WSC-3(V) - Archived 10/2000

Outlook

- Major production complete in mid-1990s for US and FMS orders

- Last-ditch effort under way to sell undisclosed number to Egypt

- Barring any future activity, this report will be archived next year, 2000

10 Year Unit Production Forecast
1999-2008

Units

MINIMAL PRODUCTION FORECAST

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
	0	0	0	0	0	0	0	0	0	0

Years
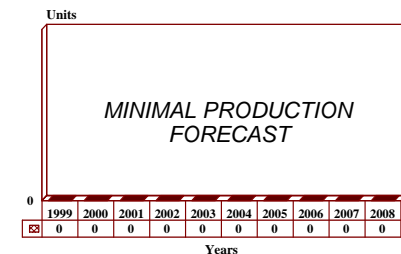
Orientation

Description. UHF line-of-sight (LOS) and satellite communication (SATCOM) terminal.

Sponsor
US Navy
  Space & Naval Warfare Systems Command (SPAWAR)
  Washington, DC
  USA

Contractors
Raytheon Systems Company
  (formerly Raytheon E-Systems)
  Intelligence & Communications Systems Division
  PO Box 12248
  St. Petersburg, Florida (FL) 33733-2248
  USA
  Tel: +1 813 381 2000
  Fax: +1 781-860-2172
  Website: http://www.raytheon.com
  E-mail: Query form available through website

Status. In minimal production.

Total Produced. Through 1998, an estimated 11,416 terminals had been produced.

Application. Standard US Navy UHF LOS/SATCOM radio for surface ships and submarines; some airborne and vehicle-mounted versions in service.

Price Range. The last known contract suggests a unit price of approximately US$49,000 in 1993 dollars.

Technical Data

Design Specifications. The 100-watt transmitter of the WSC-3(V) provides over 7,000 communications channels between 225 MHz and 399.975 MHz (at 25 kHz spacing), with a 20-channel preset capability. Transmit modes include AM (wide and narrow band), FM (wide and narrow band), FSK, PSK, and Link 11. In the LOS mode for ship-to-ship transmissions (not using a satellite link), the transmitter power is reduced to 30 watts. Average WSC-3(V) weight is 67.1 kilograms (148 pounds).

A fleet reliability assessment of the WSC-3(V) – which is nicknamed the Whiskey-3 – was conducted by the US Navy in the late 1980s, using 61 radios onboard five units of the Atlantic fleet and three units of the Pacific fleet. While the specified reliability requirements called for 4,500 hours mean time between failures (MTBF), the actual MTBF was 15,215 hours, with only nine reported failures during 136,937 hours of operational time.

The radio's modular design has contributed significantly to this impressive MTBF performance and has also helped to achieve a mean time to repair (MTTR) of three to four minutes. Although the Whiskey-3 dates back to the early 1970s, it has been kept current because the basic design consisted of 17 easily replaceable modules. Modules have been redesigned throughout its service life to reflect technological advances, and have allowed a high degree of operational flexibility, with different module combinations available for a wide range of capabilities. No matter what the configuration, all radios remain compatible.

Operational Characteristics. The WSC-3(V) is the US Navy standard shipboard UHF radio for both satellite long-haul and line-of-sight communications. Proven highly reliable on US Navy ships and submarines, it is also used by the US Army, Air Force, Marine Corps and Coast Guard, and is fully compliant with US military specifications. The radio, while originally designed as a satellite communications terminal, has come to be widely used for ship-to-air and ship-to-ship communications. Satellite communication is through the Fleet Satellite Communications (FLTSATCOM) system. In addition to clear voice communications, the WSC-3(V) can also be used for data transmissions.

Variants/Upgrades

Since the radio was approved for service use in 1974, many basic changes have occurred in its capabilities, including an anti-jam capability, 5 kHz channel spacing, and serial control to allow computer control of the radio. Below are some of the variants that have emerged:

- (V)2 and (V)3 are the original variants specifically for FLTSATCOM satellite communications.

- (V)6 and (V)7 are line-of-sight (LOS) radios that can have an electronic counter-countermeasures (ECCM) mode with the addition of HAVE QUICK II modification kits.

- (V)8 was a Coast Guard variant that had a serial interface for remote control.

