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RADAR SYSTEMS
AIR TRAFFIC CONTROL
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Easat A-SMGCS X-Trac Surface Movement Radar

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Easat SMR Dual Redundant 50W X-Band Transceiver
Easat PAR Dual Redundant 350W X-Band Transceiver

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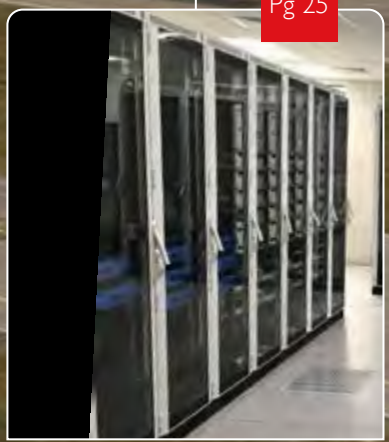

ATM/A-SMGCS Server Racks

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COMPLETE AIR TRAFFIC CONTROL
RADAR SYSTEMS

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Air Traffic Control Tower

Easat Primary & Secondary Surveillance Radar

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Easat Primary Radar & Rotating Pedestal

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FEED FROM PRIMARY & SECONDARY TO RADAR ATC TOWER VIA FIBRE OPTIC & LAN (DETERMINED AT SITE SURVEY)

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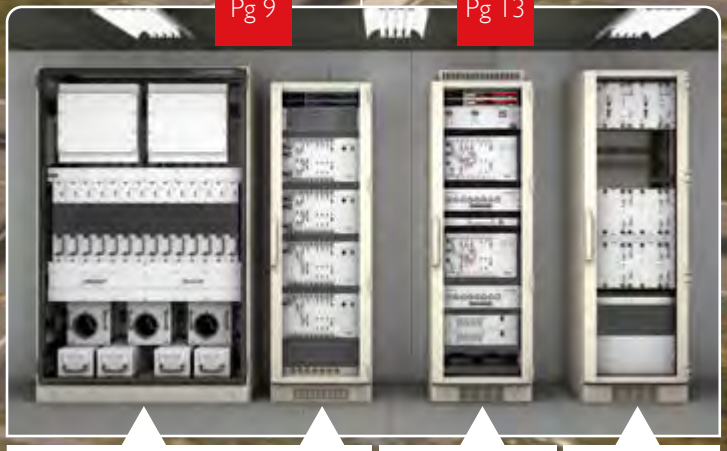

Easat Primary Surveillance Radar
16kW / 80NM

Easat Secondary Surveillance Radar
Mode-S (M10S)

Easat ADS-B Ground Station
Mode-S (M10S)

ATM
A-SMGCS

ASR

PSR

MSSR

IFF

PAR

SMR

M-LAT

ADS-B

DATIS

DVOLMET

SIMULATOR

VCCS

RADIO

RECORDER

EASAT Radar Systems Ltd changed their name from Easat Antennas Ltd seven years ago in 2016 to more accurately reflect the change in activity of the company from being a Radar Antenna supplier to a Radar System Integrator with in house Antenna, Transceiver, Interrogator and Controller Working Position manufacture.

EASAT Radar Systems not only manufacture in house all sensor hardware: antennas, solid state S & X band transceivers L Band interrogators and CWP's for over 20 years, but generate our software and algorithms for such equipment such that we offer systems compliant with Euro Control Mode-S Level 4.

To complement the 24 sensors Easat has historically supplied, Easat Radar Systems Ltd also provides airports with "Turnkey Solutions" where we integrate hard and software such that we offer bespoke ATM and A-SMGCS solutions.

EASAT obtain the ATM and A-SMGCS software from ANSART® from the Netherlands. ANSART ATM system is a multi-purpose system which is based on latest state-of-the-art technology to provide air traffic control service at all flight phases: en-route, approach, tower and ground.

With over 350 installations worldwide, Easat Radar Systems Ltd has global experience in working on all four continents and has developed a track record for reliability, good service, high performance and competitive products.

- High Precision Passive Surveillance
- Accurate Real-Time Position of all Objects Equipped with a Mode A/C/S, ADS-B Transponder in all Weather Conditions
- ADS-B Data Processing
- Relevant Identification of Targets
- Track Reports Delivery to External Systems
- System Status Reporting

