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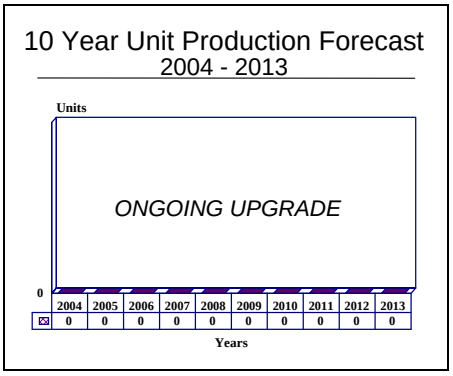
ALQ-162(V) Shadowbox/Shadowbox II - Archived 3/2005

Outlook

- Counters pulse-Doppler radars
- In service; ongoing logistics support
- Stand-alone or integrated operation
- Production over for now, upgrades continue



Orientation

Description. Airborne continuous wave deception jammer, upgradable to include pulse-Doppler jamming.

Sponsor
United States Navy
Naval Air Systems Command
NAVAIR HQ
47123 Buse Road Unit IPT
Patuxent River, Maryland (MD) 20670-1547
USA
Tel: +1 301 342 3000
Web site: http://www.nawcad.navy.mil

Contractors
Northrop Grumman Corp
Electronic Systems
600 Hicks Road
Rolling Meadows, Illinois (IL) 60008-1098
USA
Tel: +1 847 259 9600
Fax: +1 847 870 5713
Web site: http://www.northgrum.com
(Prime contractor)

Per Udsen Co Aircraft Industry AS
Fabrikvej 1
8500 Grenaa, Denmark
Tel: +45 86 32 19 88
Fax: +45 86 32 14 48
(Danish F-16 pylon unit)

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

Total Produced. Through 2003, an estimated 830 units had been produced.

Application.
U.S. Army: EH-60, MH-60, MH-47, and RC-12D.
U.S. Navy: AV-8B.
U.S. Air Force: MH-53J and MH-60G SOF helicopters.
FMS applications: Canadian CF-18, Kuwaiti F/A-18, Spanish EF-18, Danish F-35 and F-16, with EH101 and C-130 being considered.

Price Range. The estimated cost is US$75,000 to US$120,000 per unit.

Technical Data

Metric	U.S.

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Dimensions		
Size (Rx/Tx)	16 x 18 x 42 cm	6.3 x 7.2 x 16.5 in
Weight (Rx/Tx)		
ALQ-162(V)4	18.6 kg	41 lb
	18.1 kg	40 lb
Antennas (ea)	0.23 kg	0.5 lb
RCU	0.5 kg	1.0 lb

Characteristics	
Reliability	Demonstrated MTBF 335 hours
Software Interface	MIL-STD-1553A/B
Units	Transmitter Receiver/processor User-data memory Antennas (2)
Antennas	Two vertically polarized with +/-30 degree elevation and +/- 60 degree azimuth coverage Can interface with other antennas
Operational	Stand alone, does not require an RWR Compatible with any RWR, pulse jammer, or expendable countermeasures Easy aircraft installation in most locations, including a pylon station Software user programmable Controlled by ALQ-213(V)
Fully integrated with	
RWRs	APR-39(V) APR-43(V) ALR-45(V) ALR-46(V) ALR-66(V) ALR-67(V) ALR-69(V)
Pulse jammers	ALQ-126A/B ALQ-136(V)
CM dispensers	ALE-36(V) ALE-40(V) M-130

Design Features. The ALQ-162(V) continuous-wave (CW), chopped repeater/radar jammer is small enough to be installed internally in an aircraft or in a wing pylon. The Shadowbox II added pulse-Doppler jamming, and was designed to provide an aircraft high-performance protection in a compact, stand-alone package. The receiver/transmitter is a single, modular unit that most aircraft carry internally. Forced-air cooling requires no special aircraft provisions.

The system was designed to be compatible with any radar warning receiver (RWR), pulse jammer, or expendable countermeasures dispensing system. It features automatic, programmable frequency search and jamming. Software-controlled discrete and MIL-STD-1553A/B interfaces are available.

A Danish wing pylon/weapons station was designed to house the system for F-16 and other tactical aircraft. The system consists of a receiver/processor module, transmitter module, and a user-data memory module. Antennas are mounted on the front and rear of the pylon and provide an elevation field of view of +/-45 degrees and azimuth field of view of +/-60 degrees. The system is 100 inches long and weighs 195 pounds. Versions of the pylon can include an ALE-40(V) chaff/flare dispenser.

The receiver/processor has 12 shop-repair assemblies (SRAs), as well as built-in test capabilities. Modulation technique generation, system timing, low-power signal development, and radio frequency (RF) video processing are accomplished in the receiver/processor.

The transmitter has three SRAs and houses the traveling-wave tube (TWT) amplifier plus associated power and cooling equipment. The user-data memory module is a single printed circuit assembly containing programmable read-only memory.

The system can be field-programmed. Threat characteristics, priorities, techniques, and system control parameters can be re-programmed by the user.

