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ARC-164(V) - Archived 9/2008

Outlook

- Raytheon markets its ARC-232 as a replacement for existing ARC-164 installations
- JTRS radios are expected to replace several U.S. radios, and the JTRS Alternative Communications Suite does not include ARC-164
- USAF has identified the ARC-164 replacement
- If it has not already, production is expected to end in the near future
- Barring further activity, this report will be archived in September 2008

Orientation

Description. Ultra-high-frequency (UHF) airborne radio.

Sponsor

U.S. Air Force
Warner Robins Air Logistics Center
Robins AFB, GA 31098
USA
Tel: + 1 (912) 926-1110
Web site: <http://www.af.mil>

Status. In service.

Total Produced. Raytheon states it has delivered more than 60,000 ARC-164s over two decades, inclusive of all historical variants.

Application. Airborne tactical communications; compatible with dozens of aircraft types.

Price Range. The most recent contract for which numbers are available indicates a price of about \$8,000 (in FY88 dollars) for an ARC-164(V) receiver/transmitter. This figure does not factor in control equipment, inflation, or newer variants.

Contractors

Prime

Raytheon Network Centric Systems, Radios and Terminals

<http://www.raytheon.com>, 1010 Production Rd, Fort Wayne, IN 46808 United States, Tel: + 1 (260) 429-6780, Fax: + 1 (260) 429-6736, Email: commsys@raytheon.com, Prime

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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

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Technical Data

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Weight: RT-1518 panel mount	4.2 kg	9.3 lb
Size	12.38 cm x 14.58 cm x 21.89 cm	4.875 in x 5.75 in x 8.62 in
Frequency range	225.000 MHz - 399.975 MHz	
Channel spacing	25 kHz	
No. of channels	7,000 (includes 20 preset and 1 guard channel)	
Primary power	35 W receive, 110 W transmit at 24 V DC - 33 V DC (18 V DC emergency)	

Design Specifications. The ARC-164(V) is a family of highly versatile UHF radios covering the 225-MHz to 400-MHz range in 25-kHz increments. It has 7,000 channels; up to 20 channels are preselectable. The ARC-164(V) is unique in its modular or “slice” construction, which enables two or more modules to be connected via a flexible harness to form any number of different system configurations. This approach gives the radio the flexibility to serve various mission needs.

A typical slice configuration is the HAVE QUICK compatible-RT-1518 10-watt, panel-mounted receiver/transmitter that consists of five modules (transmitter, main receiver, guard receiver, synthesizer/ECCM, and switching unit) integrated via a flex harness. Additions

such as data transmission, secure speech, and remote-control frequency selection capabilities are all possible using this modular approach.

Operational Characteristics. The ARC-164(V) is capable of providing the radio communications systems needed for base stations, vehicles, ships, and satellite terminals. For airborne applications, a number of different mounting trays are available that allow the radio to be fitted to new aircraft, and as an update for older aircraft.

In addition to being a highly versatile system, the ARC-164(V) has demonstrated a high mean time between failures (MTBF) of 2,700 hours.

Variants/Upgrades

The ARC-164(V) family consists of several receiver/transmitters, controls, and auxiliary hardware that include models incorporating HAVE QUICK I (HQ I) or HAVE QUICK II (HQ II) electronic counter-countermeasures (ECCM), frequency-hopping, and 25-kHz VINSON secure voice modifications:

Receiver/Transmitters10-Watt Remote

RT-1145 - Standard set (plain)
 RT-1145A - HQ I
 RT-1145B - VINSON
 RT-1145C - HQ I & VINSON
 RT-1145F - Data Bus
 RT-1504 - HQ II
 RT-1504A - HQ II & VINSON
 RT-1614 - HQ II via MIL-STD-1553B databus

30-Watt Remote

RT-1146 - Standard set (plain)
 RT-1146A - HQ I
 RT-1146B - VINSON
 RT-1146C - HQ I & VINSON
 RT-1146D - HQ II
 RT-1146E - HQ II (JSTARS)

10-Watt Panel

RT-1168 - Standard set (plain)
 RT-1168A - HQ I
 RT-1168B - VINSON
 RT-1168C - HQ I & VINSON
 RT-1505 - HQ II
 RT-1505A - HQ II follow-on front panel, with LCD readout and KYK-13 key fill port
 RT-1505B - 20 Watt
 RT-1610 - 10/20 Watt HQ IIA