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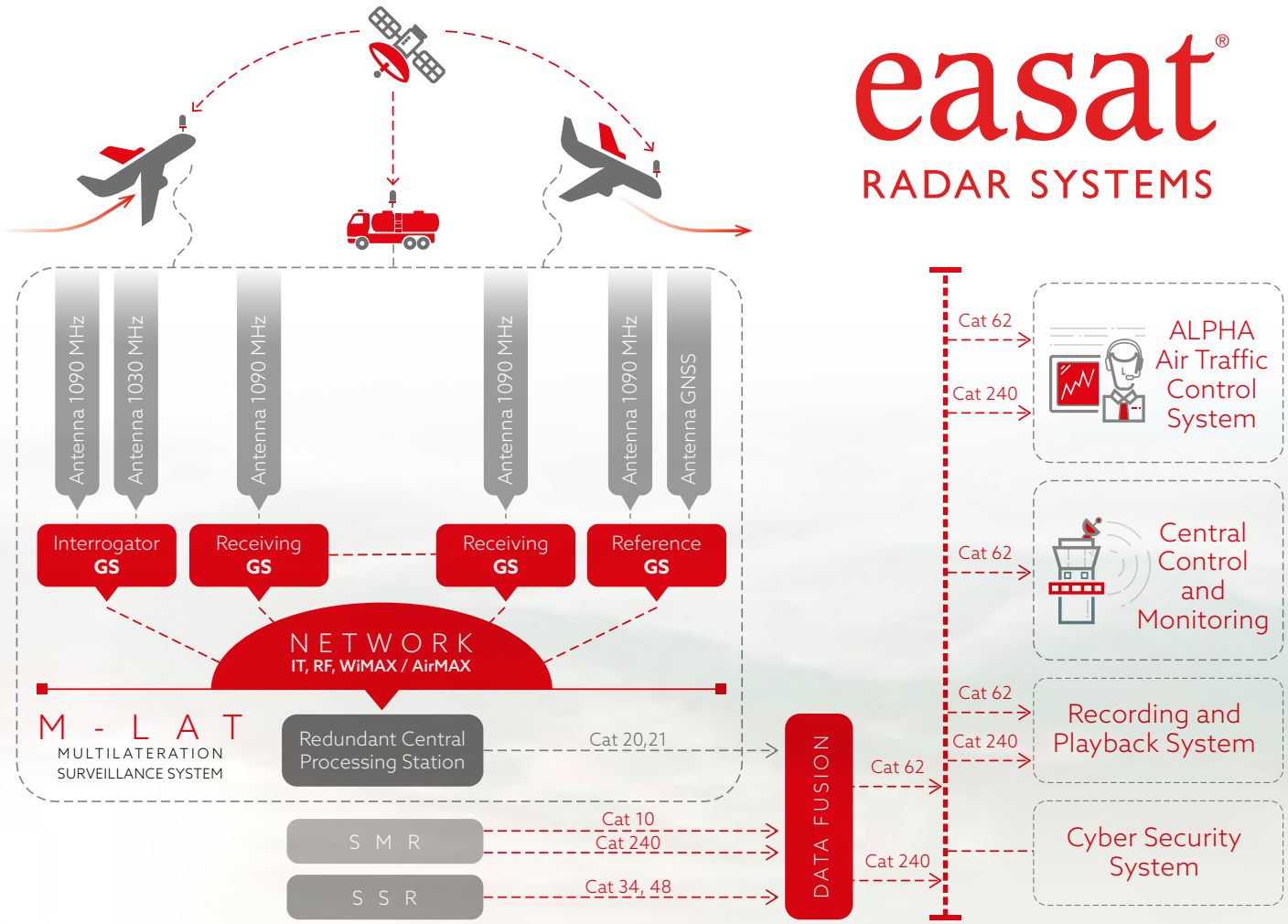

