



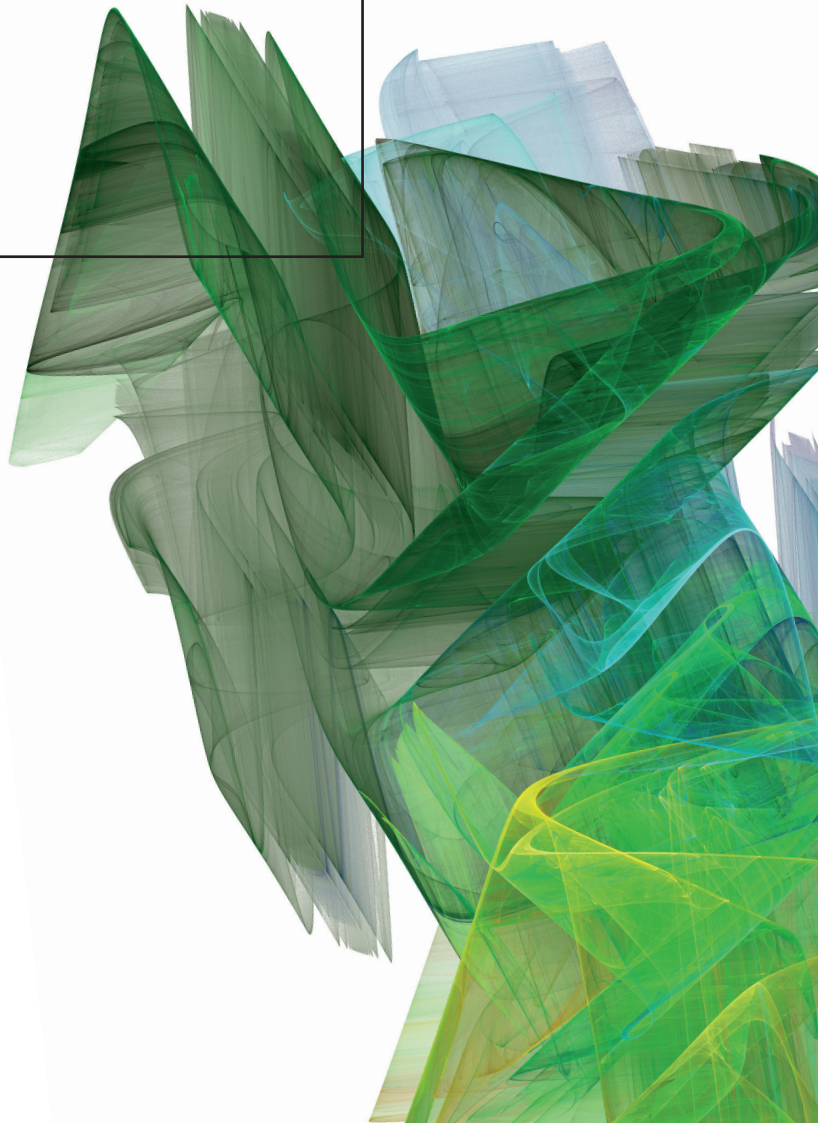
indra

AIR TRAFFIC MANAGEMENT

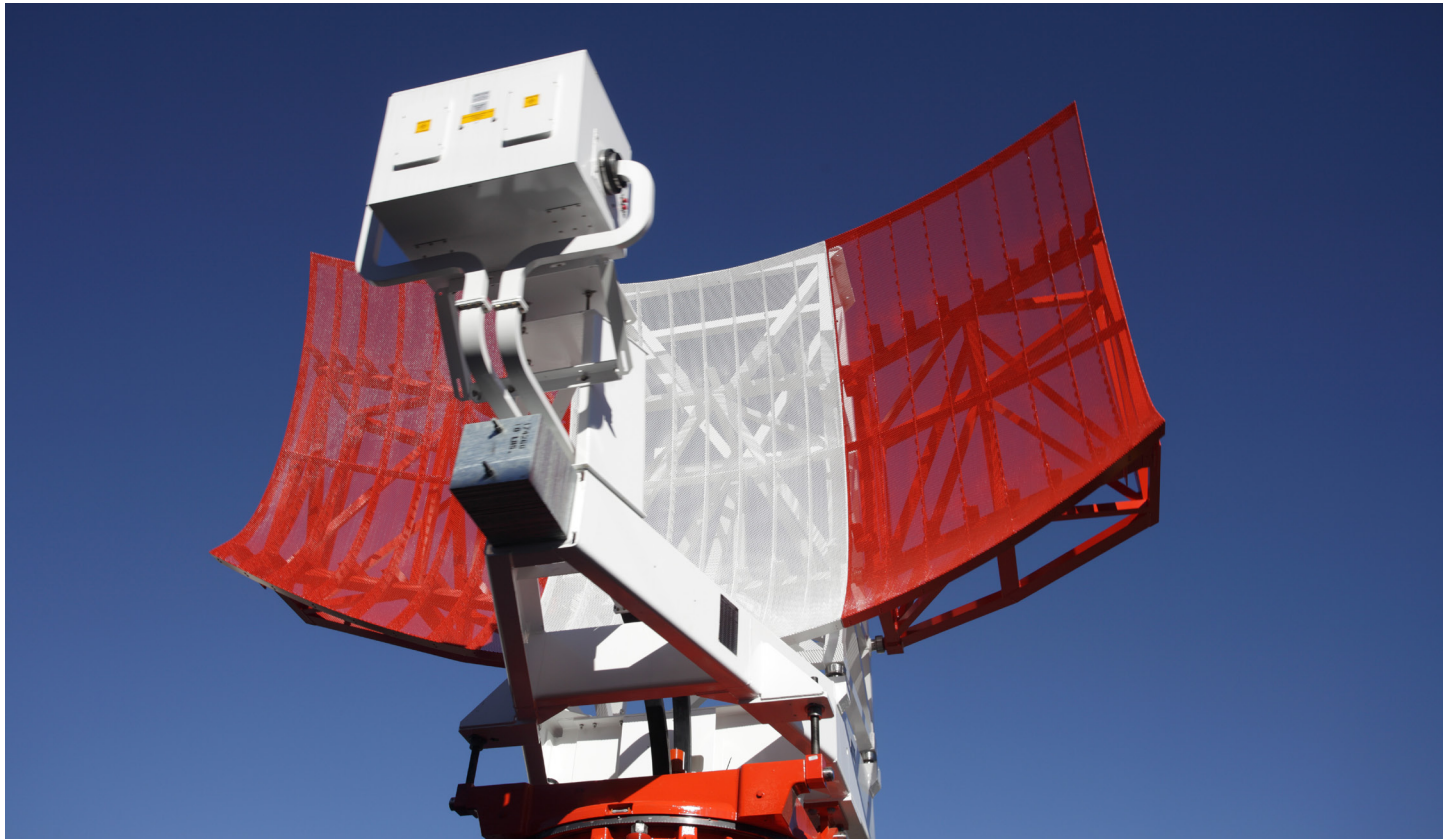
PRIMARY SURVEILLANCE RADAR

Supplying ATM systems around the world for more than 30 years

indracompany.com



PRIMARY SURVEILLANCE RADAR



Monitor all the aircraft in the airspace, clearly,
simultaneously and without interference

Indra technology for a very high and reliable radar detectability

Indra's PSR solution is a fully solid-state radar system that incorporates the latest technologies into an airport en-route surveillance radar system. The radar gives the state-of-the-art in airspace surveillance by combining features only available in the US FAA's ASR-12 air traffic control radar with newest technology: signal generation and demodulation, processors and communications technology.

This system allows the air traffic controller to monitor all the aircraft in the airspace, clearly, simultaneously, and without interference. The MTD-IV is the

fourth generation of a concept that has evolved over more than twenty years. With each new generation, significant improvements in the detection of aircraft flying tangentially to the radar (more accurate ground clutter map due to azimuth synchronization) and also targets in ground clutter and bad weather conditions were obtained.

