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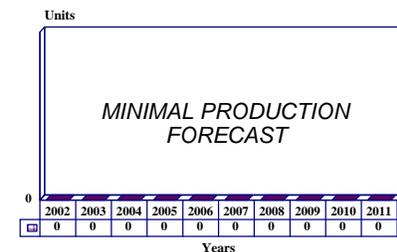
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ALQ-156(V) – Archived 4/2003

Outlook

- In service; ongoing logistics support
- Evaluated for common USAF/USN missile warning system; passive warning approach selected instead
- Part of TPQ-36(V) FIREFINDER missile alarm system

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. Airborne missile detection and warning system.

Sponsor

US Army
 Army Communications-Electronics Command
 (CECOM)
 AMSEL-IO
 Ft. Monmouth, New Jersey (NJ) 07703-5000
 USA
 Tel: +1 201 532 2534
 Web site: <http://www.monmouth.army.mil>

Contractors

BAE Systems – North America
 Information and Electronic Warfare Systems
 95 Canal Street
 Nashua, New Hampshire (NH) 06060
 USA
 Tel: +1 603 885 4321
 Fax: +1 603 885 3655
 Web site: <http://www.baesystems.com>
 (Prime)

Status. In service, in production, ongoing logistics support.

Total Produced. Through 2001, an estimated 2,000 units had been produced.

Application

ALQ-156(V): US Army CH-47, EH-1, EH-60, OV/RV-1, RC-12, RU-21, and RAF HC. Mk 2B Chinooks. It is also installed on selected C-130 and C-23 aircraft.

ALQ-156A: Part of the TPQ-37 FIREFINDER Anti-Radiation Missile protective suite.

Price Range. Estimated ALQ-156(V) unit cost is US\$75,000.

Price is estimated based on an analysis of contracting data and other available cost information, and a comparison with equivalent items. It represents the best-guess price of a typical system. Individual acquisitions may vary, depending on program factors.

Technical Data

Metric

US

Dimensions

	<u>Metric</u>	<u>US</u>
<u>ALQ-156(V)</u>		
Receiver/Transmitter Unit:	52 x 26 x 19 cm	20 x 10 x 8 in
Weight:	22.5 kg	49.6 lb
Power:	425 watts	
<u>ALQ-156(V) (continued)</u>		
MTBF:	300 hr	
MTTR:	15 min	
<u>ALQ-156A</u>		
Receiver/Transmitter Unit:	52.1 x 27.4 x 21.59 cm	20.5 x 10.8 x 8.5 in
Weight:	28.15 kg	62 lb
Power:	560 watts @ 115 Vac 3 phase 90 watts @ 28 Vdc	
MTBF:	938 hr	
<u>ASQ-210(V)</u>		
Buffer Storage Unit:	23.6 x 12.2 x 13.7	9.3 x 4.8 x 5.4 in
Weight:	4.54 kg	10 lb
Power:	60 watts @ 28 Vdc	
MTBF:	7,450 hr	

Design Features. The ALQ-156(V) missile detection system was originally designed to be installed on slow/low-flying, fixed-wing aircraft and helicopters. It uses a small pulse-Doppler radar to detect and generate a warning of the approach of threatening infrared missiles. The system can interface with the defensive avionics system to trigger expendable countermeasures dispensers.

The ALQ-156(V) is lightweight and all solid state, made up of a transceiver and a control unit. Up to six antennas provide 360° protection, even at low altitudes. The system is connected to an M-130(V) flare dispenser to automatically deploy flares when needed. It measures range and velocity to eliminate false alarms on missiles fired at other targets in the battle area, which increases overall effectiveness by reducing responses to non-threat targets. Because of the ALQ-156(V)'s digital architecture, other onboard warning devices, such as laser, infrared or radar warning, can interface with it. The system is re-programmable.

The ALQ-156A (formerly known as the ALQ-156(V)N) features a new ASQ-10(V) buffer box, a computer/controller that interfaces with the aircraft's other onboard avionics via a MIL-STD-1553 databus. It was originally developed to be the central subsystem of the Navy's Integrated Defense Avionics Program (IDAP) upgrade for the A-6E.

