ARCHIVED REPORT

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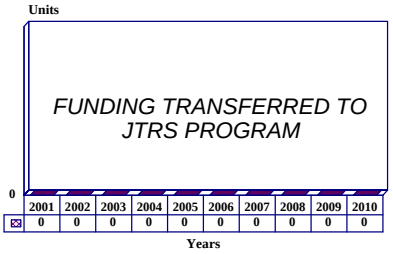
Multiband Multimode Radio (SPEAKEASY) – Archived 09/2002

Outlook

- The SPEAKEASY program has been incorporated into the Joint Tactical Radio System (JTRS) program
- This report will be archived in 2002

10 Year Unit Production Forecast
2001 - 2010



Orientation

Description. The Multiband Multimode Radio (MBMMR) program was part of the SPEAKEASY tri-service radio communications system. Both are now incorporated in the Joint Tactical Radio System (JTRS). Please refer to JTRS report for additional information.

Sponsor
US Air Force
Rome Laboratory
Griffiss AFB, New York (NY)
USA

Contractors
Motorola Inc
Government Electronics Group
8201 East McDowell Road
PO Box 1517
Scottsdale, Arizona (AZ) USA 85252
USA
Tel: +1 602 441 3033
Fax: +1 602 441 8834
Web site: http://www.motorola.com
E-mail: cdp051@email.mot.com
(Prime contractor Phase II Development)

BAE Systems North America Incorporated
(formerly Sanders)
1601 Research Blvd
Rockville, Maryland (MD) USA
Tel: + 301 838 6000
Web site: http://www.na.baesystems.com/
(Prime contractor Phase II Development)

Status. Phase II development completed. SPEAKEASY specifications have been transferred to the JTRS program.

Total Produced. A small number of development MBMMR models were produced.

Application. This program, aimed at providing a tri-service compact radio system that is software reconfigurable, has been transferred to the JTRS program.

Price Range. Since no individual production model has been developed from this program, it is not possible to ascertain an estimated price per unit.

Technical Data

SPEAKEASY	Phase I	Phase II, Model Year 1 DAM
Waveforms	AM, FM, HF, VHF: SINCGARS, UHF: HQ 1&2	FM, HF, VHF: SINCGARS, UHF: HQ I & II, UHF: SATCOM (25 kHz) GPS
RF	Ad Hoc Power Output: 1 milli-Watt (0 dBm) Frequency: 4 MHz - 400 MHz	Integrated Power Output: 2 Watts (33 dBm) Frequency: 4 MHz - 450 MHz
Internetworking	No capability	Internet Protocol Suite (4 Protocols) over Ethernet (802.3)
MMI	Sparc workstation with X-windows. GUI: hard-coded, non-modular. No remote	Pentium Laptop with Win 95. GUI: modular, object-oriented design. Remote Head with laptop display and stylus mouse
INFOSEC	CYPRIS not used. TRANSEC provided by ASICs	CYPRIS context switching: TRANSEC plus clear text bypass
Modem	Quad C40 VME cards developed for SPEAKEASY	Dual C44 PCI cards (COTS) plus CHAMPS (FPGAs)
I/O	Voice only	Voice and data
Size	6 ft, 24 inch rack (25.8 cubic ft) 6" x 2" x 2"	Small "carry-on" suitcase 11" x 1" x 2"
Weight	300 lb including Sparc workstation MMI	85 lb including laptop MMI, and RF amplifiers
Power Consumption	3300 watts	420 watts
Reliability	20 hours	500 hours (estimated)
Computer Bus	VME plus unique high-speed bus	PCI plus ISA
Computer Modules	Special-purpose hardware. Custom 12U VME cards	Mostly COTS: Pentium PC Motherboards with COTS PCI cards

Design Features. Phase I of the SPEAKEASY/ MBMMR program focused on the development of a powerful digital signal processor, coding of selected waveforms, and demonstration of the concept of a software-programmable modular radio system. During the past years, in anticipation of an Advanced Technology Demonstration (ATD), this program focused on the development of the modules of a system that is both software-programmable and modular. The ATD was to culminate in the development of a software-reconfigurable multipurpose radio that would, with the exception of some frequency-unique components, emulate many modes and functions of various frequency bands currently requiring individual radio systems.

large portion of the radio would consist of replicated modules which would be increased in number to permit more complicated waveforms to be processed. The modular architecture of the concept system was designed extend the lifespan of the radio system.

SPEAKEASY subsystems are composed of the antenna assembly; frequency conversion, filtering and amplification; specialized high-speed digital preprocessing and general-purpose digital signal processing elements in the receive section; waveform synthesis in the transmit portion, voice/data interface; terminal control; man/ machine interface; power; and a clock. Transmission and message security are embedded. The multiband high-grain antenna subsystem has a low profile and

incorporates other features to enhance its survivability. The frequency conversion, filtering and applications subsystem acts as the interface between the analog antenna and the digital signal processing. These multiband analog components were designed to be small in size and low in weight, and to be resistant to the co-site and inter-site interference that currently infest multiple-radio deployments.

Variants/Upgrades

There are no variants or upgrades due to the developmental nature of the program. Future development will take place under the Joint Tactical Radio System program.

Program Review

Background. A clear need for standardized inter-operable communications equipment, with a low probability of intercept and a high resistance to jamming or interference, was evident during Operation Desert Storm in the Persian Gulf. Fortunately, the US Department of Defense (DoD) had had the foresight to address the issue several years earlier. Congress established the Balanced Technology Initiative (BTI) in FY87 to speed the application of advanced technologies in order to correct gaps in the US Armed Forces conventional warfighting capabilities.

