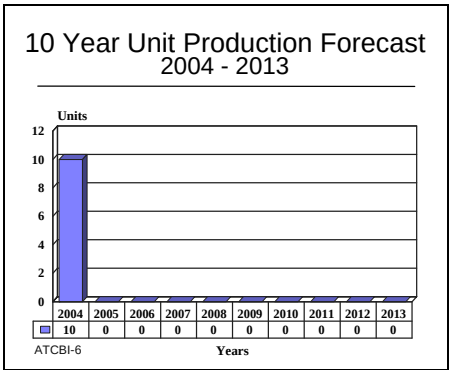
ATCBI-6 - Archived 8/2005

Outlook

- Enhanced Secondary Surveillance Radar Beacon System
- Mode S positional information and expanded data transfer
- Production nearing an end. Newer systems coming on line



Orientation

Description. The new Air Traffic Control Beacon Interrogator (ATCBI) will selectively interrogate aircraft equipped with Mode S transponders. It supports datalink services, including the Traffic Information Service (TIS). It can be equipped with the ability to gain the contents of the Ground Control Beacon Interrogator (GCBI) registers.

Sponsor

Department of Transportation (DoT)
Federal Aviation Administration (FAA)
AAT-1, Air Traffic Service
AAF-1, Airway Facilities Service
800 Independence Avenue, SW
Washington, DC 20591
USA
Tel: +1 202 267 3484
Web site: http://www.faa.gov
(Program Manager)

Status. In production, ongoing support.

Total Produced. Through 2003, an estimated 133 units had been produced.

Application. Air traffic control flight interrogator and data communications.

Price Range. Based on rough estimates, a site installation may run from US$900,000 to US$1.5 million.

Contractors

Cossor Electronics, http://www.cossor.com, The Pinnicles, Elizabeth Way, Harlow, Essex, CM19 5BB Tel: + 93 441279426826, Fax: + 93 4412794190413, Subcontractor

Technical Data

	Metric	U.S.
Characteristics		
Frequency	1,030 & 1,090 MHz	
Range	362 km	225 mi
Target capacity	1,400	

Design Features. The ATCBI-6 is a Cossor Condor Mark II Monopulse Secondary Surveillance Radar (MSSR) similar to those currently being supplied to the DoD and FAA as part of the ASR-11/Digital Airport Surveillance Radar (DASR) program, but with Mode S selective addressing capability added. It selectively interrogates Mode S-equipped aircraft and can add Traffic Information Service (TIS) and obtain the contents of Ground Control Beacon Interrogator (GCBI) registers.

Mode S improves the information exchange between aircraft and air traffic controllers by assigning each aircraft a unique communications code, allowing air traffic controllers to immediately know with which aircraft they are communicating. This makes it possible to exchange the most current weather data and facilitates the hand-off from one air traffic control (ATC) center to another.

The FAA Mode S system is all-solid-state. The Mode S Beacon System Sensor transmitter demodulator has a range of over 450 kilometers (243 nm). It selectively interrogates aircraft using the sensor's timing module to assure that responses do not overlap, eliminating transponder interference from closely spaced aircraft. ATCBI-6 has similar performance specifications.

A multi-channel monopulse receiver ensures accurate aircraft position data, even when used with existing aircraft transponders. Aircraft equipped with Mode S transponders have an integral digital two-way datalink that allows pilots to request and receive weather and other information directly without using crowded ATC voice channels.