A complete end-to-end built-in-test capability assures reliability and allows easy maintenance, since faults can be isolated down to the module level. Continuous performance monitoring and operator-initiated tests reportedly detect up to 95 percent of potential faults.

Upgrades make it possible for the ALQ-162(V) to defeat multiple threats in the same band simultaneously. Planned upgrades will allow the system to do the same in different bands. It can be controlled by the ALQ-213(V) Electronic Warfare Management System, and a suite can be adapted for rotary-wing applications. When combined with available technology from other EW products, the ALQ-162(V) can become a "full up" jammer to defeat CW and pulse threats.

Operational Characteristics. The ALQ-162(V) provides continuous wave jamming against threats employing CW radars such as the SA.6 surface-to-air missile. This modular system can operate autonomously, using its own receiver and processor, or it can work in conjunction with other RWRs. The system uses a broad range of frequencies and other transmitting parameters to jam surface-to-air missiles.

There are three operating modes: *Standby* includes TWT warm-up and self-test, and three-minute time-out; *Receive* detects, characterizes, and reports threat signals, but does not transmit; and *Operate* features fully automatic receive/transmit capabilities.

The ALQ-162(V) features are:

- Stand-alone, does not require an RWR
- Automatic, programmable frequency search and jamming
- System control, threat tables and priorities, and technique generation, all stored in a user-re-programmable memory
- Automatic generation of specific countermeasures against the highest priority threat

ALQ-162(V)

Source: U.S. Navy

Variants/Upgrade

ALQ-162(V)2. A 19-kilogram version with two AS-3554 antennas, an RT-1377A/ALQ-162(V) transceiver/processor, and a C-11080/ALQ-162(V) control unit. It is re-programmable via the user-data module and supported by the SM-756/APR-44(V) radar signal simulator. It is carried by the EH-60A.

ALQ-162(V)3. A 19-kilogram version with two AS-3554 antennas, and an RT-1377A/ALQ-162(V) transceiver/processor. It is re-programmable via the user-data module and supported by the SM-756/APR-44(V) radar signal simulator. It is carried by the MH-60K.

ALQ-162(V)4. An 18.6-kilogram version made up an a single AS-3554/ALQ-162(V) antenna and the RT-1377A/ALQ-162(V) transceiver/processor. It is re-programmable via the user-data module and supported by the SM-756/APR-44(V) radar signal simulator. It is carried by the MH-47E.

ALQ-162(V)6 Shadowbox II. This is an ALQ-162(V) upgraded with pulse-Doppler jamming to counter advanced airborne radar lock-on and ground-based missile systems.

ALQ-164(V). This is a podded system combining the ALQ-126B and ALQ-162(V). It is carried by the AV-8B Harrier II.

Enhanced ALQ-162(V) Countermeasures Set. This system allows for user programming. Advanced pulse-Doppler capabilities were added, and the PowerPlus upgrade incorporates microwave power technology that more than doubles the system effective radiated power to improve countermeasures effectiveness and platform survivability.

Program Review

Background. Development of the ALQ-162(V) started in 1976. Northrop produced an engineering development model in FY80. The Navy developed the system to complement the ALQ-126(B) pulse jammer. It was developed initially for the F/A-18C/D.

The first export orders were for the Canadian CF-18, Danish F-16, and Draken aircraft. The systems were fitted inside a single pylon on Royal Danish Air Force fighters. In the Canadian CF-18s, the ALQ-162(V) operated in conjunction with the ALQ-126B jammer to provide an "all threats" countermeasures capability similar to that of U.S. Navy aircraft.

In December 1990, Army Communications and Electronics Command (CECOM) began a market investigation to seek interest in the Eagle Claw Integrated ECM (electronic countermeasures) Program. The pod would integrate the ALQ-136(V)2 and ALQ-162(V)2 radar jammers and include new ECM technique modulators and highly accurate direction-finding capabilities. Sensor data would be analyzed to develop a consolidated situation report. Based on this report, jammer resources could be applied to counter the system. In addition, the situation report would be provided to a digital map display to assist the pilot in deciding whether to engage or avoid threats.

This investigation resulted in the development of the ALQ-211(V) Suite of Integrated RF Countermeasures (SIRFC), a fully integrated electronic combat system designed to operate in the digital battlefield of the 21st century. SIRFS replaces the ALQ-136(V) jammer and combines self-protection and situational awareness, making it possible for helicopters to share inputs and create a comprehensive picture of the battlefield electronic character. It will locate threats and other emitters of interest.

A February 1999 *Commerce Business Daily* announced that the Army Special Operations Command intended to issue a solicitation for indefinite delivery/indefinite quantity orders on a firm fixed-price basis with ITT for a minimum of one and a maximum of 36 HPRTs. Testing revealed a need to amplify the forward output signals of both the ALQ-136(V)2 and ALQ-162(V)2 pulse and continuous wave jammers for the MH-47E and MH-60K aircraft. Subsequent flight testing confirmed that adding an HPRT improved jamming.

