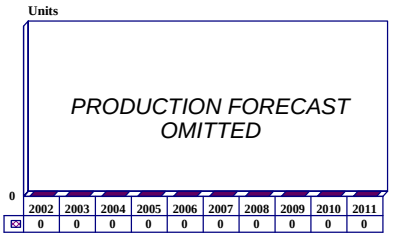
HAVE QUICK II/IIA - Archived 04/2003

Outlook

- HAVE QUICK has become a standard in most modern radios
- JTRS to include HAVE QUICK waveform
- Due to the end of specific R&D funding and the extensive use of HAVE QUICK in a large variety of radio systems, this report will be archived in 2003

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. Anti-jamming capability for UHF communications.

Sponsor

US Air Force
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Contractors

The Boeing Company
Information, Space, and Defense Systems Group
PO Box 3999
Seattle, Washington (WA) 98124
Tel: +1 206 773 2121
Web site: http://www.boeing.com
E-mail: www.mail.boeing@pss.boeing.com
(HAVE QUICK II radios for Boeing 767 AWACS aircraft)

BAE Systems
(formerly GEC-Marconi Electro-Optics Limited)
1601 Research Boulevard
Rockville, Maryland (MD) 20850
USA
Tel: +1 301 738 4000
Fax: +1 301 738 4643
Web site: http://www.baesystems.com
(Packager of HAVE QUICK II transceivers for UK Tornado F3 retrofit)

Raytheon Systems Company
1010 Production Road
Fort Wayne, Indiana (IN) 46808
USA
Tel: +1 219 429 6000
Fax: +1 219 429 4442
Web site: http://www.raytheon.com
E-mail: Query form available through Web site
(Prime: ARC-164, ARC-187; MXF-400 family; URC-126 development)

Rockwell Collins
Collins Avionics & Communications Division
350 Collins Road NE
Cedar Rapids, Iowa (IA) 52498
USA
Tel: +1 319 395 1000
Fax: +1 319 395 4777
Web site: http://www.rockwellcollins.com
E-mail: collins@collins.rockwell.com
(Prime: GRC-171, ARC-210)

Licensee

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Northfields, Market Deeping
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Tel: +44 1778 34 54 34
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Web site: http://www.parkair.co.uk
(Upgrade of UK Royal Air Force ADGE)

Status. HAVE QUICK II radios are currently in production. The original HAVE QUICK I waveform is no longer in use.

Total Produced. Because HAVE QUICK has been integrated into several systems, it is nearly impossible to obtain an accurate estimate of units produced. However, it is suspected that approximately 70,000 HAVE QUICK-capable units had been produced through 2001.

Application. Communications sets that feature HAVE QUICK II capability, either as an internal modification or with the addition of an external appliqué, include the ARC-164, PRC-113, ARC-171, ARC-187, ARC-210, ARC-171, GRC-206, MXF-400 series, PSC-5, TRC-176, WSC-3, and VRC-83.

Price Range. HAVE QUICK II is distributed over a variety of radios, which have diverse unit prices. As an example of a particularly active program, the unit price of the ARC-210(V) is about US$38,700 in 1998 dollars.

Technical Data

Design Features. The design of HAVE QUICK II differs according to the radio on which it is used. A radio can become HAVE QUICK II-capable either through internal modification or with the addition of an external appliqué. Some systems that have been provided with this capability include the ARC-164, PRC-113 (with ARC-164 forms PACER SPEAK project), ARC-171, ARC-187, ARC-204, ARC-210, GRC-171, GRC-206, TRC-176, MXF-430, MXF-440, MXF-450, MXF-460, PSC-5, WSC-3, and VRC-83 radios.

Operational Characteristics

HAVE QUICK II. Under normal conditions, the HAVE QUICK II radio can be operated in the usual manner, which allows it to use any one of 7,000 discrete UHF frequencies. However, if communications jamming is encountered, the HAVE QUICK II radios have a frequency-hopping mode.

Frequency hopping entails random changes in a radio's frequency many times per second. This results in a counter to enemy jamming, since an adversary finds it very difficult to pinpoint what frequency is being used at any given time, and thus has no fix for his jamming signal.