New technology was incorporated into the system, creating a lighter, smaller system with reduced power requirements. The original analog filter was replaced with a digital clutter filter. In addition, engineers

inserted microwave/millimeter-wave integrated circuit (MMIC) transmit/receive modules that mount on the back of the antenna. There are five MMIC chips in each module, including three amplifiers and two switches. The gallium arsenide amplifiers are positioned close to the small antennas to eliminate the need for a large central power supply and reduce reliability problems.

The FIREFINDER Survivability Suite version will be an add-on unit which can be applied and removed from individual radars as required.

Operational Characteristics. The ALQ-156(V) recognizes missile threats by comparing closure rates and other ballistic parameters with those stored in a library of missile information. It can operate as a stand-alone missile detector or as part of a comprehensive multi-threat protection suite. When coupled with radar and laser-warning sensors, the ALQ-156(V) can automatically select the appropriate countermeasure for the detected threat.

Pulse Doppler techniques eliminate battlefield clutter down to nap-of-the-earth levels. The system also features extensive electronic counter-countermeasures to protect the system from the effects of battlefield ECM. The ALQ-156(V) has a low false-alarm rate and a high probability of detection.

As a FIREFINDER Survivability Suite, the ALQ-156(V) will generate a missile attack alarm when it detects a threat by an anti-radiation missile. It will interface with a protective countermeasures system.

Variants/Upgrades

ALQ-156A. In 1988, NAVAIR initiated the Integrated Defensive Avionics Program (IDAP) to develop an off-the-shelf, integrated ECM system for existing airframes, with the A-6 Intruder as its initial platform. (Then) Sanders was contracted for 12 developmental models of a modified ALQ-156(V), designated the ALQ-156A, for evaluation. The A-6 program was terminated when the aircraft was retired in 1996. The last flight was made in December 1996.

The Navy evaluated IDAP for the F/A-18C/D as a substitute for the terminated Advanced Self-Protection Jammer (ASPJ) countermeasures system. The Navy established a more extensive Integrated Defensive Electronics Countermeasures (IDECM) F/A-18E/F

ECM suite. The system includes a techniques generator (ALQ-214(V)), fiber-optic towed decoy (ALE-55(V)) and Common Missile Warning System. The general architecture of IDECM obviously was influenced by IDAP.

ALQ-156(V)3. This is a modified system for the anti-radiation missile warning and protective Survivability Suite for the TPQ-37 FIREFINDER weapons-locating radar.

ALQ-156(V)2/(V)T3. This system is being installed on Greek CH-47 helicopters. It was modified, tested, and fielded under the Apollo program for NATO C-130 aircraft. It has improved false alarm rejection capability and is rotary- or fixed-wing capable.

Program Review

Background. The ALQ-156(V) began engineering development in FY76. In December 1976, a contract was awarded for 12 engineering development models (EDMs) for the CH-47 helicopter. Engineering development was completed in 1981 and full-scale production began in 1982. Funding to modify the system for CH-47 helicopters was granted from FY80 through FY82. Efforts to adapt the ALQ-156(V) for Special Electronic Mission Aircraft (SEMA) were completed in FY84.

According to Army avionics planning documents, the system was installed in a variety of aircraft. CH-47 modifications included the ALQ-156(V). Other aircraft slated for the system included the EH-60A QUICK FIX IIB and other Army SEMA elements.

In 1988, the Navy evaluated the ALQ-156(V) for the P-3C long-range ASW aircraft and the SH-60B LAMPS III helicopter, but instead chose the Loral AAR-47(V), a passive missile warning set, with plans to expand its platform usage to other Navy/Marine helicopters. Also in 1988, NAVAIR initiated the Integrated Defensive Avionics Program (IDAP) to develop an "off-the-shelf" integrated ECM system for existing airframes, with the A-6 Intruder as its initial platform – contracting for 12 development models.

In 1994, many non-US operators of C-130s flying humanitarian airlift missions in Bosnia equipped the planes with infrared countermeasures (IRCM) self-protection suites. Modified ALQ-156(V) units for a Quick Reaction Capability program, called APOLLO,

were acquired through Foreign Military Sales (FMS) channels.