10-Watt Waterproof Panel

RT-1167 - Standard set (plain)
 RT-1167A - HQ I
 RT-1167B - VINSON
 RT-1167C - HQ I & VINSON
 RT-1167D - Unspecified
 RT-1167F - Unspecified
 RT-1518 - HQ II
 RT-1518A - Mod 1518 by Collins
 RT-1518C - HQ II switching unit/fill port

Remote-Control Units

C-9533 - New installations (plain)
 C-9533A - New installations - HQ I
 C-9680 - ARC-34 replacement (plain)

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C-9680A - ARC-34 replacement control - HQ I
 C-9680B - Unspecified
 C-9681 - ARC-27 replacement control
 C-9681A - ARC-27 replacement control - HQ I
 C-9862 - ARC-51 replacement control
 C-9862A - ARC-51/ARC-109 replacement control with HQ I
 C-11718 - HQ II follow-on control with LCD readout and KYK-13 key fill port
 C-11719 - Unspecified
 C-11720 - Unspecified
 C-11721 - Unspecified

HAVE QUICK I/HAVE QUICK II. In 1978, following an Air Force evaluation of the anti-jamming needs of its airborne radios, the USAF Electronic Systems Division awarded original producer Magnavox a contract to develop an economical near-term solution to the jamming problem. The new system was designed to fit in the existing radio's envelope.

This initial design modification program was originally called HAVE QUICK, and Magnavox developed a slow frequency-hopping scheme to meet the requirement, initially fielded in 1981. In August 1980, the U.S. Air

Force placed an \$8.8 million order for HAVE QUICK ECCM versions of the ARC-164, followed by subsequent orders totaling more than \$50 million.

HAVE QUICK II followed in 1986, providing increased jam resistance and frequency-hopping speed. Operating utility improvements based on user experience in the field were also incorporated, with an emphasis on affordability. The HAVE QUICK II/IIA program called for the modification of all ARC-164 units throughout the U.S. Air Force, Army, and Navy.

HAVE QUICK II Follow-on Front Panel. Under a contract awarded in June 1991 by the U.S. Air Force, Magnavox produced a modification kit for existing radios that featured a new front-panel control setup. The front end has an LCD readout compatible with night vision goggles, and a fill port for the electronic loading of the HAVE QUICK II multiple-word-of-the-day with a KYK-13 key fill gun. The RT-1505A 10-watt panel-mounted set, the RT-1518C 10-watt water-proof panel-mounted set, and the C-11718 remote-control panel are all equipped with the fill port HQ II feature.

Program Review

Background. The ARC-164 system is the standard radio for the U.S. Air Force and for the NATO Alliance. The system was first fielded in 1975, following the issuance of the first production contract the previous year. The ARC-164(V) replaces the ARC-27, ARC-34, ARC-45, ARC-51, ARC-52, ARC-109, ARC-116, ARC-159, ARC-240, ARC-552, TR-AP-21, TR-AP-22, PTR-175, and PTR-377.

September 1992 marked the end of deliveries under a 1988 \$78.9 million contract for 9,496 receiver/transmitters and 687 controls. One particularly noteworthy sale since that time involved the July 1994 selection of Magnavox by Lockheed Aeronautics Systems Co to provide the latest derivatives of the ARC-164(V). These included MIL-STD 1553B databus-compatible receiver transmitters for installation on C-130J Hercules II aircraft for transmission of UHF voice and data communications.

ARC-164 Replacements

An improved UHF radio, designated the URC-126 HAVE QUICK IIA, was designed for universal

application – airborne as well as ground-based deployment. Intended as a replacement for the ARC-164(V), the URC-126 was to have a significantly higher frequency-hopping rate and the ability to synchronize frequency hopping directly from an onboard NAVSTAR GPS receiver. However, this program failed to enter production in 1993 as planned.

Currently, Raytheon markets its ARC-232 Starblazer as a form/fit replacement for ARC-164 installations for ease in upgrading to the new SATURN ECCM.

