

# ARCHIVED REPORT

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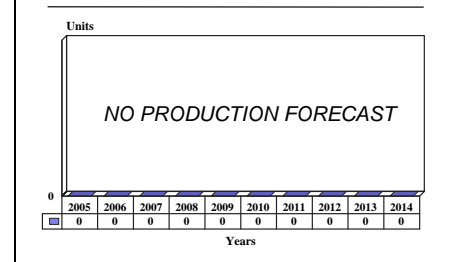
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## TPX-46(V) - Archived 6/2005

### Outlook

- Production has apparently stopped for this system

10 Year Unit Production Forecast  
2005 - 2014



### Orientation

**Description.** Identification Friend or Foe (IFF) interrogator set. The TPX-46(V)1 - (V)6 were used primarily by the HAWK and NIKE-Hercules air defense missile systems, while the TPX-46(V)7 is used exclusively on the Patriot air defense system.

#### Sponsor

U.S. Army  
Communications and Electronics Command  
Ft Monmouth, New Jersey (NJ)  
USA  
Web site: [www.as.na.baesystems.com](http://www.as.na.baesystems.com)

#### Status

TPX-46(V)1 - (V)6: In service; production believed to have ended in 1999.

TPX-46(V)7: In service.

#### Total Produced

TPX-46(V)1 - (V)6: An estimated 579 systems were procured through 2000.

TPX-46(V)7: An estimated 149 systems were procured through 2003.

**Application.** The TPX-46(V) is the U.S. standard IFF for Patriot and HAWK missile systems. It is also compatible with most versions of the FPS and TPS radar sets. The TPX-46 represents the ground portion of the Mk XII IFF system.

**Price Range.** Based on estimates from limited contract information, about \$435,000 per unit (2003 dollars).

### Contractors

BAE Systems North America - Information & Electronic Systems, Advanced Systems Division, <http://www.cnir.na.baesystems.com>, One Hazeltine Way, Greenlawn, NY 11740-1600 United States, Tel: 1 (631) 261-7000, Email: [communications.Washington@baesystems.com](mailto:communications.Washington@baesystems.com), Prime

### Technical Data

	<u>Metric</u>	<u>U.S.</u>
<b>Dimensions</b>		
Antenna (AS-2167)		
Length	223.5 cm	88 in
Diameter	38.1 cm	15 in

**Dimensions** (continued)

Height	64.8 cm	25.5 in
Weight	22.7 kg	50 lb
Receiver frequency	1090 +/- 3 MHz	
Transmitting frequency	1030 +/- 0.2 MHz	
Sensitivity	-80 dBm	
Range	200 nautical miles minimum	
Power input	115 volts ac +/- 10% 60 or 400 Hz	
Peak power	2,000 or 1,000 W (selectable)	
Vibration	MIL-STD-810B	
Shock	MIL-STD-810B	
Rainfall	MIL-STD-810B	
Wind load	Up to 75 mph (127 km/h)	

**Design Specifications.** The receiving frequency for the TPX-46(V) is 1090 MHz; the transmitting frequency is 1030 MHz. Sensitivity is -80 dBm, with a selectable peak power of 1,000 or 2,000 watts. The interrogator consists of four basic operating units: the receiver-transmitter, the coder-decoder group, the control box, and the antenna group.

The TPX-46(V) operates in modes 1, 2, 3A, C, and the additional AIMS mode, and can also provide unique Plan Position Indicator (PPI) symbology for identification-of-position and emergency replies. Defruiting provides a clean display. The antenna's 7 foot array is capable of a beamwidth of 5.5 degrees nominal – an unprecedented design feat accomplished through sum-and-difference antenna pattern techniques that provide interrogator sidelobe suppression (ISLS) and receiver sidelobe suppression (RSLS).

The complete TPX-76(V) system consists of the OR-85 receiver transmitter, OX-7 coder decoder group, C-7570 control, interrogator set, AB-1076 antenna pedestal, AS-2167 antenna, and BZ-162 alarm monitor.

**Operational Characteristics.** An easily transportable ground IFF (secondary surveillance radar) interrogator, the TPX-46(V) interrogates radar targets and, when the aircraft replies correctly, identifies aircraft for display on the associated radar PPI. The interrogator also has the ability, when its associated radar has been disabled

(except for the PPI and its power supplies), to generate its own main trigger; to rotate its own antenna, producing antenna synchronizing signals; and to display IFF replies from suitably equipped aircraft on the radar indicator. Even when subjected to environmental extremes, the interrogator antenna can synchronize with the radar antenna at speeds up to 25 rpm. In addition, the interrogator transmitter power can be reduced, making it suitable for use with Ground Control Approach (GCA) radar systems.

The TPX-46(V) is easy to maintain. Self-test circuits automatically check the operating status of the various assemblies. Mean time to repair (MTTR), or the time it takes to replace assemblies or modules in accordance with automatic self-test procedures, is only 15 minutes. Mean time between failures (MTBF) for the interrogator group is about 800 hours. A solid-state transmitter module became available as a direct replacement for the original electron-tube version, resulting in an even greater reduction in labor and maintenance costs.