A July 1999 *Commerce Business Daily* announced that the Navy Fleet and Industrial Supply Center planned to acquire a minimum of 30 and a maximum of 100 ALQ-162(V)6 pulse-Doppler units for Foreign Military Sales. A contract would be issued sole-source to Northrop Grumman.

In July 2000, Northrop Grumman announced that it had received a US$29 million contract from the U.S. Navy to provide Enhanced ALQ-162(V) systems to the Royal Norwegian and Royal Danish air forces for their F-16s. Under the terms of the contract, Norway would receive 29 units and the Danish Air Force four by the end of 2002. The contract carried options for additional systems for other fixed- and rotary-wing aircraft, including those of the Egyptian Air Force.

A December 2002 solicitation (N00140-03-Q-0719) by the Department of the Navy, Naval Supply Systems Command, FISC Norfolk Detachment Philadelphia, Pennsylvania, announced the intent to acquire one electronic countermeasures techniques analyzer, part number 001-008006, for use by the Royal Norwegian Air Force (RNoAF) in their Integrated ALQ-162(V) In-Country Reprogramming (ICR) Facility.

In January 2003, the Royal Danish Air Force (RDAF) signed an FMS contract with the U.S. Navy for 20 pulse Doppler/Power Plus retrofit kits as an initial upgrade to 82 ALQ-162(V)1 systems in use on their F-16s. The targeted installation date was late 2003 under a US$700 million contract. The RDAF also announced the intent to consider installing the ALW-162(V) on other platforms, such as C-130s and EH-101s.

Northrop Grumman continues to work with Lockheed Martin to integrate the system into the TERMA Electronic Combat Integrated Pylon System (ECIPS) wing pylon.

Funding

Funding is from platform and FMS procurement accounts, with support funded by Operations and Maintenance money.

Recent Contracts

Contractor	Award (US$ millions)	Date/Description
Northrop Grumman	28.9	Jul 2000 – FFP contract to purchase 33 ALQ-162(V) DECM sets for the governments of Norway (29) and Denmark (4). Completed October 2002. (N00140-00-C-M526)

Timetable

Month	Year	Major Development
Jan	1980	Initial developmental contract awarded
	1984	Initial production contract
Sep	1984	First export orders to Canada and Denmark; full-scale engineering development completed
Sep	1986	U.S. Navy approves production of ALQ-162(V); completes OT&E on ALQ-162(V)
	1988	First deliveries to U.S. Navy
Jul	1999	*CBD* notice for a possible 30- to 100-unit FMS procurement
Jul	2000	Royal Norwegian and Royal Danish FMS contract announced
Oct	2002	Norwegian and Danish deliveries to be completed
Late	2003	Initial 20 Danish Pulse Doppler/Power Plus upgrades to be complete

Worldwide Distribution

Canada. Used on the CF-18.
Denmark. Carried on the F-16 and F-35. C-130 and EH-101 installation being considered.
Norway. To be installed on its F-16s.
Spain. Used on the EF-18.
United States. Carried by the EH-60, MH-47, MH-60 and RC-12K.
Canada is interested in the Shadowbox II upgrades.
Finland and **Switzerland** chose the ALQ-165(V) ASPJ for the F/A-18s they are procuring.

Forecast Rationale

The ALQ-162(V) meets the need for a simple CW jammer that does not reduce aircraft performance and can be used on many aircraft. The jammer can be configured for internal-mount or pod installation. It is software-programmable to meet changing requirements, and can protect aircraft from terminal homing missiles, relieving more sophisticated jammers to counter acquisition and tracking systems. It can also be used as a backup should other equipment fail.

The Shadowbox II pulse-Doppler upgrade expanded the jammer's performance and attractiveness, since it provided protection from both ground and air threats. The ability to operate independently or in conjunction with other EW equipment is seen as a major advantage, because the ALQ-162(V) can be the add-on portion of an overall electronic combat capability. It has been a capable partner for the ALQ-126B.

The ALQ-162(V) can be used during intense, low-tech threat special operations. As the world threat climate changed to contingency operations against forces with CW-guided missiles, ALQ-162(V) protection became more desirable. Combined with IR protection, the EW

suite can provide protection from most threats typical of the low-intensity arena. Interest in and support of special operations have significantly increased since the Persian Gulf War.

Support for fielded equipment will continue. The ALQ-162(V) has been integrated with the ALQ-136(V) ECM set on some Army platforms. The Army's SOF aircraft, the MH-60K and the MH-47E, carry versions of the ALQ-162(V).

The Air Force procured the ALQ-162(V) for its Special Operations Forces MH-53J Pavelow III helicopters. The MH-60G Pave Hawk is expected to receive the ALQ-162(V) as well. Some added Foreign Military Sales were possible, but the selection of the ASPJ suite by many potential users reduced the overall number that could have been acquired.

The Royal Danish Air Force enthusiasm and acquisition of the PD/PP upgrade will possibly lead others in the area to do the same. The possibility of adapting it to their C-130s and EH-101s may also encourage similar adaptations by others.

Ten-Year Outlook

No significant production currently planned. Upgrades continue.

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