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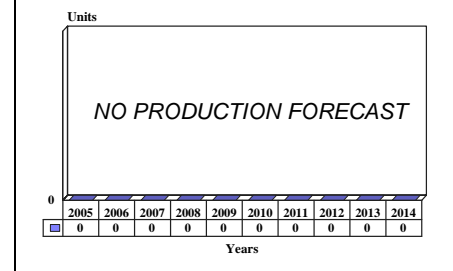
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APR-48A - Archived 4/2006

Outlook

- DF cueing for Kiowa warrior and AH-64D Longbow Apache helicopters
- Improves battlefield situational awareness
- Production ended, support continues

10 Year Unit Production Forecast
2005 - 2014



Orientation

Description. The APR-48A Precision Direction Finding (DF) system is used by battlefield helicopters for positive ID of transmitted signals and correlation to other sensors and fire control systems. It is the DF portion of the Longbow helicopter, a day/night, all-weather fire-and-forget targeting system as well as battlefield situational awareness system for the OH-58D.

Status. In production, ongoing logistics support.

Total Produced. Through 2004, an estimated 252 units had been produced.

Application. AH-64 Apache and OH-58D Kiowa Warrior.

Price Range. Estimated unit cost is \$1.2 million.

Sponsor

U.S. Army
Aviation and Missile Command (AMCOM)
Redstone Arsenal
Huntsville, Alabama (AL) 35898-5000
USA
Tel: +1 205 876 4161
Web site: <http://www.redstone.army.mil>

Contractors

Lockheed Martin Systems Integration-Owego, <http://www.lmco.com>, 1801 State Route 17C, Owego, NY 13827-3998 United States,
Tel: 1 (607) 751-5754, Fax: 1 (607) 751-3259, Prime

Technical Data

Dimension	Metric	U.S.
Antenna	53 x 20 x 9.9 cm	21 x 7.7 x 3.9 in
Receiver	28 x 22 x 17.8 cm	11 x 8.5 x 7 in
Processor	25 x 15 x 17.8 cm	10 x 5.7 x 7 in

	<u>Metric</u>	<u>U.S.</u>
Weight		
Antenna LRU	13.5 kg	29.5 lb
Receiver LRU	3.9 kg	8.5 lb
Processor LRU	5.5 kg	12 lb
 Characteristics		
Field of View	360°	
Features	Precision Direction Finding (DF) Narrow Field-of-View High sensitivity Positive ID Quick reaction time Installation flexibility	
Power dissipated	150 W	
MTBF	1,400 hrs	

Design Features. The APR-48A can be configured into a single line replaceable unit (LRU), while expansion modules permit growth to millimeter wave (MMW) for expanded threat capability. State-of-the-art capabilities were included in a lightweight system. Custom Gate Array chips perform all data formatting and interface control. The radio frequency interface (RFI) design features a four-element interferometer coupled with a three-channel phase receiver. A four-element coarse DF array is used for initial signal acquisition. When a fine DF measurement is required, a four-element, long-baseline interferometer is used. This provides high DF accuracy and a tolerance of multi-path-induced phase errors.

The receiver is a full, four-channel amplitude and three-channel phase measuring implementation that employs delay line discriminators at a high Intermediate Frequency (IF) for Instantaneous Frequency Measurement (IFM). The receiver is tuned through the targeted frequency region with a wide instantaneous bandwidth receiver, similar to a standard superheterodyne receiver.

A digital MIL-STD-1750A processor sorts the incoming pulses, computes DF, characterizes and identifies emitters,

and determines threat priority. I/O interfaces include redundant 1553B ports and analog inputs for functions such as rotor blade position and blanking signals.

A User Data Module (UDM) allows the system to be adapted to new threats in less than five minutes. It uses Ada Higher Order Language (HOL) for easy software maintenance.

Operational Characteristics. The APR-48D was designed to perform target acquisition and cueing for the electro-optical Mast Mounted Sight (MMS) on the OH-58D Kiowa Warrior and fire control radar on the AH-64D Longbow Apache helicopter.

The system increases the survivability and lethality of both helicopters, and supports selective Suppression of Enemy Air Defense (SEAD), armed reconnaissance, and attack missions. The system effectively extends the range of the radar and EO sensors, and can detect signals from hostile forces before those forces can detect the carrying helicopter.



AH-64D Longbow Apache



OH-58D Kiowa Warrior

Source: U.S. Army

Variants/Upgrades

None at this time.

Program Review

Background. In the late 1980s and early 1990s, the Army developed plans to upgrade its OH-58 light reconnaissance helicopters. This included a mast-mounted electro-optical sight and the APR-48A Radio Direction Finding system to cue the EO sighting system. The retrofit program was completed in FY99, with the Kiowa Warriors fielded by 1Q FY00.

The Army also developed plans to remanufacture AH-64A Apache helicopters into the Longbow/Apache AH-64D configuration that included the APG-78(V) Longbow radar and other helicopter improvements, including the APR-48A. The first radar-equipped flight took place August 20, 1993.

During Army operational tests and evaluations in a high-threat environment at Fort Hunter Liggett, California, Longbow Apaches reported 141 percent more hits against opposing forces than the AH-64As, and at longer ranges. Cueing from the APR-48A was a significant factor. In obscured visibility, the Longbows were able to hit most of their targets; the AH-64As with semi-active laser HELLFIREs were not. There were 87 percent fewer simulated aircraft losses.