- (V)9 gave the radio a compatibility with the 5 kHz channel spacing of the AFSATCOM satellite system (one in use by US Army's 11th Brigade at Fort Huachuca, Arizona).

- (V)10 and (V)11 are the (V)6 and (V)7 with HAVE QUICK upgrades.

- (V)12 is a (V)2 that has been adapted for Trident submarine applications.

- (V)13 is a variant that uses a 400-cycle AC power supply.

- (V)14 comes with a MIL-STD-1533-compatible interface.

- (V)15 has DAMA (Demand Assigned Multiple Access) compatibility.

- (V)17 includes DAMA compatibility and MTSC.

- (V)18 includes MTSC but is not DAMA-compatible.

- RT 1217-1 is a WSC-3 in which frequency hopping can be controlled externally.

- RT 1217-2 is a HAVE QUICK configuration.

- RT 1217-3 has an internal anti-jam capability.

- RT 1217-4 has external, non-HAVE QUICK anti-jam.

- RT 1244(V)1 has a fast frequency-hop synthesizer for ECCM.

- RT 1244(V)2 does not have an ECCM mode, but has both 5 kHz and 25 kHz spacing available.

- RT 5085/WSC is a Canadian designation for a model designed to provide a multicoupler interface.

The WSC-3(V) is usually rack-mounted and the WSC-3(V)2/(V)3 can be mounted on aircraft.

Whiskey-3 Anti-Jam. The WSC-3(V) is now equipped with various anti-jam capabilities based on frequency hopping in order to provide an interim secure communications capability for various navies, including those of the US, Denmark, Australia, New Zealand and the UK. Frequency hopping is basically the use of short-duration transmissions seemingly at random over all segments of the bandwidth. Jammers are thus forced to constantly scan the spectrum for the signal to be jammed because hostile forces cannot know with certainty when and where transmissions are occurring.

WSC-3(V) and HAVE QUICK I/II. In 1981, the WSC-3(V) received its first frequency-hopping capability as an offshoot of the US Air Force HAVE QUICK program when the Navy contracted with E-Systems, Rockwell Collins and Magnavox to provide HAVE QUICK modification kits for its ARC-182 and WSC-3(V) radios. The modifications required for a HAVE QUICK capability were minor, involving replacement of two modules and the relocation of a few chassis wires. The A20 HAVE QUICK control module is the primary kit component and quickly inserts into the lower right-hand corner of the WSC-3(V) chassis. This module includes the processor and all required memory, signal interfaces and controls.

The Danish navy has used HAVE QUICK-modified Whiskey-3s for FM data transmissions, even though the main application of the system is for AM secure/ nonsecure voice transmissions. The Danes paired Whiskey-3s with packet appliqués, and the radios then became a message transmission medium for both voice and data traffic via a single FM net that joins on-ship radios with shore-based ones. Messages are automatically relayed to nodes beyond line-of-sight by the packet appliqué, which also executes message accountability functions and network control.

An Australian/British Appliqué. The Royal Australian Navy and the UK's Royal Navy have also developed an appliqué that provides four-channel time division multiple access (TDMA) along with a medium-speed frequency-hopping capability. The appliqué (FHA) is able to maintain rapid, reliable synchronization even in conditions of severe jamming because of a robust design. With the four-channel TDMA, a single FHA-equipped radio can participate in four nets. The FHA first multiplexes four channels of incoming 16 kbps voice/data and then, with frequency-shift keying, modulates a 70 MHz carrier wave. The FHA then routes the modulated signal via a modem port to the Whiskey-3, with a transmission burst rate of 140 kbps. The appliqué was a joint development of Thorn EMI Electronics of Australia and the Advanced Engineering Laboratory of the Australian defense establishment.

Program Review

Background. Several thousand WSC-3(V)s have been produced to date for the US and 19 foreign countries, making the radio a successful product for E-Systems (which became Raytheon E-Systems, then was merged into the new Raytheon Systems Company). The WSC-3(V) has been installed on ships varying in size from small Norwegian and Danish navy torpedo boats to the US Navy's large aircraft carriers. Several WSC-3(V)s are normally carried onboard a ship.

Although production of the Whiskey-3 dates back to 1975, it was completely redesigned in 1980 and has been periodically updated since then. Early versions can be updated with retrofit kits.

