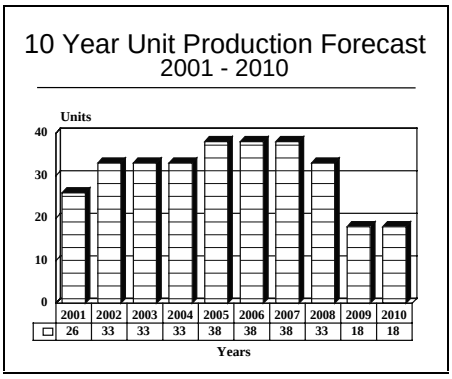
SSR/MSSR ATC Radar Series (Raytheon)

Outlook

- UAE orders two MSSR systems
- Large orders for US ASR-11 DASR and ATCBI-6 programs
- Canada continues radar modernization with MSSR systems



Orientation

Description. The Secondary Surveillance Radars (SSR) and Monopulse Secondary Surveillance Radars (MSSR) are a family of radars produced by Raytheon Systems Limited (formally Cossor Harlow and Hughes Electronics) for air traffic control (ATC) purposes. These radars are composed of the SSR 950 radar, the SSR 955 radar, the Condor MKII radar, the ASR-11 Digital Airport Surveillance Radar (DASR), and the ATCBI-6 replacement program MSSRs.

Sponsor

Raytheon Systems Ltd (RSL)
Electronic Systems
The Pinnacles
Harlow, Essex CM10 5BB
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Tel: +44 1279 26862
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Web site: http://www.raytheon.com

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Licensee. No known production licenses have been granted.

Status. In production and in service.

Total Produced. An estimated 330 radars were produced through 2000.

Application. An advanced air traffic control (ATC) radar family developed to overcome signal interference problems in high-traffic densities.

Price Range. Contract cost averaging from the 1996 US FAA and US DoD order indicates a single Condor MKII system, including installation and shelter, is priced at approximately US$2.9 million per unit (1996 dollars).

The earlier MKI models were priced at approximately US$750,000 per unit.

Technical Data

Cossor™ Secondary Surveillance Radar (SSR) 950. The SSR 950 system originally produced by Cossor is made up of the CRS 512 antenna, the SSR 950 interrogator, and the CVP 250 plot extractor.

CRS 512. The CRS 512 is a large vertical aperture secondary surveillance antenna designed to replace the familiar linear array, previously the standard SSR antenna. The large vertical aperture (measuring 5 feet) contains a vertical array of radiating elements that permits additional flexibility in controlling transmit/ receive patterns and improves performance. The CRS 512 conquers gaps in radar coverage and false replies due to reflections from local terrain and buildings that were caused by the narrow aperture of linear arrays.

The open array format minimizes weight while retaining strength, lowers wind resistance and is capable of withstanding a wide range of environmental conditions. Specific areas of application for the CRS 512 include airfields, where reflection problems can be quite severe, and long-range surveillance missions, in which superior coverage at low elevation angles is a primary requirement.

SSR 950 Interrogator. The SSR 950 interrogator was developed specifically for monopulse operation while meeting the requirements of ICAO Annex 10. The interrogator includes two matched logarithmic receivers for monopulse operation and a third receiver for receiver sidelobe suppression. The SSR 950 features improved sidelobe suppression (site selectable), programmable gain time control in range and azimuth, a digital plot extractor interface, and a computerized management system interface. The interrogator has been designed to be readily extendible for Mode S operation as it becomes fully operational.

CVP 250 Plot Extractor. The CVP 250 plot extractor uses advanced microprocessor technology and includes extensive self-test and fail-soft features. Monopulse data from the SSR 950 are used to compile target reports. The plot extractor is built into the same cabinet as the SSR 950.

Cossor™ Secondary Surveillance Radar (SSR) 955. The SSR 955, also known as Condor MKI previously produced by Cossor, is a fully sold-state version of the SSR 950. Its components include a modular transmitter, with a driver module that provides outputs to two identical high-power RF amplifiers. The SSR 955 is available with the LVA antenna and can be easily adapted to the Mode S selective address system (a required capability in the US after January 1, 1992).

Condor MKII. The Condor MKII Monopulse Secondary Surveillance Radar (MSSR), previously produced by Cossor, has Mode S performance with the addition of modules to prewired locations. It uses 486 processors on Multibus II and custom-designed very large-scale integrated (VLSI) chip technology. All system functions may be exercised remotely. Condor II is a third-generation MSSR and provides Modes A, C, and S operations. It combines the proven performance of previous Cossor SSRs/MSSRs with the latest hardware technology benefits.