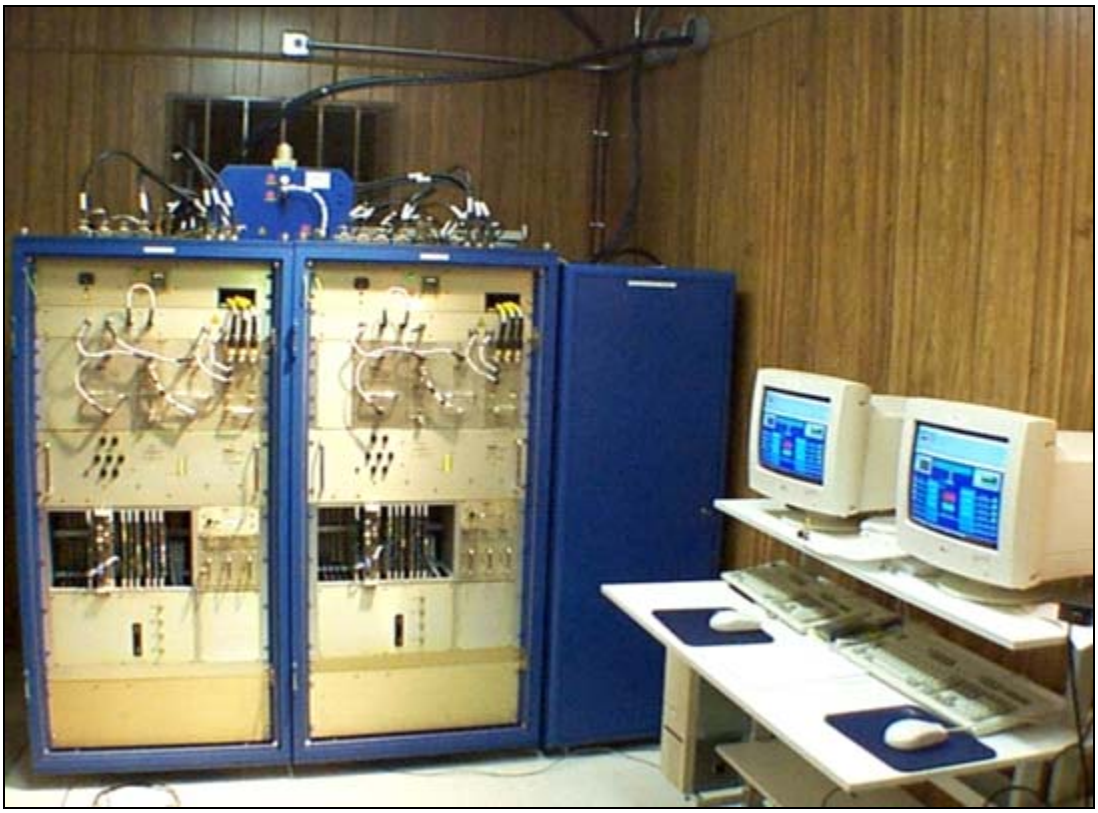
Using monopulse processing, Mode S determines the position of a given aircraft with a single reply, instead of multiple responses as older interrogators do. With selective interrogation, the availability of more than 16 million discrete identity codes permits the permanent assignment of a unique code to each aircraft, eliminating the problem of overlapping replies. Selective addressing makes it possible to use the built-in two-way digital data communications link for exchanging traffic, weather, and flight data either automatically or on demand between an aircraft and ATC. This relieves overburdened voice channels and improves the predictive accuracy of ATC computers.

Operational Characteristics. In addition to substantially reducing problems, Mode S improves surveillance by increasing the amount of information that ground controllers can get from a single aircraft reply. Improved accuracy and reliability directly enhance traffic flow by reducing spacing between aircraft and by providing more expeditious approach and departure routes. Discrete aircraft addressing and digital datalink communications make Mode S a key part of the mosaic of programs comprising the Capital Investment Plan to upgrade the ATC system. Mode S replaces the old Air Traffic Control Radar Beacon System (ATCRBS).

Mode S systems have been installed at 147 ATCB Interrogator sites and provide coverage to ground level around 108 major airports and down to 12,500 feet in selected other areas. Similar coverage will be provided by 129 ATCBI-6 systems at 150 or more sites currently equipped with older, non-Mode S hardware.

Variants/Upgrades

Certain ATCBI-6 installations may require site-specific modifications.



ATCBI-6

Source: Cossor Inc

Program Review

Background. Existing ATC Beacon Interrogators have exceeded their projected useful life. ATCBI-3 systems employ early 1960s-era vacuum technology and are well past their retirement date. ATCBI-4 systems use 1971 transistor logic technology and are at the end of their 20-year service projection. ATCBI-5 systems are 1976 integrated circuit systems and are also approaching the end of their planned lives. The FAA took action to extend secondary surveillance operations into the 21st century, supporting developments in data transfer/exchange techniques, such as Mode S.

Mode S is based on the Discrete Address Beacon System (DABS) conceived in 1969 as a three-phase development effort. Phase One began in 1972 and consisted of concept validation and system definition. The completed study confirmed that monopulse processing and discrete addressing had potential.

Phase Two, prototype engineering and system evaluation, took place between 1974 and 1976. Interface with the Automated Radar Terminal System (ARTS) and other subsystems of the (then) National Airspace Plan (NAS) plan was studied. System development contractors were selected, and three engineering models built and tested at the FAA's National Aviation Facilities Experimental Center (NAFEC) in Atlantic City, New Jersey.

Phase Three, operational trials, began in 1976, but system modifications interrupted this phase and stretched it out to 1982. By then, DABS had become known as Mode S and had been incorporated into the NAS plan.

By December 1991, contractor tests were completed and the first Mode S sensor delivered to the FAA Technical Center. Contractors acceptance tests were initiated and a Mode S sensor delivered to the Lincoln Laboratory for use in developing a parallel runway monitor capability. Mode S was installed at 144 terminal and en route sites.

In the mid-1990s, the FAA decided to replace existing ATCBI-3 systems by relocating 123 ATCBI-4/5s to selected sites and supporting these facilities until ATCBI-6 and ASR-11 equipment could be installed. All ATCBI-3 equipment would be disposed of.

In early 1998, the FAA selected two contractor teams, Lockheed Martin/Northrop Grumman and Raytheon Systems Company, to demonstrate and test a new

secondary radar system as part of the Air Traffic Control Beacon Interrogator (ATCBI-6) competition. The Lockheed Martin/Northrop Grumman team offered a new monopulse radar based on Mode S. Raytheon proposed that the MSSR system, with a selective addressing capability added, be installed as part of the ASR-11 Digital Airport Surveillance Radar (DASR) program.