In March 1994, the Army published a notice in the *Commerce Business Daily* of a sole-source solicitation to Hughes Aircraft Company, Fullerton, California. The solicitation was for the design, fabrication and qualification of two preproduction Survivability Upgrade Suites for the TPQ-37(V) Enhanced FIREFINDER, Block I. These were delivered in FY95. A user evaluation was conducted in FY96.

The upgrades were limited to modifications which would alert the FIREFINDER system and its operators of an incoming missile threat. Upon detection of an incoming missile, the radar stops emitting and the missile defense mechanism engages. The ALQ-156(V)3 can detect 95 percent of the threats that fall within the envelope of the missile defense subsystem. The system causes 95 percent or more of the detected threats to be disrupted enough to ensure that the missile impacts a minimum of 200 meters plus blast distance from the radar's Antenna Transceiver Group.

Such modifications were required to have minimal effect on the radar. Moreover, they could not degrade the operation, transportability or reliability of the radar, and operator interfaces had to be kept to a minimum.

In January 2000, Greece contracted for the FMS acquisition of 17 ALQ-156(V) 2/(V)3T systems for Hellenic Army CH-47s. The effort was valued at US\$7 million.

ALQ-184(V) Missile Warning/Chaff Dispenser Enhancement. An upgraded pod configuration was evaluated as a way to expand the ECM operation of the ALQ-184(V) countermeasures pod. An ALQ-156(V) missile warning system was added to test pods, with

antennas added to the front and rear of the pod to detect missile threats. Two ALE-40/47(V) dispensers could also be added to provide an inherent chaff-dispensing capability. An AAR-44(V) system or AAR-47A/B could be added as well.

Funding

Current funding is from O&M and platform procurement accounts.

Recent Contracts

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Lockheed Martin	7.1	Jan 2001 – Contract for 17 ALQ-156(V) Missile Warning Systems, FMS for Greece. (DAAB07-00-C-A005)

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1979	Engineering development initiated
	1981	Engineering development completed
	1982	Production
	1984	Engineering development of ALQ-156(V)2 completed
	1988	IDAP initiated
Jan	1993	Delivery of first digital ALQ-156A to Navy
3Q	FY93	IDAP Milestone IIA – low-rate initial production decision
4Q	FY94	TPQ-37(V) Survivability Suite contract awarded
2Q	FY95	TPQ-37(V) Survivability Suite Integration Testing completed
3Q	FY95	Delivery of two preproduction “A” and “B” TPQ-37(V) Survivability Suite kits
4Q	FY96	TPQ-37(V) Survivability Suite user evaluation
Jan	2000	Greek contract for 17 ALQ-156(V)2/(V)3T systems
Oct-Nov	2001	Delivery of Greek systems

Worldwide Distribution

Greece. The Hellenic Army ordered 17 systems for its CH-47 helicopters.

United Kingdom. The Royal Air Force carries the system on its HC Mk 2B Chinooks.

United States. The Army carries the system on its CH-47C, CH-47D, EH-1H, EH-60B, RC-12D/H/K, RU-21A/B/C/D and RV-1D platforms.

Carried on selected **NATO** C-130 and C-23 aircraft.

Forecast Rationale

Missile protection is critical for both helicopters and fixed-wing aircraft. Potentially hostile forces are procuring advanced surface-to-air missiles, and specialty aircraft and slow-movers are extremely vulnerable, so protection is a must.

Infrared-based systems are becoming more common, as radio-frequency-based systems, like the ALQ-156(V), cannot be used by low-observable aircraft. Radio frequency emissions can be detected, negating the advantage of stealth technology. This is not a

significant consideration in current airframes, so the ALQ-156(V) can be used as long as today's non-stealth aircraft and helicopters remain in the operational inventory.

Procurement requirements for the Enhanced FIREFINDER Survivability Suite have not been

established, but they can be expected to be determined in the near future. Still, there are over 100 FIREFINDER radars in use around the world and it is not certain how many protection suites will be built. A one-for-one procurement is not necessary. Some remaining requirements may be met with refurbished units from retired A-6s.

Ten-Year Outlook

No further production is expected.

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