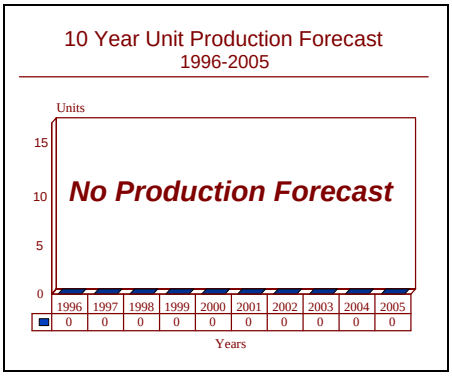
AXX-1 TCS - Archived 10/97

Outlook

- Production completed
- Focus for the remainder of the decade will be on spares support



Orientation

Description. Television camera set (TCS).

Sponsor
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Contractors
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Status. Production complete.

Total Produced. Through 1995, approximately 530 systems were produced.

Application. F-14A and F-14D.

Price Range. Approximately US$214,000 (FY91 dollars).

Technical Data

Design Specifications. The AXX-1 television camera set is a noncooperative recognition system used to visually identify aircraft at great distances. Although the AWG-9/APG-71 fire control radar (see separate report) can track targets over 100 miles away, the ability to locate such distant objects is meaningless without a positive identification of the approaching aircraft. Given the effectiveness of modern missile systems, if two opposing aircraft are close enough to see each other, chances are they are also close enough to destroy each other.

The primary objective of the TCS is to extend the visual range of the pilot, thereby allowing positive identification at greater distances. The telephoto capabilities of this camera's lenses greatly increase the pilot's sighting ability, acquiring targets up to 10 miles away.

The APG-71 radar, an updated AWG-9, when connected with the TCS, provides a highly capable sighting and tracking system. The radar first acquires a target at long range, and then the TCS enables the pilot to visually identify the potential threat while still out of visual range

of the opposing aircraft. Acquisition and tracking using the TCS system is automatic, as the coordinates are fed directly from the radar's digital processor. The system is noncooperative, passive, and unaffected by RF electronic countermeasures. Should the opposing aircraft incorporate electronic countermeasures (ECM) to jam the aircraft's radar, the pilot will still be able to visually track the target with the use of the TCS.

Operational Characteristics. The TCS operates in several modes:

1. Slave TCS to Radar. If not following its own target, it will follow whatever the radar is following.
2. Slave Radar to TCS. If the radar is not tracking a target, it will follow what the TCS is following.
3. Slave TCS to Computer. If the TCS is not following a target, it will follow computer coordinates.

The TCS, in addition to the above modes of operation, contains a number of target acquisition sequences:

1. Automatic Acquisition. TCS automatically detects and tracks a target after being cued to the target.
2. Automatic Search. TCS automatically searches and tracks a target after being cued to the vicinity of the target.
3. Manual Acquisition. The operator can manually control the TCS to initiate search and track.
4. Semiautomatic Acquisition. The operator manually directs the TCS to the target for detection and tracking.

The TCS is equipped with lenses to provide either a narrow field of view or wide field of view, and contains two separate television videocoms and two television lens systems. The television camera assembly weighs 56 pounds (26 kg). The control/power supply, which weighs 38 pounds (17 kg), is the interface between the TCS and the aircraft. It contains the power control, mode and sequence control, tracking control, and basic synchronization.

Mounting applications for the TCS vary. As applied to the F-14, the TCS can be mounted on the chin of the aircraft. Other available mounting areas include the leading edge of a wing or on a wing pylon.

Variants/Upgrades

Focal Plane Array for AXX-1. Northrop Corporation began operational prototype testing in late 1988 on the first focal plane array system to meet the size and weight restrictions for night vision equipment on the F-14, HAWK missile and other tactical items. Northrop has said the system provided a well-defined image of aircraft operating at night at ranges in excess of 10 miles in tests.

Northrop called the tests a milestone in the development of focal plane array technology and has validated the array's suitability for use in sensor systems such as the AXX-1 television camera set for the F-14A and the HAWK air defense missile's Tracking Adjunct System (TAS).