Following the operational capabilities test on the competing systems, the FAA selected the Raytheon system on August 4, 1998, and awarded a contract potentially worth US$180 million to manufacture and install up to 152 ATCBI-6 systems. Both proposals offered low-risk solutions, but the commonality of the ATCBI-6 with the ASR-11 equipment being installed was considered an opportunity to reduce the life-cycle costs of the new equipment.

DT&E was completed in September 1999, and OT&E began in October 1999. Key site commissioning took place in April 2000.

The FY2000 Transportation Appropriations Bill funded ATCBI replacement at US$25 million, down from the budget request of US$45.4 million. Congress said that this would be sufficient to procure replacement interrogators at 25 facilities. Due to slips in the Standard Terminal Automation Replacement System (STARS) program, this number would allow the FAA to replace ATCBI at the most critical facilities and move forward at facilities where STARS equipment will be deployed.

FY2000 plans were to procure 50 production ATCBI-6 systems, install and test two preproduction systems, and conduct site surveys for 13 sites.

In FY01, the FAA planned to procure another 50 systems, along with 38 sets of spares. Additionally, site surveys were to be conducted and 15 production systems installed and tested.

Another 25+ systems were procured in FY02, including spares and test equipment. Site surveys and deliveries will continue from 2003 to 2006. The goal is to install up to three systems per month.

During 2003 and 2004, flight check and disposal of ATCBI-4/5 equipment will be a priority. In other efforts, interface development and testing will be completed, and 25 Mode S systems will be relocated to ASR-9 sites.

In August 2002, the FAA commissioned into service the first production ATCBI-6 system at Tinker AFB, Oklahoma. The Tinker system provides critical radar data to the newly commissioned FAA traffic control center at Fort Worth, Texas.

Funding

U.S. FUNDING

	FY03		FY04		FY05(Req)		FY06(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
Facilities & Equipment (FAA)								
ATCBI Replacement	-	28.0	-	25.0	-	-	-	-

Note: The FY03 program was reduced US$19.1 million.

All US$ are in millions.

Recent Contracts

(Contracts over US$5 million.)

Contractor	Award (US$ millions)	Date/Description
Raytheon	180.0	Aug 1998 – Contract to manufacture and install up to 152 Monopulse Secondary Surveillance Radars for the FAA ATCBI-6 replacement program. To be completed September 2004.

Timetable

Month	Year	Major Development
1Q	1993	Begin ATCRBS relocation
4Q	1994	ATCBI ORD approved

Month	Year	Major Development
2Q	1998	Contract award
Early	1999	Begin DT&E
3Q	1999	First ORD
Apr	1999	Last Mode S installation completed
Sep	1999	DT&E completed
Oct	1999	OT&E begun
	2000	Install/test two production systems
Apr	2000	Key site commissioning
	2001	Install/test 15 production systems, first commissioning
	2002-2005	Procure 25+ production systems, complete interface development and test
2Q	2005	Last ORD

Worldwide Distribution

This is currently a **U.S.**-only program.

Forecast Rationale

At terminal and en route sites, the FAA has 392 secondary surveillance radars, including 167 ATCBI-5s, 85 ATCBI-4s, and 140 ATCBI-3s, which are the oldest secondary surveillance radars in U.S. operation. Because of limitations in automated processing equipment, each radar can interrogate only up to 250 aircraft. One hundred and forty-four Mode S systems serve mid- and high-density sites. There is a pressing need to replace the antiquated ATCBI-3s, which use 1960s tube technology. ATCBI-6 is one of the ongoing efforts to upgrade the nation's air traffic control system.

For the upgrade, the FAA decided on commonality with the ongoing ASR-11 program instead of the completed Mode S effort. Both solutions were feasible, but long-term economics favored the Raytheon proposal.

The United Kingdom, Germany, and France are procuring Mode S interrogators, and the large international ATC manufacturers have configured equipment for easy conversion or upgrade to a Mode S capability. An export version of the ATCBI-6 may eventually find its way into the market.

The increasing application of GPS technology to air traffic control and other navigation areas can be extended to Mode S, changing the character of its function and implementation. Increasingly independent flight operations are contingent on aircraft being able to exchange significant amounts of relevant data among themselves. The idea that aircraft will use GPS alone to navigate and maintain safe separation is overly optimistic, and unlikely to become a reality. Radar and ground control will continue to be a major player in air traffic control for monitoring traffic as well as providing backup in emergencies.

The events of 9/11 renewed the FAA's and DoD's interest in raw radar data from the nation's radar system. There is heightened interest in making sure that all radars have an effective raw video track capability, and any plans to replace a primary radar with a secondary radar only may be scrapped or significantly modified. Money for aviation security will hit many of the FAA's efforts, but this is one that should be funded if a request is made. Being able to track a non-cooperative aircraft has taken on new importance.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level			Speculative			
Designation	Application	Thru 03	04	05	06	07	08	09	10	11	12	13	Total 04-13
ATCBI-6	SECONDARY SURVEILLANCE (FAA)	133	10	0	0	0	0	0	0	0	0	0	10