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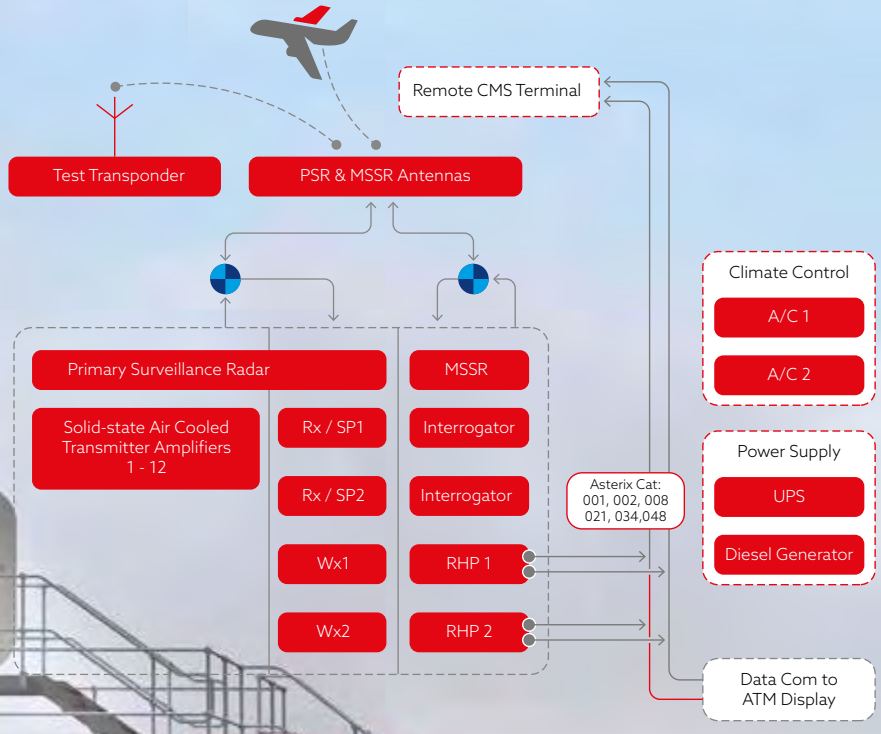
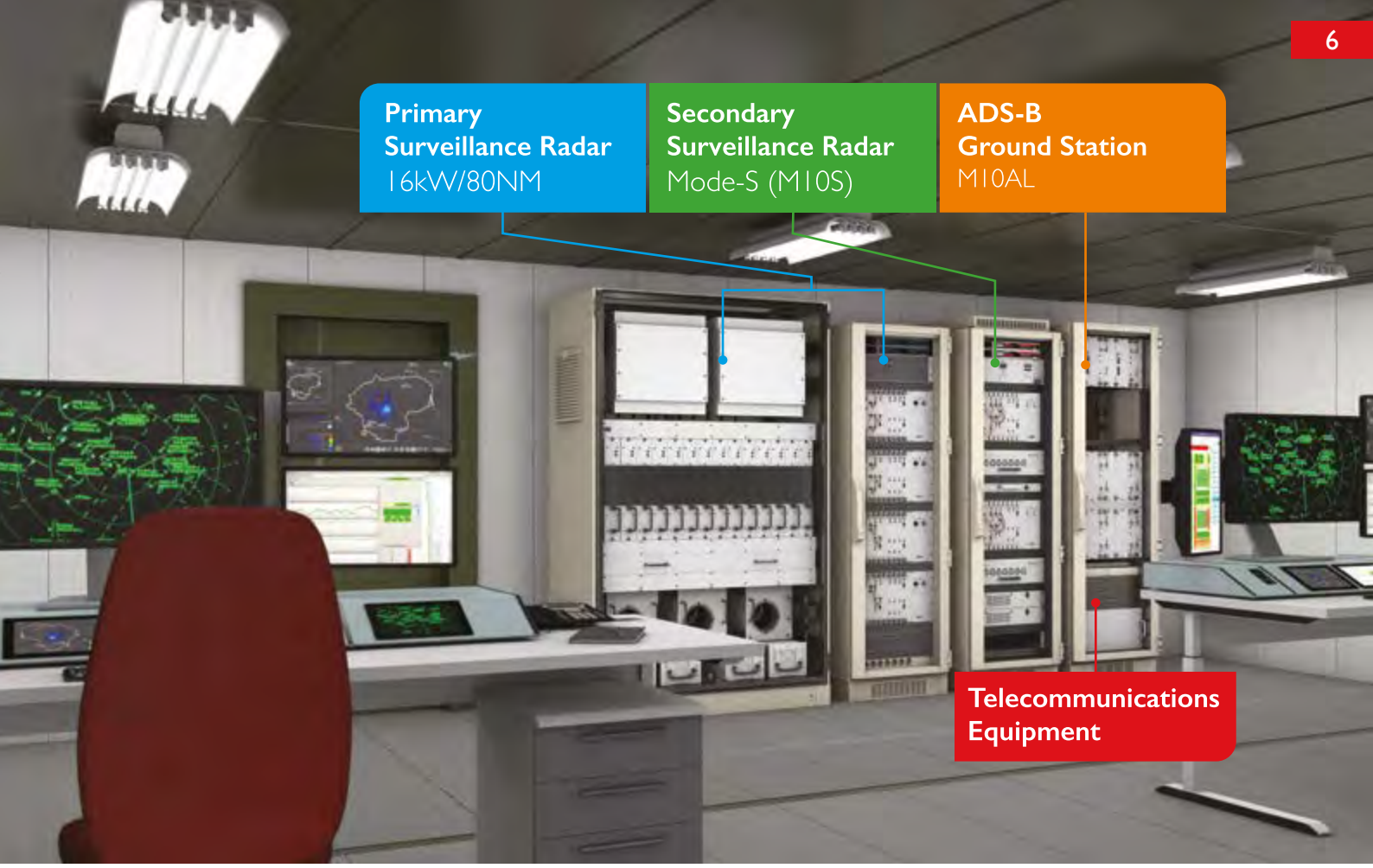
ASR