The Canadian navy has proven to be a good customer, initially ordering 140 of the radios in 1984 for the first six ships in the new Canadian Patrol Frigate class (US$3.5 million contract), and following up this order in late 1987 with a contract for 110 radios, of which many were to replace E-Systems SRC-501s that were supplied in the 1970s. Applications are focused on ship-to-ship and ship-to-air missions.

The radio remains in widespread international use, though identifiable contracts only ensured deliveries into the mid-1990s. The US Navy awarded its last known contract for WSC-3(V) procurement in 1993, for 192 units. This accounts for about 77 percent of the 249 radios involved in the contract; the remaining 23 percent – a total of 57 radios – went to Saudi Arabia, the Netherlands, France, and Spain. An option existed for another 192 radios and 92 spares, but no such contract ever surfaced.

Funding

None identified.

Recent Contracts

The last confirmed contract was awarded in 1993:

Contractor	Award ($ millions)	Date/Description
E-Systems	12.3	May 1993 – FFP incentive mod for a firm requirement for 249 WSC-3 radios and options on an additional 192 radios and 92 sets of spares. Completed November 1995. Fulfilled FMS sales to the Netherlands (4.1%), France (3.6%), Saudi Arabia (12.1%), and Spain (3.1%). (N00039-88-C-0114)

Timetable

Month	Year	Major Development
	1974	WSC-3(V) approved for service
	1975	Enters production
	1978	Initial development completed
May	1980	Multiyear contract valued in excess of US$100 million awarded to E-Systems
	1980	FMS made to Australia
	1981	Navy awarded contract to provide its WSC-3(V)s with HAVE QUICK
	1982	HAVE QUICK appliqué demonstrated on WSC-3(V)
Jun	1983	Contract awarded for US$2.5 million for a derivative of the WSC-3(V) to the Turkish navy
	1984	Production rate reported at 100 units per month; Norwegian order completed
FY	1985	Completion of a one-time development effort for DAMA mod kits for the WSC-3(V)
FY	1986	WSC-3(V) transceiver vulnerability modifications developed
	1986	Fleet reliability assessment program results in 15,215-hour MTBF for WSC-3(V)
Nov	1986	E-Systems announces sale of 20 systems to Australia
Dec	1986	US Navy awards US$21 million contract to E-Systems for 998 systems
Dec	1987	E-Systems receives US$5.4 million contract for 110 WSC-3(V)s and logistics support services for the Canadian navy
Apr	1988	Announcement in *Commerce Business Daily* that SPAWAR was planning to award sole-source contract to E-Systems for 11 WSC-3(V) HAVE QUICK mod kits (option for 54 more); FY88/89 marked by a steady stream of contracts for E-Systems
Apr	1995	Raytheon acquires E-Systems
Nov	1995	Last WSC-3(V) units delivered to US Navy under 1993 contract
Mid-Late	1990s	Effort to keep the WSC-3(V) production line open for sale to Egypt
Thru	2000	Spares and other support continues

Worldwide Distribution

In addition to the **US**, the following countries are known to field the WSC-3(V): **Australia**, **Canada**, **Denmark**, **Egypt**, **France**, **Germany**, **Indonesia**, **Japan**, **Morocco**, the **Netherlands**, **New Zealand**, **Norway**, the **Philippines**, **Portugal**, **Saudi Arabia**, **South Korea**, **Spain**, **Turkey**, and the **United Kingdom**.

Forecast Rationale

Major production of the WSC-3(V) ceased during the early-to-mid-1990's, bringing to a close a fairly successful product run. The system became the standard UHF transceiver aboard many US vessels over the past two decades, a pattern that was mirrored by the international market.

Despite its renowned reliability and numerous upgrades, the WSC-3(V) is a rapidly aging program. Several replacements have been developed and procured, designed primarily to enhance communications security (COMSEC). A minor domestic spares and replacement market should sustain limited production until the transitions are completed.

Egypt represents the most promising international WSC-3(V) customer, declaring its interest in procuring the system for its fleet. Few details have been released regarding the possible sale, which may or may not have occurred.

Barring any future activity with the WSC-3(V), this report will be archived next year, 2000.

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