SPECIFICATIONS OF THE CONDOR MKII

Antenna	
Gain:	27 dBi
Horizontal beamwidth 3 dB:	2.45 +/- 0.25 degrees
Horizontal sidelobes:	-26 dB below peak
Roll-off rate (underside):	1.9 dB/degree at -6 degrees point
High angle cut-off:	-4 dBi at +65 degrees
Wind survival 40 mm radical ice:	200 km/hr
Temperature:	-30 degrees Celsius to +70 degrees Celsius
Transmitter	
Frequency:	1,030 +/- 0.01 MHz
Output power:	32 dBW
Duty cycle:	Up to 2%, optional 6%
Operating modes:	1, 2, 3/A, B, C, D(S and 4 as options)
Suppression: (Improved ISLS (IISLS) option)	Interrogator Side Lobe Suppression (ISLS)

Log Receivers

Frequency:	1,090 +/- 0.2 MHz
Sensitivity:	-90 dBm tangential
Bandwidth (3 dB):	9 MHz
Dynamic range:	-16 to -86 dBm
Suppression:	Receiver Side Lobe Suppression (RSLS)

Extractors/Plot Processor

Multibus II:	80486 processors
VLSI technology:	Monopulse Azimuth Range Code Assembler
Target load:	Average 600/scan (120/s) (900/scan option) Peak 350/s
Standby readiness:	Software coupled (hardware option)

Extractors/Plot Processor

Video clock I/P:	16 MHz
Decode:	Up to 4 overlapping replies
Antenna check:	Built-in antenna HPD plotter
Built-in monopulse consistency check:	Continuous
Reflection suppression:	Fixed and dynamic files
Output formats available:	Radar Data Interface Format (RDIF), Asterix

Variants/Upgrades

Cossor™ Secondary Surveillance Radar (SSR) 950. Developed in the 1960s and first demonstrated in 1970, the SSR 950 is composed of the CRS 512 antenna, the SSR Interrogator, and the CVP 250 Plot Extractor. The SSR 950 was produced by Raytheon's subsidiary Cossor Electronics Ltd.

Cossor™ Secondary Surveillance Radar (SSR) 955. In 1985 Cossor introduced the SSR 955, an upgraded, fully solid-state version of the SSR 950. The SSR 955 is also known as Condor MKI. The system's main application is in the Canadian Radar Modernization Program (RAMP). The SSR 955 was produced by Raytheon's subsidiary Cossor Electronics Ltd.

Condor MKII. The Condor MKII (also known as the Condor 9600) represents the newest generation of the Cossor SSR. It evolved from the SSR 955 and includes dual monopulse interrogators and plot extractors, control and fault isolation systems, and a large vertical aperture antenna. The associated display equipment features the newest high-resolution technology with image memory techniques, as well as a CRT that consumes less power, and lasts as much as 10 times longer than existing softer phosphor types. The Condor MKII can be combined with a wide variety of primary radar. It is also fully Mode S compatible. *Please note that there are reportedly three versions of the Condor MKII: the Condor MKII, the Condor MKII - Mode S - Level 2, and the Condor MKII - Mode S - Level 5. However, these specifications are usually not mentioned in contract awards and thus all MKII variants are listed in this report under the designation of MKII, ASR-11, or ATCBI-6.*

ASR-11 Digital Surveillance Radar (DASR). The ASR-11 DASR is both the name of a cooperative FAA/DoD ATC upgrade and the designation of the Condor MKII system that will be procured by the US DoD. The ASR-11 DASR provides MSSR coverage to 120 miles and Primary Surveillance Radar (PSR) to 60 miles. It meets all current FAA, International Civil Aviation Organization (ICAO), and EUROCONTROL surveillance requirements. Up to 213 ASR-11s are expected to be procured by the US DoD and US FAA.

ATCBI-6 MSSRs. The Air Traffic Control Beacon Interrogator-6 (ATCBI-6) upgrade program is a US program aimed at modernizing previous ATCBI systems. The MSSR being procured for this program is the Condor MKII.

Program Review

Background. Cossor Electronics Ltd, a subsidiary of Raytheon Company and now known as Raytheon Systems Ltd (RSL) - Electronics Systems, developed its monopulse system in order to attack three problems that were encountered with standard SSR. These shortcomings became increasingly evident as air traffic became denser and a heavier reliance was placed on processed secondary radar data for air traffic control (ATC) because it was able to provide positive height and identity data.

