

# ARCHIVED REPORT

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## AQS-13(V)

### Outlook

- Maintenance, spares, and upgrades only
- Any production will likely be a refurbishment install only
- No full model production forecasted therefore the forecast chart has been omitted

### Orientation

**Description.** The AQS-13(V) is a family of helicopter-borne, lightweight dipping sonar systems.

**Note:** *The AQS-18 is an export version of the AQS-13F. Please see the separate report "AQS-18" for specific market intelligence on this system.*

#### Sponsor

U.S. Navy  
Naval Air Systems Command  
Washington, DC  
USA  
(Program manager)

**Status.** In active service, with retrofits and upgrades in continuing for the U.S. Navy AQS-13F variant.

Additionally, there is a strong spares and maintenance market.

**Platform.** The SH-60B/F/R, AB-212, and HS.23 helicopters (Spain's version of the SH-60) are leading platforms.

**Application.** Anti-submarine warfare.

**Price Range.** Estimated per-unit cost was \$1.2 million, based on a 2005 contract (no recent pricing data has been made available). Adjusting for inflation would put the per-unit cost at roughly \$1.93 million in January 2024 dollars.

### Contractors

#### Prime

L3Harris - Ocean Systems

<http://www.l3harris.com>, 15825 Roxford St, Sylmar, CA 91342-3597 United States,  
Tel: + 1 (818) 367-0111, Fax: + 1 (818) 367-0403, Prime Defunct

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

**AQS-13(V)****Technical Data****AQS-13F**

<b>Dimensions</b>	<b>Metric</b>	<b>U.S.</b>
Operating depth	440 m (15.25 m hover)	1,450 ft (50 ft hover)
Raise speed (avg)	6.71 m/sec	22 ft/sec
Lower speed (max)	4.88 m/sec	16 ft/sec
Water exit speed	1.53 m/sec	5 ft/sec
Seating speed	0.61 m/sec	2 ft/sec
Range scales	1,000, 3,000, 5,000, 8,000, 12,000, 20,000 kyds	
System weight (total)	2,984 kg	626.9 lb
Operating frequencies	9.23, 10.00, 10.77 kHz	
Sound pressure level	215 +/-1 dB ref	
Transducer tilt (max)	1.6 deg in 1-kt current	
Operational modes	Active 3.5 and 35 ms rectangular pulse with MTI, 200 or 700 ms shaped pulse	
	Communications mode at an SSB frequency of 8.087 kHz (UQC)	
	Passive	
Visual outputs	Range, range rate, bearing, operator verification	
Audio output	Available audio: Binaural left and right channel with auto gain control	
	Also available: Summed audio constant level	

**Design Specifications.** The AQS-13F, one of the more advanced variants of the AQS-13(V) family of sonar systems, is a long-range, low-frequency active sonar. It provides 360-degree coverage for the detection of submarines and other underwater objects. The five active transmission modes include 3.5-meter-per-second and 35-meter-per-second rectangular pulse, 200-meter-per-second and 700-meter-per-second shaped pulse, and moving target indicator. The one passive listening mode is in the 500-Hz bandwidth between 9 and 11 kHz. The system has an 8-kHz single sideband voice communication mode. Very high-speed reeling allows a dip, cycled to maximum depth, to be completed in three minutes.

The system also features the Adaptive Processor Sonar (APS), which greatly enhances detection capabilities in reverberation-limited conditions that are typical of shallow water, while minimizing the occurrence of false alarms. The APS utilizes Fast Fourier Transform (FFT) techniques to provide narrow-band analysis of the shaped CW (continuous wave) pulse transmitted in the APS mode. Unique processing algorithms include reverberation whitening, automatic target selection, and bearing integration.

The AQS-13F shipset consists of a reeling machine, a reel and cable assembly, a transducer assembly, a multiplexer with mounting base, a receiver with mounting base, an azimuth and range indicator, a dome control, and a sonar data computer with mounting base. Optional equipment includes a cable payout indicator, a bearing and range indicator, a multipurpose recorder with mounting base, a transducer housing, and a transducer funnel.

**Operational Characteristics.** In the U.S. Navy SH-60F CV Helo configuration, signals from the omnidirectional transducer are processed by the AQS-13F's CP 1323 computer and displayed on the acoustic sonar operator's console displays. The ASO console is part of the helicopter's Teledyne ASN-150 ASW tactical data system and is interfaced with the ARR-75 sonobuoy receiver. The console is equipped with a plan position indicator (PPI) radar display that shows range and bearing data; single fall, double fall, and passive sonobuoy data; Doppler, bearing, and range information on active sonobuoys; and transducer depth. The system is also equipped with a range rate meter and a bathythermograph display.