COMPLETE AIRPORT SURVEILLANCE RADAR SYSTEM

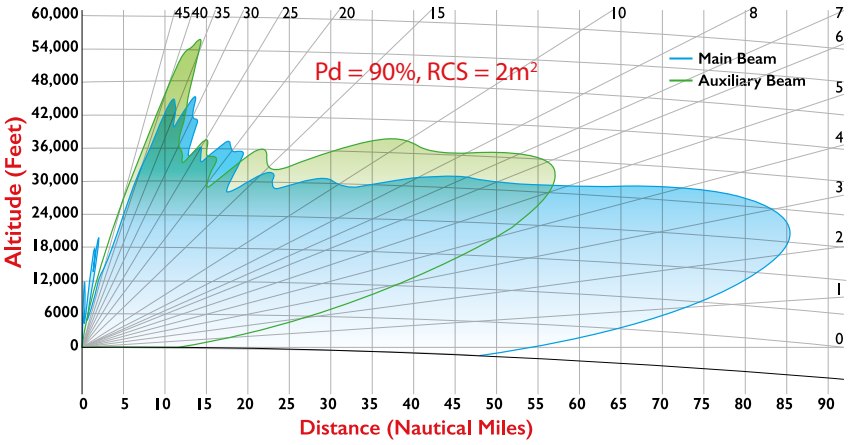
The Combined Radar Sensor includes Fully ICAO Compliant:

- Fully-Integrated, Modern Solid-State Transceiver and Interrogator, Carbon Composite S-Band Primary Surveillance Radar (PSR)
- Monopulse Secondary Surveillance Radar (MSSR), Mode-S Level 4
- Lattice Tower and Temperature & Humidity Controlled Equipment Shelter, or
- Mono-Tube Tower with Integrated Temperature Controlled Equipment Shelter.
- Civil Design and Foundation Construction
- Mono-Tube or Lattice Tower Design, Manufacture & Installation
- Tailored Spares, Maintenance & Upgrade Packages available

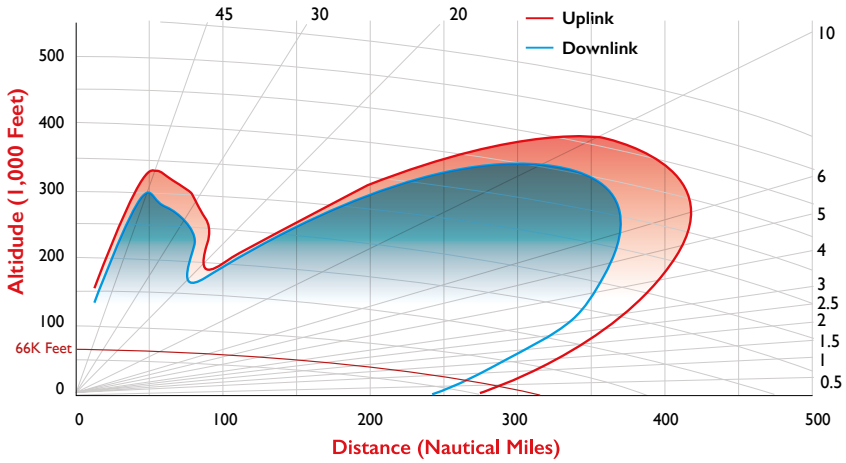




Easat PSR Blake Chart*



Easat MSSR Vertical Coverage*



Easat's S-Band Transceiver and L-Band Interrogator meet or exceed all relevant ICAO and Eurocontrol Standards

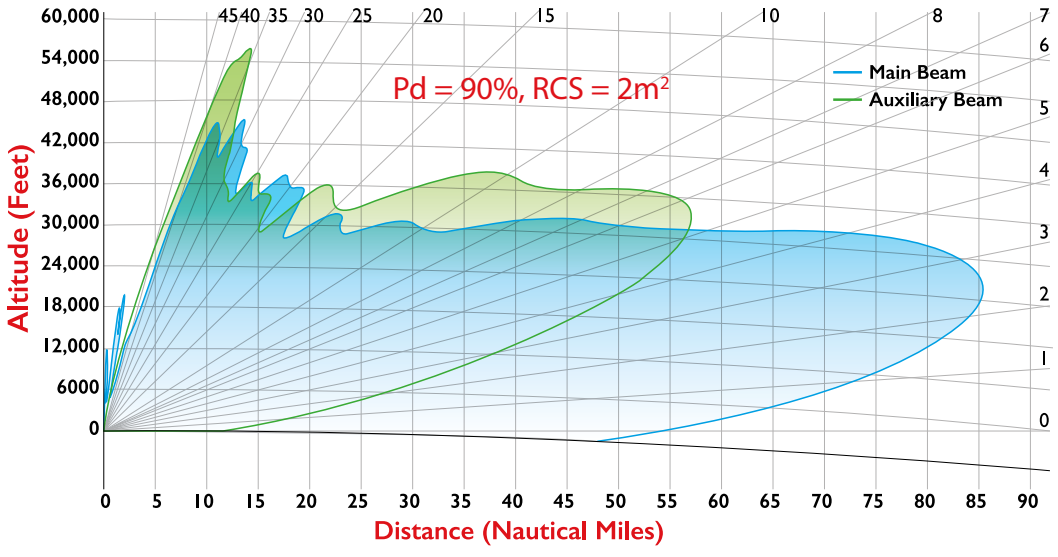
- Fully Solid-State, Air-Cooled Transceiver using GaN Semiconductors for High Performance and Long-Life
- Interrogation, Detection and Acquisition of Modes 1, 2, 3/A and S.