A pattern of frequencies to be used on any given day is stored in every HAVE QUICK II radio. During a specific time period, all the radios in the same net must

use the same pattern of frequencies. To ensure coordination between all radios on a net, it is necessary to have an accurate master clock to control the times when each frequency pattern is used, and all sets in the net have to be synchronized to this clock. A UHF radio link uses a time distribution and maintenance system for time coordination. Although any time standard can be used within a net, Universal Coordinated Time was selected to facilitate interservice and NATO use of the system.

HAVE QUICK IIA. According to the US Air Force, the HAVE QUICK IIA offers an increase in the number of frequencies over which the systems can hop, an increase in modulation factor, expansion of time dissemination methods, an increase in the number of preset frequencies, and provisions for multiple and automatic word-of-the-day entry (new control head). In addition, new software has been incorporated to optimize the performance of co-site multiple radios operating on the same platform.

Other improvements include greater output power, which has been raised to 20 watts, a significantly higher frequency-hopping rate, the ability to synchronize frequency hopping directly from an onboard NAVSTAR GPS receiver, and internal COMSEC capability that does not rely on a ground station.

Variants/Upgrades

GRC-171B(V)4. The US Air Force contracted with Rockwell Collins to produce the GRC-171B(V)4 radio incorporating HAVE QUICK II capabilities for its GRC-XXX requirement. The GRC-171B(V)4 high-performance UHF receiver-transmitter is designed for reliable air traffic control communications in normal or frequency-hopping modes at collocated VHF/UHF transmitter/receiver sites.

Rockwell was awarded a contract option for 564 GRC-171B(V)4 HAVE QUICK II radios in April 1992, valued at US$18.6 million. This marked the fourth option exercised under the production contract, bringing the total number of GRC-171B(V)4 radios to approximately 1,040 through 1993. A remaining option was to be exercised during May 1993 to procure 421 radios for the Marine Corps. In a separate action, the US Air Force awarded Rockwell a US$6.1 million contract for 260 GRC-171(V)1/(V)2/A(V)1 radios for delivery out to 1996.

URC-126. This is an improved Air Force UHF radio with HAVE QUICK IIA capability. For several years now, it has been under evaluation for production as the replacement for the ARC-164. The URC-126 was designed for universal applications – not for aircraft only, but for ground-based deployment as well. The radio was intended to offer a significantly higher frequency-hopping rate and to be able to synchronize frequency hopping directly from an onboard NAVSTAR GPS receiver. Magnavox (now Raytheon) was the prime contractor for the URC-126 program, with Harris, Motorola, and E-Systems (also now Raytheon) competing for the second-source slot. The Program Office had been validating a reprocurement data package for use in a competition in fall 1992, but this phase was placed on hold due to funding problems. There has been no change in the status of this program since that time.

HAVE QUICK Remote High-Power Amplifier. A remote high-power amplifier will operate with the HAVE QUICK IIA panel mount or remote mount radio, but will be a separate line replaceable unit (LRU) mounted in the avionics bay of US Air Force tactical fighter aircraft. It may also be used with ground-based HAVE QUICK IIA radios.

HAVE QUICK A-NET (ARC-204) and the E-3 AWACS. The ARC-204, or HAVE QUICK A-NET, is an anti-jam communications system designed for the E-3 AWACS to communicate with both ground and airborne forces. Each shipset consists of Group A (cabinets, modifications to cabinets, antennas, cables, wiring, and cooling ducts) and Group B components. Group B consists of 17 LRUs. These LRUs are two hybrid multicouplers, four receivers/filters, four receiver filter power supplies, four receiver exciter modules, two control indicators, and one radio frequency oscillator. Boeing Co is the prime contractor for the A-Net program.

In December 1997, Boeing announced that it had completed its Mod Block 1 contract to upgrade NATO's fleet of 17 E-3 AWACS aircraft. The contract, which covered new color displays, HAVE QUICK radios, and a version of JTIDS, had been awarded in 1993.