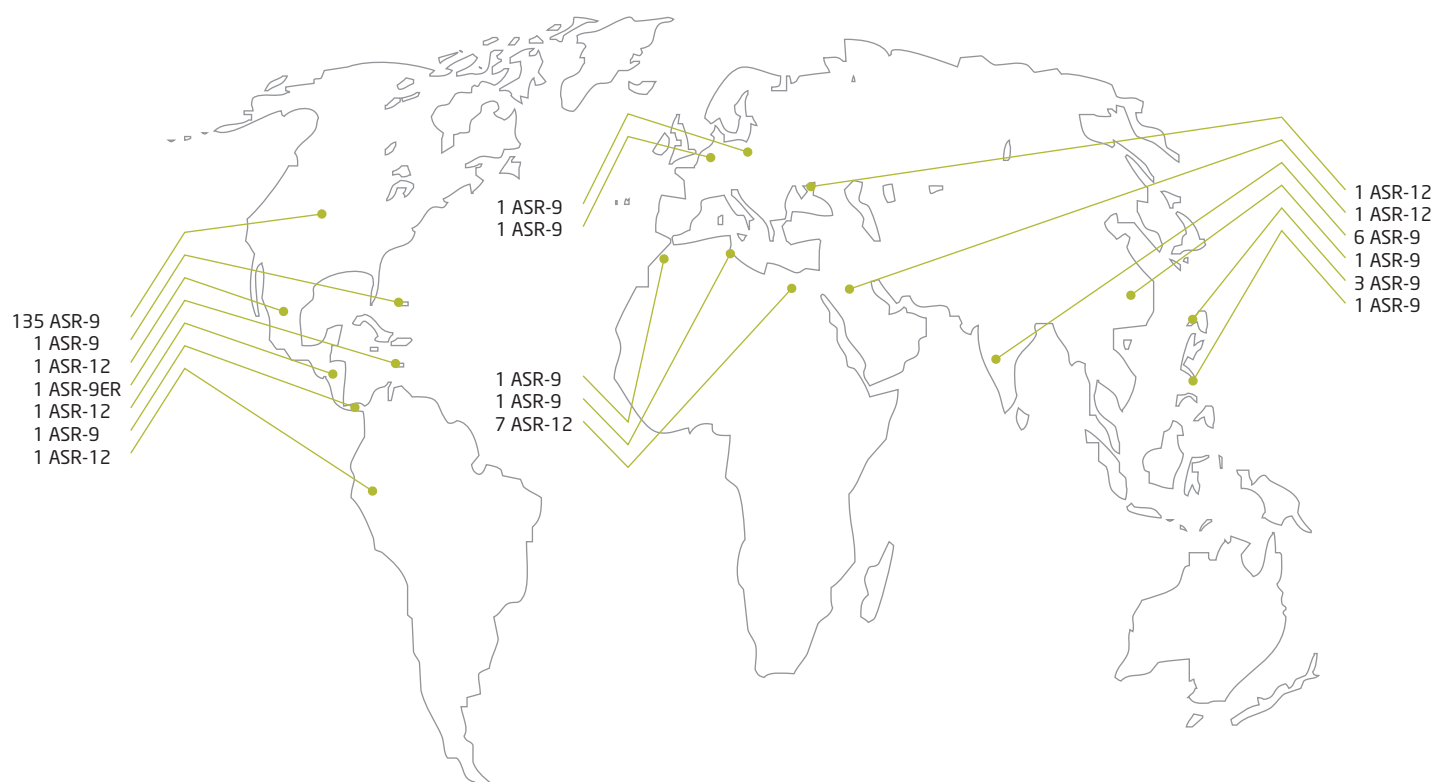
Weather conditions detected by the radar are measured in six levels of intensity conforming to the ICAO and U.S. Weather Bureau standards and are processed using a weather channel in parallel with the target channel. The integrated weather

channel has an independent set of Doppler filters that eliminate clutter from the weather output. Special processing techniques are used to edit multi-trip and anomalous propagation clutter echoes. The six level weather mapping is implemented in redundant processors, thereby providing high availability of this critical product.

The particular Moving Target Detector (MTD) implemented is optimized to allow controllers to see an aircraft in severe ground and weather clutter conditions.

References

ASR12 radar is the direct heritage of ASR-9 systems, and is installed and operating successfully worldwide



Technology benefits

Features

- All solid state with MTD-IV performance
- ICAO and EUROCONTROL performance
- Uncompromised Doppler visibility detects aircraft in weather
- Excellent range resolution with a unique technology to detect small aircraft close to large ones
- Calibrated ICAO compliant six-level weather mapping
- Seamless switching of signal received with two antenna beams by means of software
- COTS and Open system architecture, readily interfaces to your ATC system
- Additional redundancy points
- CE marking
- European interoperability requisites

Benefits

- Best value and high performance at competitive costs
- High reliability and ease of maintenance results in significant operating cost savings
- Easily maintenance through user-friendly "expert systems" technology
- Low false alarm aircraft detection in weather improves controller productivity
- Accurate weather situation picture allows aircraft to be safely routed around storms
- Full capacity to be integrated with MSSR/ Mode S as an advance surveillance station entity

Discriminators

- The most technologically advanced ATC system - solid state, programmable, MTD-IV Doppler processing
- High receive dynamic range solves clutter performance problems with solid-state radar
- Ultra low Doppler Filter sidelobes provide unsurpassed rejection of weather
- Open system architecture results in widest interface capabilities
- User-friendly radar to operate and maintain
- Programmable processor (parameters and site adaptation)

Primary Surveillance Radar

Main features

The radar is highly reliable S-band surveillance radar designed as an unattended system intended to operate twenty-four hours a day, 365 days a year, while simultaneously performing system self test, reporting status and surveillance data to the Air Traffic Control System.