PSR

ADVANCED S-BAND SOLID-STATE PRIMARY SURVEILLANCE RADAR SYSTEM

- Facility to Top-Mount LVA for MSSR or IFF Interrogation
- High Angle of Coverage
- Excellent Beam Shaping and Sidelobe Control
- Polarisation switching (Linear, Circular and Elliptical) on Auxiliary & Main Beams
- Robust Build for Low Life Cycle Costs
- No Radome Requirement
- Dual Drive Pedestal
- Dual Optical 14 or 16 bit Azimuth Encoders
- Transportable Versions Available
- Tailored Spares, Maintenance & Upgrade Packages available

Easat PSR Blake Chart*



Easat's Primary Surveillance Radar (PSR) systems are optimised for aircraft approach and long-range en-route air traffic applications.

Easat PSR radars offer excellent system stability, effective clutter attenuation and elimination of false targets enabling high probability of target detection out to ranges of 85 NM.

The high precision dual-beam of Easat's PSR antennas ensures reliable coverage even under severe ground clutter conditions. Advanced algorithms and beam switching techniques mitigate dynamic high-speed clutter, such as wind turbines, trains and road traffic.

Easat PSR radars include independent high-resolution weather channels, providing precise information on weather conditions (US-NWS 6 level).

Easat PSR radars feature advanced modular design, full solid-state technology and comprehensive integrated BITE systems, ensuring low running costs and minimal maintenance requirements.

Easat provides complete turn-key solutions, to include a range of antenna tower options, civils works, installation and after-sales service.

General & Mechanical*

Type	Cosecant^2 Shaped Reflector (PSR)
Aperture Size	4.9x 3.1 m
Total weight (incl. Turning Gear & Motor, Excluding LVA)	4000kg
Height	4.7 m
Height including Pedestal & SSR	6.2 m
Max Swept Radius	3.6 m
Drive Type	Dual Redundant 15 kw
Rotation Rate (Typical)	6 to 15 RPM
Design Life with Planned Maintenance	20 years
PSR Antenna Tilt	-5° to +5°
Azimuth Coverage	360°
Elevation Coverage	0° to +45°
MTBF	>36,000 Hours
Noise Level @20 m	63 dB