Longbows dominated the battlefield in 15 force-on-force engagements against baseline AH-64As. They were considered to have exhibited a 4:1 lethality advantage and 7:1 survivability advantage. Datalinking with the radar improved situational awareness. There were no AH-64D fratricide incidents, while a reported 37 AH-64As were attacked by other AH-64As. The results allowed testers to complete Initial Operational Test and Evaluation (IOT&E) earlier than expected.

In December 1995, the Army and McDonnell Douglas signed the initial phase of the AH-64D contract with an agreement to deliver 18 remanufactured Longbow Apaches in the first year of production.

The Army and McDonnell Douglas signed a multiyear agreement for the production of 232 AH-64D Longbow Apaches over five years. The agreement made it possible to procure 50 more aircraft at a higher rate than with five single-year contracts.

The first remanufactured AH-64D Longbow made its first flight on March 21, 1997, at the McDonnell Douglas Helicopter Systems Facility in Mesa, Arizona.

During the March 1997 Advanced Warfighting Experiment (AWE) at the National Training Center, Fort Irwin, California, Longbows and Kiowa Warriors validated the performance of the APR-48As. The mast-mount made it possible for both helicopters to do targeting by just sticking the above-rotor sensor and radar above ridgelines, without having to unmask the entire helicopter.

EXFOR commanders used the Longbows mostly at night to take advantage of their most potent capabilities – and with great success. These field tests gave the Army an opportunity to demonstrate the capability of the Longbow Apache as a sensor and a shooter on the battlefield of the 21st century. Besides the SEAD missions, the two Longbow Apaches provided intelligence and targeting information from their sensors and passed that information to the ground force, which was linked through a “tactical internet” that shared situational awareness and battlefield information with a variety of air and ground units in near real time.

In August 2001, the U.S. Army accepted its 200th AH-64D Longbow.

The first of 269 additional AH-64A Apaches to be remanufactured into AH-64D Apache Longbow helicopters arrived at the Boeing facility in Mesa, Arizona, on January 10, 2002.

Funding

APR-48(V)-specific funding is included in Operations & Maintenance accounts for the helicopters.

Recent Contracts

(Contracts over \$5 million)

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
McDonnell	242.0	Nov 2001 – FFP contract for the remanufacture of 35 Egyptian Air Force AH-64D Apache helicopters with fire control/radio frequency

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Douglas Helicopter		interferometer provisions for Egypt. To be completed 2006. (DAAH23-01-C-0195)
Lockheed Martin	1.2	Aug 2003 – Increment of a \$15,995,309 FFP contract for a user data module reprogramming capability for the Apache APR-48A. Complete May 2008. (DAAH23-02-C-0233)
Lockheed Martin	7.9	Aug 2003 – Mod to FFP contract for FY2003 RFI requirements for the government of Kuwait. Complete February 2007. (DAAH23-03-C-00323)

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1984	Initial studies
Jul	1995	U.K. selects Longbow for attack helicopter
Oct	1995	Full-rate production authorized
Nov	1995	The Netherlands contracts for Longbow helicopters
Dec	1995	Initial Army Longbow production award
Mar	1996	Approval for remanufacture of up to 240 Longbow helicopters
Aug	1996	Multiyear contract for remanufacture signed
Oct	1996	Milestone IIIB
	FY97	Longbow IOC
Feb	1998	First Article test begins
May	1998	U.K. deliveries begin
Jun	1998	Longbow fielding ceremony
Jul	1998	First Longbow unit equipped
Oct	1998	1st U.S. Longbow combat-ready battalion
1Q	FY99	Longbow multiyear contract approved
2Q	FY99	Kiowa Warrior OH-58D retrofit program complete
Oct	1999	Israeli purchase request announced
1Q	FY00	Kiowa Warrior fielding complete
Jul	2001	U.K. initial weapons clearance
Dec	2003	Production contract for 207 U.S. units scheduled to be completed
	2006	U.S. Army AH-64D remanufacturing (501) to be completed
2Q	FY08	Retirement of Kiowa Warrior to begin
Sep	2008	All U.S. Longbows to be mission-ready

Worldwide Distribution

The **United Kingdom** selected the Longbow Apache as its new Army attack helicopter; 67 planned. Total of 48 deployed with the 16th Air Assault Brigade.

Egypt requested upgrading 35 AH-64As to AH-64Ds.

Israel requested 24 AH-64D Apache attack helicopters.

The **Netherlands** will purchase 30 Longbow Apache attack helicopters.

Singapore decided to add the radar to the AH-64Ds being acquired.

Taiwan took delivery of 29 Kiowa Warrior helicopters, and requested 13 more (pending).

The **United Arab Emirates (UAE)** requested remanufacture of 30 AH-64As to the AH-64D configuration, with 32 APR-48As included in the request.

The **U.S. Army** will field the Longbow helicopter, remanufacturing AH-64As into AH-64D Longbows through 2006.

Other nations have expressed an interest in the Longbow, including **South Korea, Kuwait, Japan, and Taiwan.**

Forecast Rationale

Although there is international interest in the Apache, the number of exported helicopters carrying the Longbow radar and associated systems is limited because the DoD will not allow a major operational advantage to be exported to anyone but reliable allies. A nation can upgrade its AH-64As to the AH-64D configuration, and request the radar and other systems

separately. Requests from some unidentified countries have already been denied.

This forecast is based on current AH-64D production estimates. Termination of the Comanche helicopter will expand and extend the use of the Apache Longbow in the field. This will extend the support needed for the APR-48A and all other avionics on the helicopters.

Ten-Year Outlook

No further production anticipated. Support and spares replenishment will continue.

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