A Proof of Concept program for SPEAKEASY was initiated in 1990, with contract awards going to Hazeltine Corporation, TRW, Lockheed Martin, Motorola and Rockwell Collins. From this first phase of the program, a few prototypes were built that had two programmable channels and used VME bus architecture. These models were demonstrated at wargames held at Hanscom AFB, Massachusetts, in September 1995.

As part of the SPEAKEASY Phase II development program, Motorola was awarded a US$26.8 million contract in June 1995 to develop a radio that could transmit and receive sophisticated data (such as video), in addition to voice transmitted by traditional analog radios. Motorola was to refine the radio open system architecture, enhance the RF design and reduce its size.

Motorola led an industry team that consisted of ITT and Lockheed Martin's Sanders unit. The team also built prototypes allowing for customer feedback which were used to modify successive models. At least six advanced development models of the radio were expected to be constructed.

SPEAKEASY was supposed to be transferred to its own program element in FY94; however, by FY96 it was still being funded through major technology research programs, this time in PE#0603226E Experimental Evaluation of Major Innovative Technologies, Project EE-21 Advanced Land Systems.

Throughout FY95, SPEAKEASY focused on the development of an advanced system that featured full electronic reprogrammability to achieve interoperability with existing military radios.

In FY97/98, funding continued to be provided to the overall SPEAKEASY program primarily from the US Air Force. During these years, the SPEAKEASY Phase II Model 1-1 was demonstrated in support of the 11th Air Support Operations Squadron (ASOS) Tactical Air Control Party (TACP) during the US Army Task Force XXI Advanced Warfighting Experiment (AWE). The system was validated for use on HF, VHF, and UHF-bands operating in single-sideband, amplitude-modulated, frequency-modulated, SINCGARS, and HAVE QUICK (hopping and non-hopping) modes. The system also demonstrated the benefits of using an advanced radio-frequency (with co-site mitigation) and smart radio functions in field tests.

The push for the Joint Tactical Radio System (JTRS) began in FY99. The JTRS program incorporated SPEAKEASY technology, as well as a variety of advanced waveforms. While JTRS meant the end of SPEAKEASY as a separate program, it will continue to serve the advancement of SPEAKEASY technology. Please refer to the JTRS report for additional information.

Funding

MBMMR and SPEAKEASY funding has been rolled into the JTRS program. Please refer to the JTRS report for additional information.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Motorola	29.0	Jun 1995 – CPAF contract for development of the SPEAKEASY Phase II Multiband Multimode Military Radio. Contract completed July 1999. (F30602-95-C-0026)

Timetable

Month	Year	Major Development
Mar	1993	Basic program concept demonstration
Nov	1994	BTI technology demonstration
Mar	1996	Phase II Preliminary Design Review
Mar	1997	Phase II Critical Design Review demonstration
	1997	Phase I full-scale development
FY	98/99	SPEAKEASY transferred to the Programmable Modular Communications System (PMCS) Architecture
Aug	1999	Phase II demonstration and testing

Worldwide Distribution

MBMMR/SPEAKEASY was a US Department of Defense ARPA advanced-technology development program that led to the development of the Joint Tactical Radio System. The JTRS will be fielded by all branches of the **US Armed Forces**.

On the international front, SPEAKEASY technology is being used as the baseline for an R&D program initiated by **NATO**. The primary countries involved include the **US**, **UK**, **Germany** and **France**.

Forecast Rationale

The US SPEAKEASY program was established for the development of a software programmable radio intended for use by all branches of the US military. Utilizing an open systems architecture, SPEAKEASY employed software designed to handle a variety of waveforms, including UHF HAVE QUICK, VHF, SINCGARS, HF, UHF Satcom, VHF AM, and VHF FM.

In 1990, the SPEAKEASY program was initiated with the award of proof-of-concept contracts to five companies. A second phase of SPEAKEASY commenced in 1995 when Motorola and Sanders (now BAE Systems North American) won contracts to refine the open systems architecture of the Phase I prototypes, enhance the RF design, and reduce the radio's size. This stage culminated in the development of SPEAKEASY Phase II Advanced Development Models, which successfully completed operational tests in 1997 at the Task Force XXI Advanced Warfighter Experiment conducted at Fort Irwin, California. The open systems architecture of the SPEAKEASY Phase II Advanced Development Models allowed for the extensive use of COTS boards and modules. Approximately 70 percent of these models were composed of COTS items.

By the late 1990s the SPEAKEASY program had been absorbed by a new and more encompassing program titled the Joint Tactical Radio System (JTRS) project. In September 1997, the US Undersecretary of Defense signed a Decision Memorandum officially creating the JTRS program, which is intended to standardize radio communications throughout all branches of the US military. The JTRS program will incorporate every waveform and network protocol required by the US military. Once fully developed, this program is likely to replace most, if not all, radios currently in US military service.

Three consortiums were established in February 1999 to design architecture for the Joint Tactical Radio System. The US Army awarded cost-sharing agreements (valued at US$1.5 million) to the Boeing Company Consortium, the Raytheon Consortium, and the Motorola Consortium, the latter being a major player in the development of SPEAKEASY technology. Although the SPEAKEASY program no longer exists as a single entity, it is considered to be one of the vital building blocks of the JTRS program. Because SPEAKEASY is not specified in any budget activity, this report will be archived in the near future. For up-to-date information on the standardization of US military radio communications, please refer to Forecast International's report on the Joint Tactical Radio System (JTRS).

Ten-Year Outlook

The forecast chart has been omitted, as SPEAKEASY funding/production has been transferred to the JTRS program.

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