Environmental*

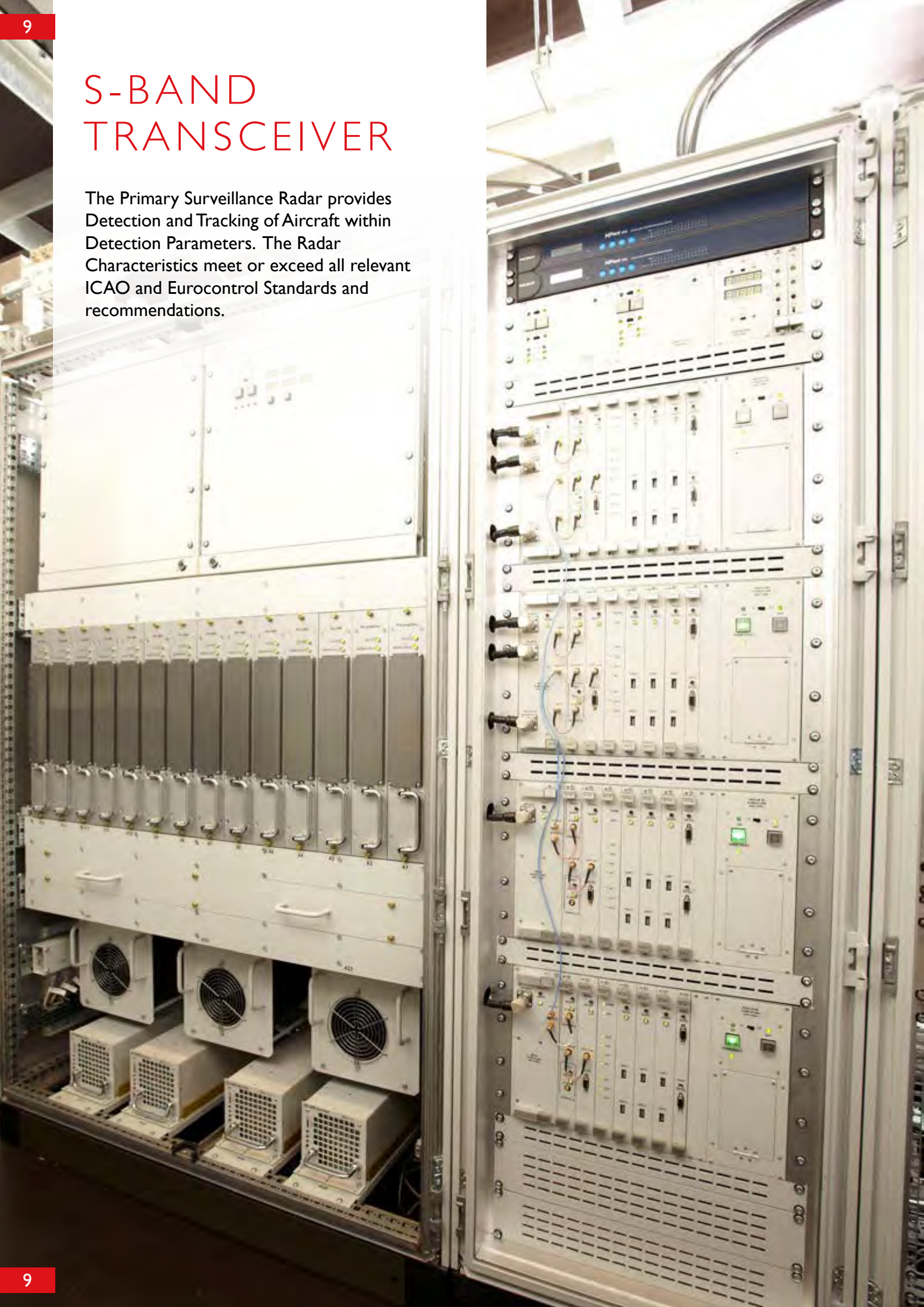
Wind Speed (Operational)	With MSSR LVA: 167 KPH (90 Knots) with 12mm Ice
Wind Speed (Survival)	With MSSR LVA: 223 KPH (120 Knots) with 12mm Ice
Temperature	-40°C to +49°C (incl 1,160 Watts Solar Radiation)
Humidity	100%RH
Altitude	Sea Level to 3,500 m
Protection	Suitable for Coastal Environment
Sand & Dust	MIL-STD-810 (or Equivalent)
Hail	Up to 30mm Diameter
Precipitation	100mm per Hour

Electrical Specification: S-Band*

Beam Characteristics	Low (Main) Beam	High (Aux) Beam
Gain (including Microwave Loss)	≥34dB	≥32.5 dB
VSWR (Average / Peak)	≤1.5 : 1	
Side Lobes	<-2.5 dB	
Frequency Range	'S' Band · 2.7 ·2.9 GHz	
Circular Polarisation (Both Beams)	≤ -19 dB ICR Measured in the Principal Azimuth and Elevation Planes	
Azimuth Beamwidth (-3dB)	1.45° + 0.1°	1.45° ± 0.1°
Azimuth Sidelobes (Referenced to the Peak of the Main Beam)	≤ -25 dB from 0° to ± 10° ≤ -30 dB (from ±10° to ± 30°) ≤ -35 dB (from ±30° to ± 180°)	
Elevation Beamwidth (-3dB)	≤4°	≤ 6°
Signal Output.s (Both Beams)	Target-Co-Polar Signal: Weather- Cross Polar signal	

S-BAND TRANSCEIVER

The Primary Surveillance Radar provides Detection and Tracking of Aircraft within Detection Parameters. The Radar Characteristics meet or exceed all relevant ICAO and Eurocontrol Standards and recommendations.