The identified problems associated with the display screen were 1) track wander, caused by signal interference, 2) garbling of close flying aircraft, making it difficult to make separate identifications, and 3) false targets caused by nearby objects reflecting the radar signals. As a result of these problems, ATC operations had to provide large aircraft flight path separations which, in turn, meant longer times spent in loiter prior to landing and higher fuel consumption.

The track wander problem was overcome by the SSR monopulse system implementation concept. Instead of ascertaining bearing by relying on the average of a number of replies, the monopulse concept typically needs only one pulse of a single transponder reply, largely eliminating the risk of distortion from an interruption of the reply pattern.

The other two problems were addressed by the CVP 250 plot extractor. The extractor can differentiate the replies of each aircraft by their signal strengths and arrival angles. The extractor is also able to detect and eliminate false signals by reviewing a number of quality measurements such as signal strength, multiple assignment of codes, length of track, and the location of known reflectors.

By mid-1985, Cossor/Raytheon had received orders for 92 SSR 950s. The company then addressed Thomson-CSF's turnkey ATC system capability by making the Condor MKII available as part of a total ATC system (then thought to be dubbed System 2000). System 2000 was expected to take advantage of Raytheon's radar design capabilities and previous experience and would include Raytheon's ASR-9000 G/H-band primary radar. Innovations developed for the Canadian RAMP program were also incorporated.

The UK and Norway ordered this system to form the basis of their modern military ATC networks. In the former case, the deployment is in partnership with Watchman primary radar; the latter the system is apparently used in conjunction with Giraffe primary search systems. Both applications appeared to have relatively small procurements.

The first delivery of the Condor MKII radar went to the UK in 1992. Since then, Cossor Ltd (now known as Raytheon Systems Ltd) has secured several lucrative contracts for MSSR equipment. In 1993, India reportedly chose Cossor's/Raytheon's Mode-S capable MSSR MKIIs, along with various other equipment, for installation in its Bombay and Delhi airports. Although the amount ordered is unknown, the two airports were expected to be operational by 1996. In 1994, The Hong Kong government reportedly awarded Cossor/Raytheon a contract for three MSSRs and other various ATC equipment for the Chek Lap Kok and Kai-Tak airports.

An Australian contract, valued at approximately US$100 million, was awarded in 1995 for the setup of the Royal Australian Air Force's ATC system designated the Australian Defence Air Traffic System (ADATS). This contract called for seven primary radars, eight radar and flight data processing centers, 11 ATC switches, and seven Condor MKII MSSRs. Also in 1995, the Brazilian government awarded Cossor/ Raytheon a contract for its SIVAM Program. This program was to provide surveillance on the entire Amazon Basin and was worth approximately US$1.2 billion. Included in the contract was an order for an undisclosed number of MKII MSSRs.

Cossor/Raytheon delivered 10 MSSRs to Norway's Civil Aviation Administration (CAA) in April 1996, as well as an eleventh MSSR unit to Statoil. These deliveries marked the opening of Norway's Oslo Center for Operation.

In December 1996, the US Air Force's Materiel Command Electronics Systems Center ordered an indefinite quantity/indefinite delivery (ID/IQ) contract for up to 213 radars, including ASR-11 Digital Airport Surveillance Radars (DASRs). Final signing of the US$619.9 million contract was delayed until December 1996 due to protests lodged by Raytheon's competitors. However, in December the US General Accounting Office (GAO) upheld the contract. When it was eventually signed, deliveries were scheduled to begin in 1997 and to be completed around 2007.

Raytheon/Cossor also received contracts from the Cyprus Telecommunications Authority, the Estonian Air Navigation Services, and China for MKII MSSRs. The Cyprus contract, worth about US$2 million, would supply various ATC equipment, including one MKII MSSR for the Lara airport. Contracts for additional

MKII MSSRs were expected to be awarded sometime in the future. The Estonia contracts were for one MKII MSSR to be installed in Tallinn, Estonia's capital, and another in Martna, the southwest region of Estonia. Finally, China also awarded Cossor/Raytheon a contract for an undisclosed amount of MKII MSSRs.

In 1997, the Raytheon MSSRs garnered an additional order from China. The Chinese order, worth approximately US$4 million, was deployed at the Guangzhou International airport located in the Guangzhou province of the People's Republic of China. Both the primary radars (ASR-10SS) and the Condor MKIIs were scheduled to be operational in early 1998.

