and Lynx HAS.8 helicopters, and RAF Nimrod Mk 2 and MRA4 MPAs

U.S. U.S. Navy P-8A Multimission Maritime Aircraft (MMA), P-3 aircraft, SH-60 and SH-2 helicopters

The remaining systems have been sold to unidentified countries.

Forecast Rationale

Although no longer in production, the ASQ-504 is still in operational use with several of the world's navies, and manufacturer CAE therefore continues to support it with spares and repair work.

CAE has replaced the ASQ-504 with an upgraded digital version known as the ASQ-508. Those ASQ-504s currently in use can be transformed into the ASQ-508 configuration using an upgrade kit.

This report will be archived in the near future.

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