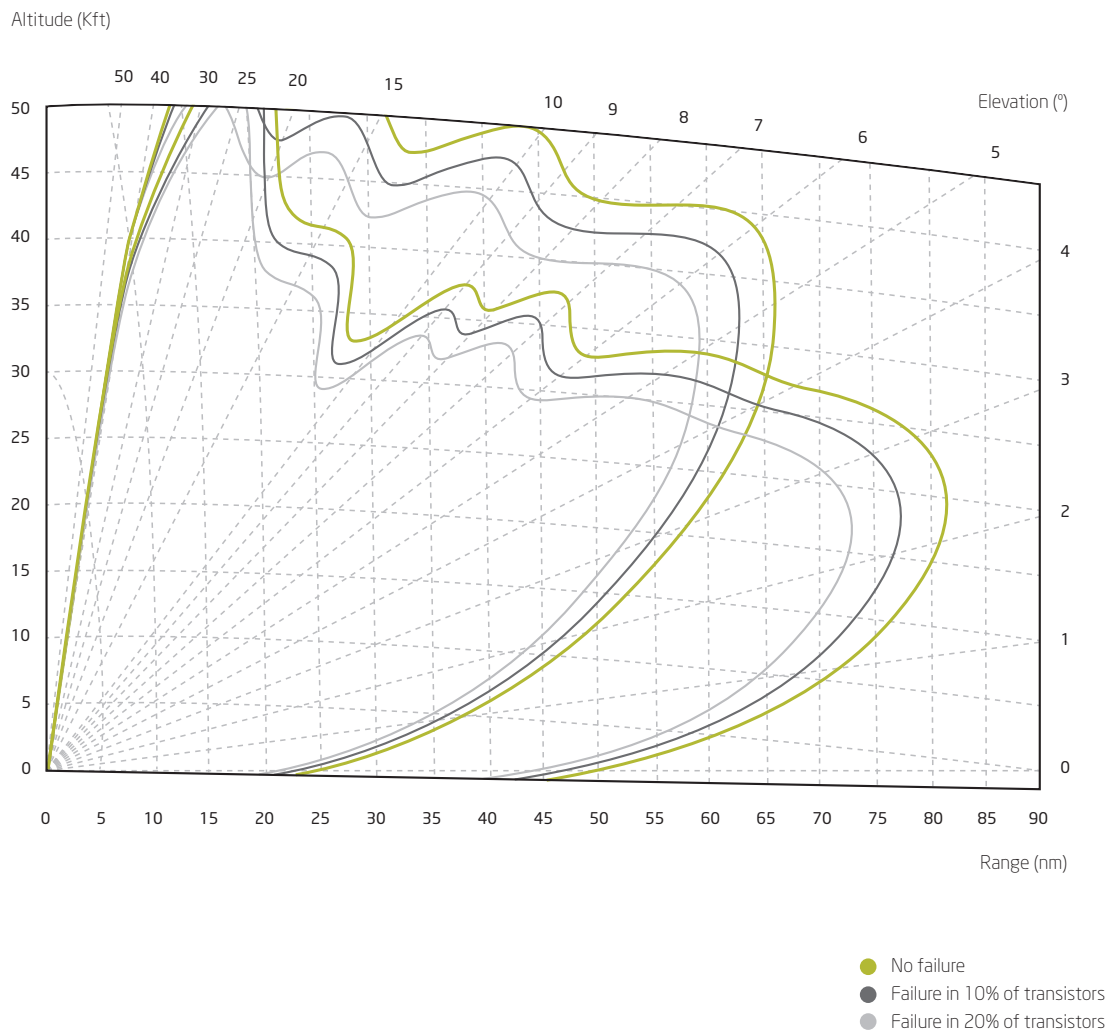
Except for the antenna transmitter and waveguide components, the equipment in the system is configured in dual channels to provide a totally redundant system. Cross connections between redundant modules permits additional failures to occur while the system continues operation, in comparison to other systems. The transmitter is implemented using N+1 redundancy providing inherent high reliability with a fail-soft operation. Due to power margin and considering graceful degradation, the transmitter can be maintained without interruption of service.