**Note:** *It has been assumed for the purposes of this report that all Patriot missile batteries will follow the U.S. requirement of six launchers/fire control radars being commanded by a single, integrated command center where the TPX-46(V)7 is installed.*

## Variants/Upgrades

While technical details are not available, identified variants of the TPX-46 family are as follows:

TPX-46  
 TPX-46(V)1 - (V)6  
 TPX-46(V)7  
 TPX-46A

TPX-46A(V)1 - (V)6  
 TPX-46A(V)7

The TPX-46(V)7 version is the one used for the Patriot missile system. The manufacturer reportedly does not provide the antenna.

## Program Review

**Background.** Hazeltine (now BAE Systems Advanced Systems) was awarded the initial development contracts

for the TPX-46(V) in the mid-1960s. The system was first deployed as a general-purpose interrogator for the

ground element of the Mk XII IFF system. The U.S. Army deployed it with its HAWK and Improved HAWK anti-aircraft missile batteries throughout the 1970s.

With the end of all fabrication of HAWK missiles (save for modifications and upgrades), the main application of the TPX-46(V) is now the MIM-104 Patriot, the U.S. Army air defense missile system that received the lion's share of publicity among U.S.-deployed weapons in Operation Desert Storm in 1990-1991. Until late 1991, Hazeltine was completing small orders for the TPX-46A(V)7, while maintaining spares production.

By the late 1990s the Patriot was still the U.S. Army's main long-range air defense system. The TPX-46(V)7 interrogator had received a temporary lease on life with the signing of two Patriot contracts that should keep the system in production through at least 2005.

The first contract, signed at the end of 1998, was for the delivery of six Patriot batteries at an inferred rate of one battery per year from 1999 through 2004. The second contract was awarded by Egypt in March 1999 to acquire Patriot in order to begin modernizing its antiquated air defense system. This contract calls for the delivery of approximately six batteries at the

assumed rate of one battery per year from 2000 through 2005.

In early 2000, two other countries were also considering the purchase of the Patriot system. Turkey was considering the purchase of up to 12 batteries to replace its aging HAWK systems. South Korea, while being offered the Russian S300, was said to be leaning heavily toward Patriot because of the ease with which that system can be integrated. The main Russian advantage was that the systems would be given to South Korea to pay off a US\$1 billion loan that the Russians received in the 1980s.

One of the more recent Patriot orders was the December 2000 US\$104 million contract from the U.S. Army. Military analysts believe that the popular air defense system could be in active duty until 2025.

By late 2000, Hazeltine had been acquired by BAE Systems North America.

With the advent of the upgraded Patriot, Raytheon's PAC 2 GEM+, and Lockheed Martin's PAC 3, it would appear that the TPX-46 had become outdated by the end of 2002. There has been no new mention of the system in public sources since the late 1990s.

## Funding

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It is believed that U.S. DoD procurement funding for the TPX-46(V) has ceased.

## Recent Contracts

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There have been no recent contracts identified through public sources.

## Timetable

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1967	TPX-46 introduced
	1975	TPX-46 chosen for Patriot system
Jan	1983	Hazeltine receives US\$2.5 million contract for component modernization and technical improvements to system
	1984	Efforts made to increase jamming resistance and replace obsolescent circuitry
	FY85	Testing of Mk XII TIP A equipment in Patriot AD system completed
	1990	Last publicized production orders for TPX-46(V) completed
	1992	U.S. completes procurement of new-production Patriot missiles
Thru	1990s	Production of TPX-46(V) continues at low level
	1998	Greek order for six TPX-46(V)7 systems to equip Patriot batteries
	1999	Egyptian order for six TPX-46(V)7 systems to equip Patriot batteries
	2000	BAE Systems North America acquires Hazeltine
	2004	Full-scale production of PAC 3 Patriot missile to begin
	2005	Likely end of TPX-46(V)7 production

## Worldwide Distribution

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Actual distribution figures for the TPX-46(V) are unavailable, but customers of the Patriot and HAWK missiles are the likeliest recipients. Outside of the **U.S. Army** and **Marine Corps**, customers of the TPX-46(V) *may* include any of the following:

**Patriot – Egypt, Germany, Greece, Netherlands, Israel, Japan, Kuwait, Saudi Arabia**

**HAWK – Bahrain, Belgium, China, Denmark, Egypt, France, Germany, Greece, Iran, Israel, Italy, Japan, Jordan, Kuwait, Netherlands, Norway, Saudi Arabia, Singapore, South Korea, Spain, Sweden, Thailand, United Arab Emirates, U.K.**

## Forecast Rationale

The TPX-46(V) Identification Friend or Foe (IFF) interrogator set has been one of the main components of the older Patriot missile system for many years. However, no contracts have been made public through open sources for many years. Current MIM-104 customers may be relying on newer, more advanced IFF systems such as those produced by Thales Raytheon Systems. It is becoming more and more apparent that

the U.S. may no longer have a long-term need for the system for its own Patriot application. The latest version of the Patriot, the PAC 3, is now poised to completely replace older systems in the U.S.

In light of the probable end of production, and with the utter dearth of any useful information regarding ongoing sales, this report has been archived.

## Ten-Year Outlook

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Production has ended for this system.