SATURN. The Second-Generation Anti-Jam Tactical UHF Radio for NATO (SATURN) program was a NATO-sponsored effort to develop a multinational anti-jam VHF/UHF radio covering the 225 MHz to 400 MHz band with a single unit. The HAVE QUICK IIA waveform was accepted by NATO as the basis for the UHF component of SATURN. A Standardized NATO Agreement (STANAG) for this system was signed by the US in 1990, and cooperation was multinational.

In early 1992, however, the US Air Force decided to withdraw from the project due to cost constraints. An

adjustment to the program allowed for the transfer of SATURN technology to NATO allies. The Air Force stated that it would adopt the SATURN standard once a HAVE QUICK IIA replacement is adopted.

MXF-400 family. These HAVE QUICK II UHF/VHF receiver-transmitters from Hughes (now Raytheon Systems Company) are of modular construction to allow assimilation of future modifications, such as software upgrades. The MXF-430 and PSC-5 are line-of-sight ground systems intended to replace the RT-1319 in the VRC-83 and GRC-206 (PSC-5 is upgradable to HAVE QUICK II capability). For airborne applications, the MXF-440 is to operate within the footprint of the ARC-187; the MXF-550 is form, fit, and functionally interchangeable with an RT-1504/ ARC-164 or RT-1614/ARC-164. All members of the MXF-400 family, including the -450 variant, adapt to their various platforms through interfaces proven on the ARC-164, ARC-187, ARC-222, and PACER SPEAK. SATURN anti-jam and SINCGARS were considered optional preprogrammed product improvements (P^3I) as of 1996.

Program Review

Background. The initial HAVE QUICK program began in 1977, with the rationale of providing a measure of voice communication security by a rapid modification of conventional UHF radios that possessed the capability to operate only on a single selected frequency that was neither jam-resistant nor secure. With the award of an initial development contract in December 1978, Magnavox was given the task of developing a frequency-hopping technique that could be added in the field to existing radios without requiring any changes in external dimensions. Production of the first HAVE QUICK radios began in December 1980.

After a study revealed a number of shortcomings in the HAVE QUICK I upgrade program, the Air Force chose HAVE QUICK II in 1982. The Air Force wished to keep HAVE QUICK in service for the long term, and this upgrade sought to extend the system's life by enhancing the jam resistance, increasing operational flexibility, and improving the man-machine interface. This made it easier to synchronize two or more HAVE QUICK II radios, since a more automated system using HF radios for long-distance links replaced the earlier, more cumbersome version for time-of-day information. The upgrade also featured additional frequencies, increased memory, software improvements, more power, and faster frequency hopping for enhanced jam-proofing. Additionally, software was made compatible with that of the E-3 AWACS aircraft.

The HAVE QUICK II full-scale development program began in May 1983, and Magnavox subsequently received a contract for initial software modifications. In June 1984, the company received another full-scale development contract for follow-on improvements. Production began in mid-1986, with follow-on upgrades beginning in late 1987.

Although originally envisioned as an interim solution, HAVE QUICK has continued to evolve into the present HAVE QUICK II/IIA program. Production of HAVE QUICK II upgrade kits was completed at about 15,000 units. In addition, the HAVE QUICK II configuration was introduced to the production line for the ARC-164(V) airborne UHF radio. While the US Air Force had procured a modification kit to bring older radios up to the new HAVE QUICK II standard, the service initiated plans to develop three new HAVE QUICK IIA radios to meet its requirements: the URC-126, the GRC-XXX, and the VRC-XXX.

The original procurement requirements of the Air Force for the URC-126 were put at 8,000 to 12,000 units over a six- to 10-year period beginning in FY93. To meet this requirement, the service sought to select a second source to Magnavox for the URC-126. Motorola, Harris, and E-Systems were contracted to deliver two URC-126 prototypes built from government-furnished parts in order to qualify the data package drawings. The Air Force had planned to award Magnavox a contract in 1990 for the first 300 URC-126 radios, but this was delayed indefinitely as the service moved to redefine its acquisition plans for the new radio.