Later in 1997, Raytheon received a contract from the Botswana Department of Civil Aviation for an S-band radar and two MKII MSSRs. Raytheon also announced in December 1997 that a new company, Raytheon Systems Ltd. (RSL), had been created. This new company would be further split into two divisions: Electronic Systems and Systems Integration. Of these, the Raytheon Cossor Harlow and Hughes Microelectronics Glenrothe operations were combined to form the Electronic Systems division.

Finally, it was announced in 1997 that RSL would be engineering and producing a pre-operational European Mode S MKII MSSR for EUROCONTROL (the European ATC Authority).

March of 1998 was a busy month for RSL and the MKII MSSR systems. On March 26, Raytheon announced that the US Department of Defense (DoD) and Raytheon Systems Company broke ground on the scheduled Digital Airport Surveillance Radar (DASR). DASR is located at US Eglin Air Force Base in Florida. Testing and evaluation reportedly took place throughout 1998 at the airbase. Once this part of the DASR schedule was completed, the US FAA's first site, thought to be Stockton Municipal Airport in California, was expected to be used for continued testing and evaluation (T&E).

Also in March 1998, the Department of Civil Aviation in Jamaica, the Department of Civil Aviation in Curacao, and the Princess Juliana International Airport in St. Maarten selected Raytheon to equip them with modern ATC systems. The contract, worth approximately US$20 million, includes three of Raytheon Systems' Condor MKII MSSRs.

China formally accepted RSL's Condor MKII MSSRs in March 1998 and the Civil Aviation Administration of China (CAAC) awarded RSL a contract for MSSRs for installation at China's Hangzhou and Shanghai Pudong airports.

March 1998 ended with the US FAA selecting Raytheon Systems Company to test the operational capabilities of its MKII MSSRs for possible use in the Air Traffic Control Beacon Interrogator (ATCBI-6) Replacement program. In August 1998, the FAA awarded Raytheon the contract worth approximately US$180 million to produce and install up to 152 MKII MSSRs for the ATCBI-6 Replacement program.

In December 1998, Raytheon announced that its Air Traffic Management/Aeronautical Information Services Data Acquisition Processing and Transfer (ADAPT) was operational at the Geneva and Zurich Area Control Centers. Reportedly, MKII MSSRs were part of this ATC modernization.

On March 8, 2000, it was announced that the Air-Material Command of the Royal Danish Air Force (Flyvmaterielkommandoen) had awarded RSL a contract for its Radar Upgrade Program. The contract will provide the Royal Danish Air Force with three Condor MKII MSSRs and include Mode 4 integration with existing Primary Surveillance Radars (PSRs).

The next day, March 9, 2000, RSL announced another contract for MKII MSSRs. This award was signed by RSL with the Civil Aviation Supplies Import and Export Corporation (CASC), which was acting on behalf of the Civil Aviation Administration of China (CAAC). The contract was for the provision of four MSSRs. The four radars are scheduled to be installed at China's Wuhan, Zhoukou, Shijiazhuang and Shaoguan airports. All four MSSRs were expected to be commissioned by the end of 2000.

It was announced on March 30, 2000 that pre-production activities involving ASR-11 DASR had been completed, resulting in the start of positive low-rate initial production (LRIP) of 23 systems ordered Live operation of ASR-11 DASR was scheduled to begin in early summer 2000. The US DoD and FAA are expected to procure up to 213 ASR-11 DASRs.

Another order for the Cossor Condor MSSR system was placed by the United Arab Emirates (UAE) in July 2000. The contract for this system, which is to be located at Abu Dhabi International Airport, is valued at US$4.5million and includes a major part of the necessary civil and electrical work associated with the installation.

Raytheon landed another large order of 50 MSSR systems in August 2000. This order is to supply the FAA with equipment for its Air Traffic Control Beacon Interrogator (ATCBI-6) replacement program. Deliveries for this program, which calls for up to 152 ATCBI-6s, are scheduled to begin in July 2001.

Two additional contracts were awarded to Raytheon for the MSSR system in 2001. In February the UAE placed an order for its fourth MSSR. This system, which is

intended for use at Tarif in Abu Dhabi, is scheduled to be installed and operational by February 2002. The other sale was made to NAV CANADA, Canada's provider for air navigation services. Two MSSR systems are to be added to a network of 41 systems previously supplied by Raytheon as part of Canada's radar moderation program. Installation of these systems are to completed by mid-2002.