Northrop's focal plane array consists of over 16,000 sensors, each 1/1,000th of an inch square, arranged in a cluster that is linked to a microprocessor. Infrared radiation absorbed by the array is converted into a TV picture displayed on a cockpit or control center monitor. Among other benefits, the program enhances the AXX-1 television camera set to provide F-14A/D aircraft pilots with the maximum capabilities available to distinguish between friendly and enemy aircraft at greater distances.

On the F-14D, the AXX-1 shares a dual chin pod with the General Electric Infrared Search & Track (IRST). Grumman has been developing several technologies as possible candidates for continued upgrades for the F-14D including sensor fusion of the F-14D's APG-71 radar, IRST, and AXX-1 TCS to provide an enhanced target acquisition and tracking capability.

Program Review

Background. The TCS is an improved version of Northrop's earlier Target Identification System, Electro-Optical (TISEO). Approximately 500 TISEO units were manufactured for the Air Force and flown onboard F-4 aircraft. The AXX-1 was first developed in the early 1970s, and is now used solely on the USN F-14 Tomcat.

F-14 Upgrade. The US Navy had been planning to perform airframe upgrades to extend the service lives of 198 F-14A/B models, then following this with an upgrade of 157 A/Bs to the Block 1 Strike standard while also modifying 54 D models to the Block 1 configuration. The service's FY95 request was gutted, however, by the House, which has once again directed the Navy to instead upgrade its Ds with "F-15-E Strike Eagle" capabilities for the air-to-ground mission.

In its FY96 POM the Navy countered with a proposal to add little more than the precision-guided weapons capability to the Tomcats and, while the scope and

direction of future F-14 modifications thus remains to be determined, it appears increasingly likely that a compromise will be sought.

A congressional faction has been pressing the service to expand its F110 Tomcat re-engining efforts, but the Navy's claims of the lack of available funding has thus far precluded this.

Funding

US FUNDING

	FY92		FY93		FY94		FY95 (Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
Proc.	-	162.1	-	135.2	-	-	-	-
Modifications		228.1		195.5		115.5		158.3
RDT&E (PE#0205667N)		115.1		120.1		70.9		171.7
Total		505.3		450.8		186.4		330.0

All US$ are in millions.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Northrop	11.2	Mar 1991 - FFP contract award to produce 51 television camera sets and 47 spare control power supplies for the F-14 aircraft. (N00019-89-C-0037)

Timetable

Late	1970s	TCS originally developed
Aug	1983	First production TCS installed aboard Navy F-14 aircraft
	1987	Last of 555 F-14As delivered to Navy
	1990	Focal plane improvements initiated; Navy took deliveries of first F-14Ds
	1991	F-14D upgrade contract awarded
Jul	1992	Last manufactured F-14D delivered to Navy
	1993	F-14D deployment

Worldwide Distribution

Iran (Air Force) - 80 F-14As, of these, we estimate seven may still be flyable.

United States (Navy) - 637 F-14A/B/D aircraft have been procured through the beginning of FY94 (including F-14As upgraded to F-14D standards), of which 486 are estimated to have been equipped with the AXX-1 TCS.

As of December 1, 1994, the US Navy had a total of 397 F-14s left in its inventory.

Forecast Rationale

With the last production F-14D aircraft delivered to the US Navy in July 1992, and a 1991 spares order for 51 TCS sets and 47 control power supplies completed last year, the AXX-1 program has transitioned to a low-production spares activity as the system, as well as its platform, fade throughout the turn of the century. The only possible work for this program could be the manufacture of modification kits to upgrade existing AXX-1s with the new focal plane array capability. According to Northrop, the new IR focal plane array will give the system a nighttime capability and increase its daytime performance.

Nonetheless, with at least some F-14s earmarked to receive extensive electronics overhauls, the AXX-1's place in the fleet will continue to wane.

US Navy upgrade plans call for a portion of the Tomcat fleet to become dual-mission aircraft, an F/A-14 that will replace the aging A-6E Intruder by 1998. Improvements and modifications include the installation of a new, unspecified FLIR sensor and laser target designator/spot tracker; GPS-based inertial navigation system; ALE-50 chaff/flare dispenser; and a night vision-compatible cockpit. This emphasis on newer technology will likely edge the AXX-1 into retirement.

Ten-Year Outlook

With production complete, the AXX-1 program will focus on spares support for the remainder of the decade.

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