ARCHIVED REPORT

For data and forecasts on current programs please visit

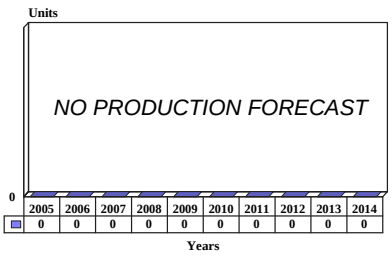
www.forecastinternational.com or call +1 203.426.0800

APX-101(V) - Archived 4/2006

Outlook

- In production with ongoing support
- Common IFF Digital Transponder (CPX) replaced several transponders
- Limited production ending

10 Year Unit Production Forecast
2005 - 2014



Orientation

Description. Identification Friend or Foe (IFF) radar transponder.

Sponsor
U.S. Air Force
Warner Robins Air Logistics Center
Robins AFB, Georgia (GA)
USA
Tel: +1 912 468 1001
Web site: http://www.robins.af.mil

Status. In low-level production for spares support.

Total Produced. Through 2004, an estimated 10,150 units had been produced.

Application. Mk XII radar transponder for various tactical aircraft.

Price Range. Estimated at $17,000 per set.

Contractors

Teledyne Technologies Incorporated, http://www.teledynetechnologies.com, 12333 West Olympic Blvd, Los Angeles, CA 90064 United States, Tel: 1 (310) 898-1600, Fax: 1 (310) 893-1669, Prime

Technical Data

	Metric	U.S.
Dimensions		
Weight	6.53 kg	14.4 lb
Dimensions	15.24 x 14.73 x 27.80 cm	6.0 x 5.8 x 10.82 in
Characteristics		
Frequency	1,030 MHz (interrogate) ±1.5 MHz 1,090 MHz (respond) ±1.5 MHz	
Power	500 W (min. @ 1% duty cycle)	
Bandwidth	-6 dB points >7 MHz	

	-60 dB points, < ±25 MHz
Sensitivity	-77 dBm
Dynamic range	> 50 dB
Reply rate	1,200 per second (for 15-Pulse-Coded Reply)
Modes	1, 2, 3A, 4, C
Characteristics (continued)	
Antennas	2
Transmitter	All solid state
Receiver	2-channel TRF
MTBF	1,200 hr

Design Specifications. The RT-1063/APX-101(V) solid-state radar transponder is a standard-dimension, internally mounted Single Line Replaceable Unit (SLRU). The solid-state system entirely consists of replaceable modules and can be mounted to an airframe without special shock mounts. It is a "Diversity Transponder" with an upper and lower antenna that provide nearly spherical coverage for interrogator reception.

The transmitter and dual-channel Tuned Radio Frequency receiver are a single LRU. A typical installation uses two antennas, with an interrogation reply automatically routed to the correct one. This prevents "shadowing" during maneuvering.

Stripline production and micro-electronics eliminate the need for RF coaxial cavities, while the solid-state design enhances reliability and reduces weight, size and power requirements. Crystal-controlled pulse-width discrimination, decoding and encoding ensure accurate responses to interrogations. Channel selection circuits control antenna selection, while built-in test circuits continually monitor and report equipment status for all modes.

The receiver input is isolated from the transmitter output by a diplexer. The RF signal is amplified and converted into video that uses video amplification and logarithmic compression to produce a wide dynamic range. The video processor performs sensitivity control, channel determination, ISLS (interrogation sidelobe suppression) rejection, and pulse-width discrimination. The output from each receiver is sent to the decoder for further processing.

Digital synthesis techniques ensure accuracy and stability in the coder/decoder functions of the APX-101(V). A crystal-controlled clock provides a timing reference for the pulse-width discriminator and commutator during coding and decoding. Timing accuracy is within ±10 nsec at the end of a Mode 3 Emergency reply. System jitter is less than 50 nsec.

The commutator, which normally operates as a decoder, receives the digital pulses from each video channel. These pulses are compared with the incoming pulses. When coincidence occurs, the decoded mode is stored and the channel that resulted in the decode is selected for reply. Pulses are then shifted to each code gate in succession to generate the code train reply. Each code gate is enabled by the code control in the mode that has been decoded. The commutator is reset as a decoder after the last pulse has been generated whether or not normal, I/P, or emergency conditions have been selected.

Suppression gates are generated to inhibit AIF decodes when an SLS (sidelobe suppression) pulse, a Mode 4 trigger, or external suppression occurs. They also inhibit SIF replies during Mode 4 replies and provide external suppression during SIF and Mode 4 replies.