Funding

The Cossor family of air traffic control systems was developed as a private venture using corporate funding. Cossor is now Raytheon Systems Ltd.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Raytheon Systems Ltd	$20.0	Mar 1998 – The Department of Civil Aviation of Jamaica awarded Raytheon Systems a contract for modern radar equipment. RSL will provide three Condor MKII MSSRs. (Note: two additional Caribbean islands, Curacao and St. Maarten, added additional orders for MSSRs at this time, or shortly thereafter.)
Raytheon Systems Ltd	unknown	Mar 1998 – The Civil Aviation Administration of China (CAAC) awarded a contract for Condor MKII MSSRs for installation at its Hangzhou and Shanghai Pudong airports.
Raytheon Systems Ltd	$180.0	Aug 1998 – The US FAA awarded RSL up to US$180 million for the production and installation of up to 152 MKII MSSRs. This contract is part of the ATCBI-6 replacement program.
Raytheon Systems Ltd	unknown	Mar 2000 – The Air-Materiel Command of the Royal Danish Air Force awarded RSL a contract for the provision of three Condor MKII MSSRs. Delivery and installation date(s) unknown.
Raytheon Systems Ltd	unknown	Mar 2000 – The CAAC awarded RSL a contract for the provision of four MKII MSSRs for installation in China's Wuhan, Zhoukou, Shijiazhuang and Shaoguan airports. All four systems are expected to be commissioned by the end of 2000.
Raytheon Systems Ltd	4.5	Jul 2000 – UAE ordered an off-mounted Cossor Condor MSSR system for the Abu Dhabi International Airport. The contract included civil and electrical work associated with system installation.
Raytheon Systems Ltd	18.6	Aug 2000 – Contract to supply 50 MSSR systems to the FAA for use in the Air Traffic Control Beacon Interrogator (ATCBI-6) replacement program. Deliveries are scheduled to begin in July 2001.
Raytheon Systems Ltd	unknown	Feb 2001 – UAE places another order for a MSSR system. System to be installed at Tarif Abu Dhabi. Installation of the system is expected to be completed by February 2002.
Raytheon Systems Ltd	8.5	May 2001 – NAV CANADA orders two MSSR systems as part of Canada's radar modernization program. Installation of these two systems will be completed in mid 2002.

Timetable

Year	Major Development
FY 1970	Cossor first demonstrates a monopulse SSR

Year	Major Development
FY 1983	1st foreign order for SSR (Saudi Arabia); SSR enters Civilian Aviation Authority (CAA) service in the UK (the first authority in the world to specify the system)
FY 1984	SSR ordered for 22 RAF airfields; Cossor to supply 41 SSRs for Canadian RAMP program; Royal Navy selects three SSRs for Royal Navy air stations
FY 1985	Cossor introduces 1st fully solid-state monopulse SSR; UK CAA SSR installation completed
FY 1986	1st RAMP SSR delivered; Australia and Greece order SSR; Omani and Dubaian SSR installed
FY 1987	1st RAF SSR operational at RAF Scampton; Geneva Airport to get 2nd SSR; Sweden orders three (up to 14) SSRs; two SSRs delivered to Zurich International Airport; 1st monopulse SSR installed at Australia's Brisbane Airport
FY 1988	1st SSR of Swedish order delivered and installed at Romele
FY 1989	4th Condor radar ordered by Sweden for Umea airport; 2nd SSR delivered to Lulea; Cossor 8600 low-cost ATC radar introduced
FY 1990	3rd Swedish SSR delivered to Ostersund; ATC system installed at Mount Catherine in Trinidad/Tobago
FY 1991	Delivery completed of RAMP SSRs; Condor installation complete at Umea
FY 1992	1st delivery of the MKII delivered to the UK
FY 1993	India picks MKIIs for installation at Bombay and Delhi airports; four Swedish sites completed
FY 1994	Hong Kong reportedly orders three MKII units and various other equipment
FY 1995	Australia orders seven MKII units; Brazil orders unknown quantity of MKII MSSRs
FY 1996	10 MKII units delivered to Norway's CAA and one to Statoil; US DoD/FAA order up to 213 ASR-11 DASRs; Cyprus contract for one MKII MSSR unit awarded and delivered
FY 1997	China orders MKII system for installation at Guangzhou airport; Cossor becomes Raytheon
FY 1998	DASR T&E; Department of Civil Aviation of Jamaica orders three MKII MSSRs; CAAC orders unknown amount of MKII MSSRs; US FAA orders up to 152 MKII MSSR units for ATCBI-6; ADAPT fully operational in Zurich and Geneva
FY 1999	DT&E testing completed and OT&E testing begun for US ATCBI-6 program
FY 2000	China and Denmark award contracts for four and three MKII MSSRs, respectively; LRIP of ASR-11 begins; ATCBI-6 key sight commissioning reportedly takes place