The PSR System features:

- Fully Solid-State, Air-Cooled, Fail-soft Transceiver using GaN Semiconductors for High Performance and Long-Life
- Dual / Redundant Design to ensure continued Radar Operation in case of Equipment Failure
- Comprehensive BITE and CMS allows Automatic Switch-Over to Stand-By Equipment when Fault is Detected
- Most LRU Spares are Hot-Swappable to allow Continuous Radar Operation
- Coherent Reception, Digital Radar Signal Processing System for a High Target-Detection Probability
- Frequency Diversity Mode throughout the complete Coverage Volume In Short and Long-Pulse
- Digital Signal Generation and Compression to ensure High Stability
- MTD Target Signal Processing;
- Adaptive adjustment of Digital Receiver Parameters to Minimise False Reports
- Data Plot Extraction Processing;
- Radar Data Recording and Playback using PPI
- Local and Remote Control and Monitoring
- Weather Data Processing to 6 Levels
- Automatic or Manual Switching between Polarisation Modes (Linear or Circular) to Improve Weather Clutter Rejection
- Tailored Spares, Maintenance & Upgrade Packages available

Specifications*

Transceiver

Frequency Band	S-Band, 2700 -2900 MHz
Frequency Diversity	Yes, 2 Programmable Frequencies are used in Short and Long-Pulse
Frequency Agility	Yes
Amplifier Type	Solid-State (GaN), Fail-Soft, N+1
Peak RF Output Power	17 kW Nominal (15 kW min.)
Pulse Width	Up to 100 µsec, Programmable
Duty-Cycle	Up to 10%
Cooling System	Forced-Air (Internal Fans)

Receiver

Receiver Type	Digital Receiver with Dual Frequency Converters
Tangential Sensitivity	-102 dBm (-120 dBm after Pulse Compression)
Dynamic Range	75 dB (93 dB after Pulse Compression)
Noise Figure	typ. 1.3 dB
Number of False Plots (per Scan, Averaged)	< 10

Antenna

Polarisation	Linear and Circular
Antenna Type	Cosecant^2, Main + Aux Beams
Instrumental Range	> 80 NM (RCS = 2m^2, Pd = 90%)
Min. Range	0.25 NM
Azimuth Visibility	360°
Elevation Angle	0° – 45°
Max. Height	40,000 ft

Signal Processor

A-MTD	Yes
Min/Max Doppler Speed	20/800 Knots
Clutter Maps, Automatic	Yes
Beam Switching Maps	Yes
STC Maps	Yes
Probability of False Alarm (Plot Processor)	< 10^{-6}
Range Accuracy	50 m
Azimuth Accuracy	0.1°
Range Resolution	230 m
Azimuth Resolution	2°
MTD Improvement Factor	> 60 dB
Processing Delay (Latency)	< 45 Deg (< Update Rate)

MSSR

MONOPULSE SECONDARY SURVEILLANCE RADAR

- Developed in full compliance with ICAO and Eurocontrol
- Mode 1, 2, 3/A, C and Mode-S ELS/ EHS
- Automatic system reconfiguration and switch-over
- Built-in data processing and suitable for combining for MSSR, PSR, ADS-B and MLAT
- Built-in track processor and output data formatter
- BITE for continuous monitoring of MSSR subsystems and non-radar equipment
- Diagnostic CMS to provide local and remote control of operation
- Archiving, playback and statistical analysis of surveillance data
- Cost-effective and low maintenance cost solution
- Remotely controlled SSR Mode-S monitor
- Built-in extended reception channel testing
- Transportable version available
- Tailored Spares, Maintenance & Upgrade Packages available

Easat is a leading supplier of advanced Mode S Monopulse Secondary Surveillance Radar (MSSR) systems for global Air Traffic Management applications.

Easat's latest generation of Mode-S MSSR has been designed to ensure that it is fully compliant with ICAO requirements and Eurocontrol standards. Easat MSSRs are intended for cooperative air traffic control surveillance in accordance with elementary and enhanced Mode-S specifications.

