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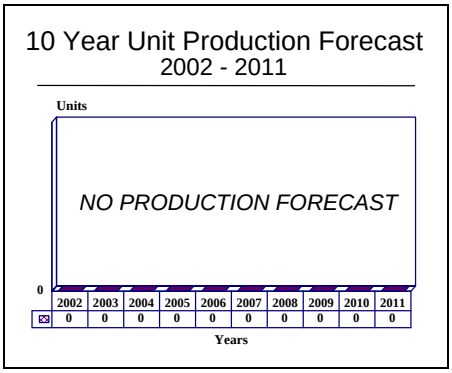
ASR-23SS - Archived 08/2003

Outlook

- Production complete
- Procured to meet special ATC needs
- On-going support continues



Orientation

Description. This is a solid-state, L-band surveillance radar tailored for the longer range requirements of the en-route air traffic control environment.

Sponsor
This was a company-sponsored development.

Contractors
Raytheon Systems Company
Sensors & Electronic Systems
Equipment Division
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Web site: http://www.raytheon.com

Status. In production, in service, ongoing support.

Total Produced. An estimated 55 ASR-9100 and ASR-23SS systems were produced for the Canadian RAMP upgrade and other users.

Application. Airspace surveillance for air traffic control.

Price Range. Estimated unit installation cost runs between US$3.2 and US$4.0 million, depending on setup and ancillary equipment, excluding buildings and power equipment.

Cost/price is estimated based on an analysis of contracting data, other available cost information, and a comparison with equivalent items. It represents the best-guess price of a typical system. Individual acquisitions may vary, depending on program factors.

Technical Data

	Metric	US
Characteristics		
Frequency		
Primary radar	1,250 to 1,350 MHz	
Secondary radar	1,030 & 1,090 MHz	
Range		
Primary radar		

	Metric	US
8 transmitter module sys	129 km	80 nm
16 transmitter module sys	290 km	180 nm
Secondary radar		
8 transmitter module sys	222 km	120 nm
16 transmitter module sys	354 km	220 nm
Characteristics (continued)		
Peak power (primary radar)	23 kW (8 transmitter modules) 46 kW (16 transmitter modules)	
Pulse width	1 and 100 µsec	
Pulse compression	100:1	
Antenna gain	36 dBi	
Antenna beamwidth	1.25°	
Antenna rotation	12/10 rpm (8 transmitter modules) 6/5 rpm (16 transmitter modules)	
Polarization	Linear and circular	
Clutter improvement factor	53 dB	
Track capacity	750	
Modes/features	Primary surveillance Monopulse secondary surveillance Full frequency diversity Digital pulse compression Dedicated six-level weather mapping Open architecture CFAR MTD with adaptive beam/STC maps	
Availability	>0.9999	
Critical MTBF	30,000 hr	

Design Features. The ASR-23SS L-band primary surveillance radar is an enhanced, low-cost derivative of the modular, all-solid-state ASR-9100 primary radar provided for the Canadian air-traffic-control system. It combines a solid-state L-band primary radar with a monopulse secondary surveillance radar (MSSR) to provide surveillance of the airspace surrounding light- to medium-traffic airports. Except for the power modules and antenna, it is similar to the ASR-10SS terminal surveillance radar in use around the world.

The radar uses high-power RF transistors in an eight- or 16-module configuration to provide two power and range capabilities. Digital-array signal processors operate in a VME environment, and single board computers host mature, supportable software written in the C high-order language (HOL). The coherent transmitter/receiver and digital processing provide good aircraft detection in adverse weather conditions, while the receiver/signal processor uses a redundant, dual-channel architecture. A separate weather channel and selectable circular polarization enhance weather performance and make more detailed information available to air traffic controllers. Digital pulse compression enhances stability and dedicated weather processing produces a six-level weather map.

The receiver features a four-, five-, or eight-pulse digital moving-target detector with adaptive Doppler filters and adaptive beam/STC maps. CFAR, binary integration, and adaptive thresholding are used for effective false-alarm control. Automatic plot extraction and scan-to-scan tracking is possible for up to 750 targets. The radar has 14-bit direct A/D conversion improved receiver dynamic range. Primary and secondary radar data are combined for ATC operator display.

The solid-state transmitters were designed to make unmanned operation possible, and built-in test equipment can be monitored and controlled from a remote display terminal. The two transmitter configurations make it possible to adapt the radar to either approach or extended terminal coverage.