Worldwide Distribution

Raytheon claims that at least 30 countries utilize the SSR/MSSR systems. The following countries reportedly have purchased some form of the Cossor SSR and/or MSSR: **Australia**, **Brazil**, **Canada**, **China**, **Cyprus**, **Denmark**, **Greece**, **Hong Kong**, **India**, **Jamaica**, **Norway**, **Oman**, **Saudi Arabia**, **Sweden**, **Switzerland**, **Trinidad/Tobago**, **United Kingdom**, and the **United States**.

Forecast Rationale

The Secondary Surveillance Radar (SSR) and Monopulse Secondary Surveillance Radar (MSSR) systems are a family of advanced air traffic control (ATC) radars produced by Raytheon Systems Ltd (formally Cossor Harlow and Hughes Electronics) for the purpose of surmounting signal interference problems within regions having a high volume of air traffic. These systems have reportedly been procured by at least 30 nations since their introduction to the world market.

Throughout the world, air traffic is rising at an exponential rate. Many nations lack the infrastructure to manage this increase. In the more modern nations, the demand on the existing ATC systems is beginning to exceed their capacities. In Europe and North American attempts by organizations such as the US FAA and EUROCONTROL are taking steps to upgrade current systems. An essential part of these air traffic control modernization efforts is the implementation of surveillance radar systems like the Condor MKII MSSR.

Having one of the largest and most crowded air spaces in the world, the US is becoming the top customer of the Condor MKII MSSR. In the US the ASR-11 Digital Airport Surveillance Radar (DASR) and the Air Traffic Control Beacon Interrogator (ATCBI-6) programs are moving forward. As the ASR-11 begins low-rate initial production (LRIP), a first trench order of 50 MSSR systems for the ATCBI-6 program has been placed. A total of 152 MKII MSSRs are expected to be procured for the ATCBI-6 program and 213 ASR-11 systems are slated for the DASR program.

In other regions outside North American and Western Europe, there is also a great need for ATC systems like the Condor MKII MSSR. Many nations in Africa and Latin America lack the basic infrastructure to provide proper air traffic control. Often pilots are left to their own means to control the skies around them. Once individual nations and multi-national organizations like the Common Market for Eastern and Southern Africa (COMESA) are able to obtain the political environment and economic means to build an ATC infrastructure, the Condor MKII MSSR will be in high demand.

With the US placing orders in support of its ATC modernization programs, the production of the Condor MKII MSSR will remain steady throughout the forecast period. Several additional orders are expected from other nations also involved in ATC modernization programs. As less developed nations become more affluent and air travel to and from those regions becomes more popular, the demand for the Condor MKII MSSR will continue to increase.

Note: For a general overview of ATC programs within various nations, please see the reports filed under the *Electronic Systems* binder Tab C - FAA/ATC Programs. "ATC-Africa," "ATC-Eastern Europe," "ATC-Latin America," "ATC-Russia," and "EURO-ATC" are all covered in the Tab.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level			Speculative			
Designation	**Application**	**Thru 00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**Total 01-10**
SSR/MSSR ATC RADAR SERIES	ASR-11 DASR (DOD/FAA)	18	5	15	15	15	20	20	20	15	15	15	155
SSR/MSSR ATC RADAR SERIES	ATCBI-6 UPGRADE PROGRAM (FAA)	32	15	15	15	15	15	15	15	15	0	0	120
SSR/MSSR ATC RADAR SERIES	MKI ATC RADAR (CANADA)	41	2	0	0	0	0	0	0	0	0	0	2
SSR/MSSR ATC RADAR SERIES	MKII ATC RADAR (DANISH ROYAL AIR FORCE)	1	1	1	0	0	0	0	0	0	0	0	2
SSR/MSSR ATC RADAR SERIES	MKII ATC RADAR (VARIOUS)	46	3	2	3	3	3	3	3	3	3	3	29
SSR/MSSR ATC RADAR SERIES	Prior Prod'n:	192	0	0	0	0	0	0	0	0	0	0	0
Total Production		330	26	33	33	33	38	38	38	33	18	18	308