**AQS-13(V)**

Optional visual outputs include remote display of range and bearing, a cable payout indicator, and a CRT (cathode ray tube) display. The following status advisories are given: transducer submerged, snagged, wet, hot, bottom, trail, tilt, sonobuoy RF duplication, AF duplication, and sync loss. Audio outs are dual channel with gain control and are provided at a constant level to the aircraft intercom system.

For sonobuoy capability, the AQS-13F can operate in conjunction with four SSQ-41s (LOFAR), four SSQ-47s (RO), four SSQ-50s (CASS), three SSQ-53s (DIFAR), two SSQ-62s (DICASS), or three SSQ-77s (VLAD). Bathythermoby buoy capability is provided by one SSQ-36 sonobuoy.

**Variants/Upgrades**

**AQS-13.** The original design, the AQS-13 is a medium-frequency sonar in the range of 9.25 to 10.75 kHz at 5 kW, with a 3.5- or 35-meter-per-second pulse. It has range scales of 1,000, 3,000, 5,000, 8,000, 12,000, or 20,000 yards, with a typical pulse width of 180 degrees. It has a launch and recovery rate of 2 to 3 minutes and can reach a depth of 450 feet. A total of 246 systems were produced.

**AQS-13A.** The same as the AQS-13, except along with voice communication it adds keyed (coded) communication. A total of 314 systems were built.

**AQS-13B.** Lighter version with 16 preformed beams. A single 360-degree omnidirectional ping was adopted for speed scan. A total of 442 systems were built.

**AQS-13C.** This version features a sonobuoy interface.

**AQS-13E.** This version adds the Adaptive Processing Sonar for better shallow water performance. It is carried on U.S. Navy SH-3H Sea Kings. Approximately 250 were manufactured.

**AQS-13F.** All-digital version.

**AQS-13G.** Version proposed as alternative to Airborne Low Frequency Sonar (ALFS) requirement

that would feature improvements developed for Italy's AQS-18A system. It would reportedly be an even better shallow water system than the AQS-13F.

**AQS-18.** Export version of the AQS-13F. It is virtually the same system, but the dry-end processing is limited.

**AQS-18(V)-3.** Another name for the AQS-18 version. It is said to be equivalent to the U.S. Navy's AQS-13F.

**AQS-18(V)-5.** Similar to the AQS-18(V)-3 but lighter and with a shorter operating depth.

**AQS-18A.** Modified version of AQS-18 and equivalent to the U.S. Navy's AQS-13G.

**AQS-18AC.** Another version of the AQS-18 and equivalent to the U.S. Navy's AQS-13G using a powerful commercial off-the-shelf (COTS) digital processor with a higher mean-time-between-failures (MTBF) rating.

**AQS-502.** Export version of the AQS-13B as used by the Royal Canadian Navy on CH-124 Sea King helicopters.



AQS-13F Dipping Sonar System

Source: L3 Ocean Systems

**AQS-13(V)**AQS-18(V) Dipping Sonar System

Source: L3 Ocean Systems

**Program Review**

**Background.** The AQS-13 was developed from the AQS-10 dipping sonar, which entered service in 1959. While the AQS-10 was being developed, the U.S. Navy decided to procure an improved system for the SH-3 Sea King helicopter, which was also under development. Using the AQS-10 as a building block, Bendix developed the first AQS-13, which entered service in 1960. The AQS-13 weighed 775 pounds and had a range of 4,000 yards. It had an operating depth of 450 feet. A modified version, the 825-pound AQS-13A, entered service in 1964. The AQS-13B was introduced in 1969.

During the 1970s, the Navy and Bendix developed the AQS-13C, which came out in 1973. The AQS-13C was the Navy's first dipping sonar capable of interfacing with sonobuoys. The AQS-13E followed in 1981; this version added APS for better shallow water performance. It also had a longer cable for greater operating depth.

***AQS-13F the Model of Choice***

Development of the AQS-13F began in FY82. It has higher power (5 dB) than the -13E and a 1,500-foot cable. The AQS-13F was developed under PE#0604219N Airborne Anti-Submarine Warfare Developments, Project W0485 Carrier ASW Helicopter Avionics Improvement. The system's platform, the SH-60F helicopter, was developed under PE#0604229N Carrier Inner-Zone ASW Helicopter. The Navy conducted technical and operational tests in 1986 on an engineering development model (EDM) of the AQS-13F that had been installed aboard an SH-60B helicopter. These tests were unsuccessful because the heavy water pressure distorted the transmitting beam at great depths. The Navy's first helicopter ASW squadron equipped with the AQS-13F entered service in 1990.