The RF oscillator and high-power RF amplifier array provide full power at 1 percent duty cycle with a clean frequency spectrum. The high-efficiency design operates at a low voltage, generates negligible heat, and is unaffected by antenna Voltage-Standing Wave Ratio (VSWR).

Built-in Test supports in-flight, pre-flight and organizational maintenance. Circuits enable RF stimulation of the transponder in any SIF mode and evaluation of the RF reply whether stimulated internally or externally. Receiver frequency, receiver sensitivity, decoder accuracy, transmitter frequency, transmitter power, frame coder accuracy, and antenna VSWR are evaluated in a complete end-to-end test. Evaluation of an acceptable condition is performed and either a GO or a NO-GO signal is generated.

Operational Characteristics. The APX-101(V) is a typical military-capable IFF/SIF transponder. It receives coded electronic queries from ground and airborne radar systems and responds with a set code to identify the aircraft as friendly.

It operates in Modes 1, 2, 3/A, 4 and C altitude reporting capability. Mode A provides 4,096 discreet identification codes. The transponder uses an air data computer for Mode C and a transponder computer for Mode 4, and operates with Control Transponder Set C-6280(P)/APX.

Added codes establish the particular identity of the carrying aircraft. The Mode 4 military mode contains

additional, encrypted identification information for combat operations. Mode C operation provides altitude information from aircraft equipped with the appropriate altimeter decoders.

Variants/Upgrades

No variants or upgrades have been identified.

Program Review

Background. The APX-101(V) was built to NATO Mk XII IFF standard. Following its first foreign sale to Norway in 1986, the APX-101(V) was used on all F-15 and F-16 aircraft sold via Foreign Military Sales (FMS) until 1990. Egypt is the only exception, using a Soviet IFF system operating on a frequency of 675 MHz (0.6 GHz).

Historically, F-16s destined for Egypt had their APX-101(V)s removed and replaced by another Teledyne unit, the TEC-60, which was jointly designed by Egypt and Teledyne. The same set is believed to have been installed in Egypt's MiG-21s, Su-7s, F-4s and Mirage 5s.

In 1990, the APX-111(V), a combined interrogator/ transponder (CIT), began to replace the APX-101(V) on the F-16. Since then, other new transponders (APX-113/114(V), APX-117/118(V)) have replaced the APX-101(V) in many platforms.

The Air Force Materiel Command published a Sources Sought notice in July 2003 for potential sources with the expertise, capability, facilities, and experience to meet the requirements for depot repair of the RT-1063C/APX-101(V) IFF transponder.

Funding

No recent funding has been identified.

Recent Contracts

No contracts worth over $5 million have been recorded recently.

Timetable

Month	Year	Major Development
Early	1970s	Initial development
	1976	Full-scale production
	1986	First APX-101s sold for use on FMS F-15 and F-16 aircraft
	1998	Common IFF replacement search begins
	2004	Estimated end of production
	2005	Repair support continues

Worldwide Distribution

The APX-101 is known to be in service in 30 nations, including the applications listed below.

Bahrain. F-16C/D
Belgium. F-16A/B
Denmark. F-16A/B
Egypt. F-16A/B/C/D
Indonesia. F-16A/B
Israel. F-15A/B/C/D, F-16A/B/C/D
Greece. F-16G
Japan. F-15J
Morocco. F-16
Netherlands. F-16A/B
Norway. F-5A/B, F-16A/B
Pakistan. F-16A/B

Portugal. F-16
Saudi Arabia. F-5E/F, F-15C/D
Singapore. F-5E/F, F-16
South Korea. F-16
Spain. C-101EB
Switzerland. F-5E/F
Taiwan. F-16
Thailand. F-5E/F, F-16A/B
Turkey. F-16C/D
United States. USAF: A-10A, F-5E/F, F-15A/B/C/D/E, F-16A/B/C/D, KC-10A; USN: F-16N
Venezuela. F-16A/B

Forecast Rationale

The U.S. and many key allies have replaced the APX-101(V) with the APX-111(V) CIT. NATO F-16 MLU (Mid-Life Upgrade) operators chose it because their F-16s are employed as air superiority fighters, armed with beyond-visual-range air-to-air missiles, and need an interrogator capability to challenge unidentified aircraft. The APX-111(V) provides that capability, together with the transponder, in one space-saving unit. The APX-111(V) also provides Mode S capability.

APX-101(V) service has been stretched out, but newer technology and systems are being adopted. Systems such as the APX-101(V) will be kept in service with older aircraft, so spares support will continue.

Ten-Year Outlook

No further production beyond spares/repair support expected.

* * *