The configuration of the radar consists of a Terminal Approach radar to 60 nm with a rotation rate of 15 RPM and a Mid-range Terminal Approach version to 80 nm with a rotation rate of 12 RPM. Performance of both systems is identical except for the extended coverage provided by the Mid-range version.

- Internally redundant architecture
- Solid-state Transmitter with graceful degradation and hot repair
- High dynamic range receivers (84 dB at signal processor input)
- Sampling at IF, digital I&Q generation and demodulation
- Commercial-off-the-shelf (COTS) Power-PC based Generic Processors for Signal and Data Processing-growth for the future, scalability, load balancing, portability
- Fully programmable processing parameters-site adaptation and optimization
- The MTD employs adaptive processing techniques in Time and Doppler domain to uniquely identify aircraft and clutter returns
- User friendly control and monitoring interfaces - Graphical for ease of understanding
- Wide range of interfaces

Characteristics summary

Frequency	2.7 to 2.9 GHz
Frequency Diversity & Agility	2 frequencies (Long/short pulse) 75 MHz frequency diversity. Possible exchange of frequencies for subsequent CPI
Peak power	19.2 Kw
RF TX & Blanking	Sectorize (1.4°) Synchronous clutter map
Pulse width	Short pulse: 1.2 µs Long pulse: from 60 to 90 µs
PRF	735 to 1300 Hz (custom-built)
Stability	62 dB
MTI improvement factor	55 dB
Sub-Clutter visibility	>42 dB (till 800 knots)
Instrumented range	60 nm or 80 nm
Detection range	>60 nm or >80 nm
Reliability	
Availability	99.999%
MTBCF	45,000 hours
MTTR	20 minutes
Resolution	
Range	230 m rms (short pulse) 170 m rms (long pulse)
Azimuth	2.8° rms
Accuracy	
Range	50 m, rms
Azimuth	0.15°, rms
Receiver	
Noise figure	2.35 dB
Sensitivity	-108 dBm (short pulse) -126 dBm (long pulse)
Dynamic range	84 dB at signal processor input (without pulse compression)
STC	3 stages (2 RF and digital)
ADC	14 bits @ 93.2144 MHz
Antenna	
Beams	1 transmit, 2 receive
Gain	34.5 dB (low beam) 32.5 dB (high beam)
Azimuth beamwidth	1.35°
Elevation beamwidth	4.5° cosecant squared +40°
Rotation speed	12/15 rpm
Polarization	Linear (vertical) Circular (right hand)
Receiving channels	4 simultaneous
Processing	
Type	MTD-IV doppler filter bank
Filters	6/8 (low/high PRF) - 80 nm 8/10 (low/high PRF) - 60 nm
False alarm control	Interference suppression/detect GO-CFAR, MTAT, MTAC Clutter and geo-censor map Anomalous prop detection
Weather channel	Ground clutter suppression filters US-NWS 6 level detection
Capacity	1000 plots/600 tracks per scan



Coverage

The coverage of the radar system, operating at 12 RPM with a 6/8 filter set is the previous (with a false alarm probability of less than 10^{-6} in the clear assumed).

A detection probability of 80% is required for a 1 square meter, swerling case 1 target. The graph shows that detection requirements are fully accomplished: detection range on a 1 square meter target is 81.3 nm.

Detection range (for a detection probability of 80%) on a 2 square meter, swerling case 1 target is 96 nm (processing is stopped at 80 nm).

Fail-soft capabilities allow detection range to exceed 60 nm for a 1 square meter, swerling 1 target with a detection probability of 80%.

Indra Sistemas S.A. and Northrop Grumman Overseas Service Corporation have entered into a Manufacturing Licensing Agreement for the transfer of Northrop Grumman technology to Indra for Air Surveillance Radar (ASR) for Air Traffic Control known as the ASR-12. This Agreement allows Indra to manufacture and sell ASR-12 Radars and to enhance the Northrop Grumman technology to develop, manufacture and market Indra's own airport surveillance radar. The Agreement gives the license to Indra in an exclusive way and in a worldwide basis except USA.



ISO 9001:2000



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Indra reserves the right to
modify these specifications
without prior notice.

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