Now, all of the US Armed Forces have shifted their attention to the Joint Tactical Radio System (JTRS) program: a program designed to manufacture standardized open-architecture, software-programmable communication devices. The radios developed under this program will include, among others, the HAVE QUICK II waveform. In June 2002, the Boeing JTRS Team, which includes Boeing, TRW, BAE Systems, Harris Corporation, and Rockwell Collins, was awarded the contract for the development and production of JTRS devices. Low-rate initial production of JTRS radios is expected to begin circa 2005.

Funding

Much like SPEAKEASY, HAVE QUICK technology is not specifically identified in current funding documents. Future HAVE QUICK funding is believed to fall under developmental programs of the Joint Tactical Radio System (JTRS).

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Raytheon	5.75	Apr 2000 – Four-year contract to provide two vehicles and 227 manpack HAVE QUICK IIs equipped Multi-Band Multi-Mission Radios.
Rockwell Collins	N/A	Jul 2000 – Contract for the installation of HAVE QUICK II-equipped ARC-210 radios in British Lynx Mk 8 helicopters.
Boeing	558.2	Mar 2001 – Contract awarded for the upgrade of 80 CF-18 Hornet fighter aircraft. A main component of this contract is the installation of Rockwell Collins ARC-210 HAVE QUICK II radios. Work will begin in January 2003 and end in April 2006.

Timetable

Month	Year	Major Development
	1977	HAVE QUICK program begun
Dec	1978	Magnavox awarded initial development contract
Dec	1980	First production HAVE QUICK radios
Dec	1982	US Air Force endorses HAVE QUICK II improvements program
May	1983	Full-scale development of HAVE QUICK II improvements
	1985	Production of expanded memory board for airborne version; procurement of HAVE QUICK II-equipped radios for additional ground and air platforms
Mid	1986	Production of HAVE QUICK improvements
	1987	Development of timing interface; development of new control head on F-15; HAVE QUICK security update
Aug	1989	Development of HAVE QUICK IIA vehicular radio (VRC-XXX) initiated
Mar	1992	Air Force cancels SATURN involvement
Fall	1992	US Air Force HAVE QUICK IIA procurement suspended
FY	1993	US funding for HAVE QUICK program reduced to cover only limited development and software support
FY	2001	Last currently scheduled year of funding for anti-jam radio RDT&E

Worldwide Distribution

HAVE QUICK II is deployed as an ECCM modification to several airborne and ground-based communication sets. It has been procured by all the **US** services. The list of verified international users of HAVE QUICK II equipment includes **Australia**, **Finland**, **France**, **Italy**, **Japan**, **Malaysia**, **Spain**, **Switzerland**, **Thailand**, **Turkey**, and the **UK**.

Forecast Rationale

HAVE QUICK is not a particular radio, but rather a frequency-hopping, anti-jamming technology utilized as an electronic counter-countermeasures (ECCM) modification for a variety of airborne and ground UHF radio systems. Since its development in the late 1970s, it has been successfully applied to several models of military radios. It is estimated that this technology has been embedded in over 70,000 radio sets.

Currently, the US Armed Forces are developing the Joint Tactical Radio System (JTRS) program, which is intended to produce standardized open-architecture, software-programmable communication devices. In order to communicate with existing systems during its implementation period, specifications for the JTRS call for HAVE QUICK I and II technology to be included in radios built under this program.

In June 2002, the Boeing JTRS Team was awarded the contract for the development and production of JTRS devices. Low-rate initial production of JTRS radios is expected to begin circa 2005. JTRS radios will likely replace most, if not all, radios currently in US military service. Since procurement and full integration of JTRS will not begin for several more years, HAVE QUICK will remain a standard UHF anti-jamming feature on several radio systems throughout the forecast period.

Because HAVE QUICK technology has been incorporated into a large variety of radios, it has become virtually impossible to accurately forecast production of HAVE QUICK-compliant units. As such, the forecast chart has been omitted. The omission does not imply that HAVE QUICK is an obsolete concept, but points to the inability to summarize HAVE QUICK incorporation with any degree of accuracy. For this reason, the HAVE QUICK II/IIA report will be archived in 2003.

Ten-Year Outlook

Due to the many variations of HAVE QUICK technology and the countless systems incorporating said measures, the forecast chart has been omitted.

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