In September 1997, the U.S. Undersecretary of Defense signed a Decision Memorandum officially creating the Joint Tactical Radio System (JTRS) program. JTRS is intended to standardize radio communications throughout all branches of the U.S. military. Once fully developed, this program is likely to replace most, if not all, radios currently in U.S. military service, including the ARC-164. The JTRS program continues to face technical difficulties, mostly with software. The JTRS program is covered in a separate Forecast International report.

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Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1980	Upgraded to first production HAVE QUICK configuration
	1982	First 25-kHz modification configuration produced
	1985	Upgrade planned
Feb	1988	Delivery of U.S. CINC Black Hawks equipped with ARC-164(V)
Nov	1988	U.S. Air Force orders nearly 9,500 ARC-164(V)s
Jun	1991	Order placed for new ARC-164(V) front-end kits
Sep	1992	9,500-unit order completed
	1992	URC-126 production phase placed on indefinite hold
Feb	1994	Front-end orders completed for U.S. Air Force
Jul	1994	Selected for use on C-130J aircraft
Sep	1995	Hughes buys the defense operations of Magnavox
Sep	1997	JTRS program officially created
Dec	1997	Raytheon acquires Hughes electronics business
May	2005	U.S. Army selects JTRS Alternative Communications Suite – ARC-164 not included

Worldwide Distribution/Inventories

The ARC-164 has been installed worldwide on the following aircraft types: A-7, A-10, AH-1, AH-64, AC-130, B-52, C-5, C-130, C-141, CH-3, CH-47, EH-60, EF-111, F-4, F-5, F-15, F-16, F-111, Hawk, HC-130, HH-1, HH-53, HH-60, K-8, KC-10, OH-58, OV-1, OV-10, RF-4, Sea Harrier, Sea King, Strikemaster, T-37, T-38, T-39, UH-1, and UH-60.

Forecast Rationale

Some Business in Upgrades

The last known large contract for the ARC-164 was identified in 1994. However, the ARC-164 has been listed in modernization packages and as standard equipment for various aircraft. The ARC-164 was included in an upgrade under the Greek F-4E Phantom modernization program called Peace Icarus 2000. Thirty-six aircraft were upgraded under this program, which was completed in 2004.

In 2002, Thales began upgrading 13 Sea King helicopters to the AEW.7 standard, enhanced to provide a new airborne surveillance and control (ASaC) mode. The upgrade included the Thales Cerberus mission system and two ARC-164 UHF radios, among other improvements. The first two upgraded aircraft were delivered in 2002 and the project was scheduled for completion in mid-2004. Two Sea King AEW.7 helicopters collided with each other in mid-air in March 2003 during Operation Iraqi Freedom. In June 2005, Thales received an order to upgrade an additional two

Mk 6 helicopters to the AEW.7 standard. They are scheduled to enter service in 2007.

Pushed Out of the Market

Other radios are pushing the ARC-164 out of the market. In January 2004, the Rhode & Schwarz MR6000R/L VHF/UHF radio was selected as a substitute for the ARC-164 radio to be fitted onto 48 F-16C/D aircraft being produced for Poland. Other radios vying for the contract were the Rockwell Collins ARC-210 and Raytheon's ARC-232 Starblazer. The ARC-210, in fact, may be the most dominant threat to the ARC-164. According to Rockwell Collins, it has sold over 14,000 ARC-210 radios, and ARC-210s equip more than 135 military aircraft types worldwide.

U.S. Air Force Budget Documentation for FY08/FY09 states that the ARC-164s equipping F-16s have poor radio reception, limited VHF/UHF frequency range, no SINCGARS capability, and other problems. The ARC-210 radio said to be capable of overcoming these deficiencies.

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The Next Generation: JTRS

Several U.S. radio communications systems are scheduled to be replaced by hardware developed under the Joint Tactical Radio System (JTRS) program. JTRS is the U.S. DoD next-generation, software-based radio. JTRS has had some program difficulties, leading the U.S. military to initiate a JTRS Alternative Communi-

cations effort. The JTRS Alternative Communications for Army helicopters consists of a suite of ARC-201 SINGARS and ARC-231 radios. Forecast International believes that other airborne applications will also use this Alternative Communications suite, or possibly the popular ARC-210 radio.

Production of the ARC-164 is expected to end soon.

Ten-Year Outlook

With no outlook forecast and the archiving of this report in September 2008, Forecast International has **omitted** the Ten-Year Outlook chart.

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