Operational Characteristics. The ASR-23SS incorporated a variety of operational features that enhanced the ability of air-traffic controllers to monitor aircraft flying either in the Terminal Control Area (the 60-nautical-mile radius surrounding an airport), or for longer range en route ATC operations. The system can distinguish between aircraft flying close to one another and can accurately and reliably display aircraft flying in

weather clutter. Digitized video superimposes aircraft identification and weather data with targets on the controllers' displays. These are major advances over the old radars.

Six-level precipitation data improves the ability of controllers to guide traffic to and from an airport. By knowing storm intensity and how much rain is falling in any particular area, controllers are able to guide aircraft more efficiently. With the old, two-level system, controllers had no idea how intense the weather was in a particular area and usually had to divert aircraft around an entire storm system. With the six-level system, they will be able to bring aircraft through non-threatening areas, and help pilots to avoid high-intensity cells.

The moving-target-detection function reduces target drop-out when an aircraft is flying tangentially to the radar or through high-clutter areas. Processing controls the false-alarm rate and provides controllers with a clean, more informative display. Information on the display will be valid target and weather data, with specific features selectable by the operator.

Maintenance is easier, faster, and less costly than for the older radars. A built-in, computer-aided system continually monitors status and system operation.

ASR-23

Source: Raytheon Co.

Variants/Upgrades

No variants identified.

Program Review

Background. Building on a long history of air-traffic-control radar experience, in the 1980s Raytheon designed, manufactured, and installed 41 solid-state radars as part of the Canadian Radar Modernization Program (RAMP). These systems are now the sensors for the entire Canadian airspace management system. Based on the RAMP radars, the systems were upgraded into the shorter range, S-band terminal ASR-10SS and longer-range, L-band ASR-23SS.

In 1995, the Royal Australian Air Force procured over US$100 million in ATC equipment for the Australian Defence Air Traffic System (ADATS). This contract

includes seven primary radars, seven MSSRs, 14 radar and flight data automation systems with controller work stations, and 14 ATC switches. Long-term support was included in the contract.

In March 1998, the Department of Civil Aviation, Jamaica, awarded a contract with a potential value of US$20 million for the provision of air-traffic-control radars at the Montego Bay and Kingston International airports. In addition to Jamaica, the Department of Civil Aviation, Netherlands Antilles (DCA-NA), and the Princess Juliana International Airport, St. Maarten, Netherlands Antilles, selected Raytheon ATC systems for their islands as well. These installations are to include radar, MSSR, and traffic management systems.

On May 21, 2000, the Royal Australian Air Force commissioned its first ADATS site at Darwin, Australia. The system includes the DASR and Mk II MSSR combined with Auto-Trac™ and a digital voce communications switching system. ADATS is to be installed at 12 defense bases throughout Australia by end of 2001.

Funding

Funding is from the ATC budgets of individual countries and is not broken out.

Recent Contracts

No recent US contracts recorded.

Timetable

Month	Year	Major Development
	1984 - 1990	Canadian RAMP program
	1995	ADATS selected by RAAF
	1998	Selection by Jamaica and St. Maarten
Jun	2000	First ADATS site commissioned

Worldwide Distribution

The ASR-23SS or ASR-9100 have been procured by **Canada** and **Australia**. **Jamaica** and **St. Maarten** (in the Netherlands Antilles) have selected Raytheon ATC systems for their islands.

Forecast Rationale

The 41 en route and terminal radars of the Canadian RAMP are considered first-generation solid state. The ASR-10SS and ASR-11SS radars drew on the basic architecture and design of the earlier radars, updating and modernizing them with the latest in data-processing components. The ASR-23SS primary radar is considered second generation, with the secondary monopulse system called fourth generation. The basic technology is the same, but the new system has a more open architecture and takes advantage of recent technology developments.

Both the ASR-23SS and the ASR-10/11SS terminal radars share a common design, but were configured to meet different needs. The ARS-10/11 is better adapted for the terminal sensor role. It does not have the range needed for en route operations. The ASR-23SS, however, has increased range for users who need increased coverage, and its L-band operation can usually perform better in rainy conditions. Production now supports ongoing repair/spares requirements.

The events of September 11th renewed the interest in raw radar data from a nation's radar system. There is an increased 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. Being able to track a non-cooperative aircraft has taken on a new importance.

Ten-Year Outlook

No further system production is expected.

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