***L-3 Communications Chosen as Sole-Source Contractor***

In December 2001, the U.S. Navy awarded L-3 Communications (now L3Harris Technologies) a sole-source contract to support various AQS-13F updates. This contract specifically involved work on the transducer support component. In December 2002, L-3 received a contract from the Navy for several additional AQS-13F dipping sonar transducers for its SH-60F helicopter.

"L-3's AQS-13F dipping sonar continues to be the primary ASW system defending the U.S. Navy's carrier battle groups worldwide," said Steven Schorer, then-president of L-3 Communications' Ocean Systems division in a company media statement on December 23, 2002.

The AQS-13F is used largely for retrofits and support. Most of the earlier AQS-13(V) variants are likely to be replaced with the AQS-22.

***AQS-22 in Production for MH-60R***

The AQS-22 Airborne Low Frequency Sonar (ALFS) is a helicopter-borne, low-frequency, active/passive dipping sonar used to locate, identify, and track submarines. It is made by Raytheon. The system is completing full-rate production for the U.S. Navy, with its primary platform being the MH-60R helicopter. A small number of units are being produced for various other platforms. The system is also installed on the Royal Australian Navy's and Royal Saudi Navy's MH-60R helicopters.

The last U.S. Navy MH-60R was delivered in 2018.

**AQS-13(V)**

Full-rate production of the AQS-22 is expected to conclude once all production of the MH-60R helicopter (U.S. and international) has run its course. A long and healthy market for AQS-22 spares and maintenance is expected.

**Note:** For specific details and intelligence on this system, please refer to the report titled "AQS-22 ALFS (Airborne Low Frequency Sonar)."

## Funding

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This product was initially funded by L3Harris (formerly L3 Technologies).

## Contracts/Orders & Options

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No recent orders valued over \$5 million had been identified at time of writing.

## Worldwide Distribution/Inventories

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Since 1965, more than 1,000 sets of the AQS-13(V) dipping sonar family (including the AQS-18(V) export model) have been sold, equipping the Agusta/Bell 204/212; the Sikorsky SH-3, S-70, SH-60F, and MH-60R; and the Westland Helicopters Sea King, among others. Some known user countries are the following (This list is not all inclusive of every user.):

<b>Algeria</b>	EH-101	<b>Peru</b>	Sea King, AB-212, SH-60F
<b>Australia</b>	MH-60R	<b>Portugal</b>	Super Lynx Mk 95
<b>Brazil</b>	Sea King	<b>South Korea</b>	MH-60R/NH90/AW159
<b>Canada</b>	CH-124	<b>Spain</b>	Sea King, AB-212
<b>Egypt</b>	SH-2G(E) with AQS-18A	<b>Taiwan</b>	S-70C
<b>Germany</b>	Lynx Mk 88A	<b>Turkey</b>	AB204
<b>Greece</b>	AB-212	<b>U.S.</b>	SH-3, SH-60F, SH-60R
<b>Italy</b>	Sea King		
<b>Japan</b>	Sea King		

## Forecast Rationale

The AQS-13(V) family of helicopter-borne, lightweight dipping sonar systems, made by L3Harris (formerly L3 Ocean Systems), is primarily used by the U.S. Navy for anti-submarine warfare. The export version is the AQS-18(V). (See Forecast International's separate report, "AQS-18.")

The ASW dipping sonar system detects and maintains contact with underwater targets through a transducer lowered into the water from a hovering helicopter. It provides target classification clues and can accurately determine the opening or closing rates of moving targets. The AQS-13F has been designed to provide rapid tactical response against the most advanced submarine threats. High-speed reeling allows a dip

cycled to maximum depth to be completed within 3.5 minutes, while the azimuth and range indicator and receiver provide a video display for the operator.

Because the next-generation system, the AQS-22, is in service, the AQS-13(V) will likely not be produced. Current will likely be used as emergency replacement units or cannibalized for retrofit upgrades to even older versions. While several variants (including exports) are in operational use worldwide, the AQS-13F is the most prominent version.

Although the maintenance and spares market is expected to remain strong for several years, no full production is seen at this time. Thus the forecast chart has been omitted.