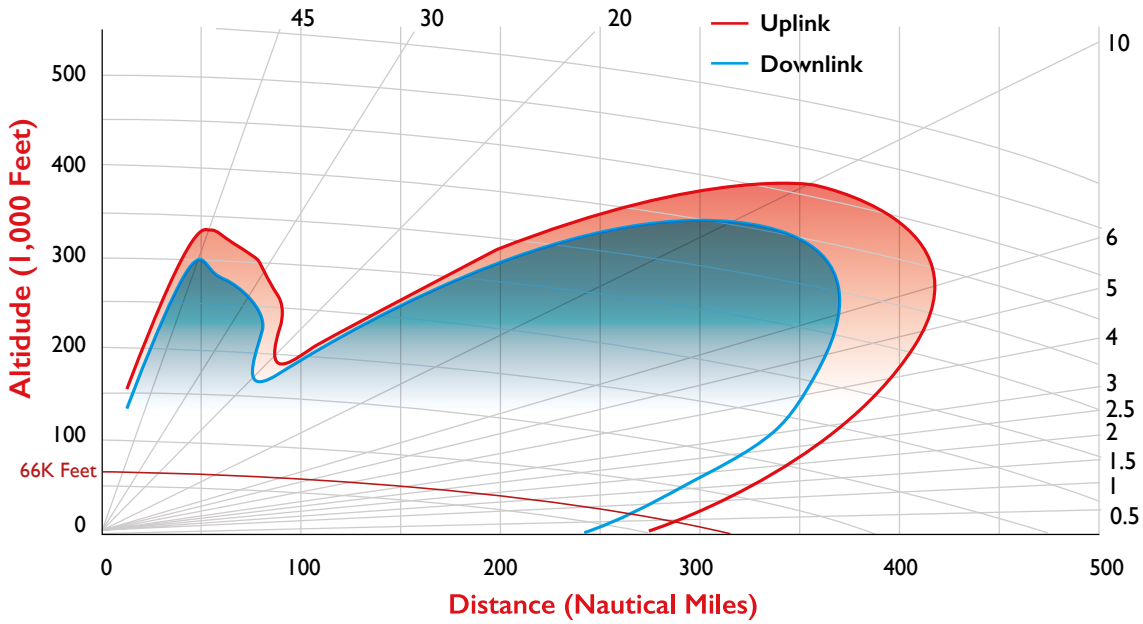
Easat's MSSR can be used either as a stand-alone system or integrated with PSR, ADS-B and M-LAT systems. In situations where MSSR is to be integrated with other surveillance systems, common content management and advanced tracking will ensure that combined targets, as well as process status and performance parameters, are displayed simultaneously.

The Easat MSSR system is highly flexible with open architecture which is easily adapted to meet customer requirements.

Specifications*

Minimum Range	0.25NM
Maximum Range	256NM
Height	66,000 ft
Elevation	0.3-45 deg
Repetition Frequency	50-250 Hz
Rotation Period	6 to 15 RPM
Maximum Number of Aircrafts per Scan	1,000
Maximum Number of Aircrafts In a 10° Sector	100
Azimuth	0.068 deg
Range Accuracy, Mode-S	15m
Range Accuracy, Mode AC	30m
Detection Probability	99%
Code Detection Probability	98%
Probability of Code Validation:	
Mode A/C, greater than	98%
Mode S, greater than	99%
Multiple Target Reports by Splits	0.1% From Total
False Reports, not more than	0.1% From Total
Probabillty of Combining MIOS MSSR Information with PSR	0.95
Aircraft Azimuth Information Delay, not more than	30 deg
Interrogation Modes	1, 2, 3/ A, C, S ELS/EHS All combinations
Availability	0.99998
Drive Type	Dual Redundant

Easat MSSR Vertical Coverage*



MSSR INTERROGATOR

- High Level of Integration and Modularisation using the latest well proven Technologies without losing Full Redundancy in Operational Equipment to meet System Availability. Hot Stand-By Redundant Configuration
- Simple, Reliable, Contrasted and Robust Design of the Radar Station concept based on experienced Dual Local Area Network Technologies
- Complete Remote Control and Monitoring System including a powerful BITE System to help Technical Maintenance Staff
- Modern Connectivity between Radar Stations and Area Control Centres using different Network Protocols Free of Errors, such as X.25, IP, etc. to help Diffusion of Radar Data and other Data Types depending on Project Scope
- Mode-S Level 4 Transponder Upgradable to Level 5
- Tailored Spares, Maintenance & Upgrade Packages available

Easat's Monopulse Secondary Surveillance Radar (MSSR) Mode-S System is a modern solid-state fully dual/redundant cooperative radar system conforming to ICAO recommendations and EUROCONTROL requirements.

The 100% digital monopulse radar can be used either stand-alone or in combination with a primary surveillance radar (PSR). An integrated ADS-B system further enhances ATC surveillance capability and flight safety.

The radar system features redundant/dual system architecture, high-reliability, low maintenance, and quick repair times. COTS equipment is used wherever feasible and appropriate to simplify system expansion and upgrades over time. These include industry-standard networking equipment, PC/servers, racks, fans, power-supplies, rotary joints, azimuth encoders, etc.

Comprehensive built-in test equipment (BITE) immediately detects any system faults and alerts the user through the local and remote control & monitoring system (LCMS/RCMS) and via indicator lights on the radar equipment itself. All critical electrical components and circuit boards are redundant and mounted on hot-swappable line-replaceable units (LRUs).

The Mode S MSSR will interrogate, detect & track all aircraft location and movement parameters for aircraft with active 1090MHz transponders and correctly-formed replies in modes 1, 2, 3/A, B, C and S within the volume of airspace centered on the radar antenna.

Specifications*

Coverage Area

Maximum Range	256 NM
Minimal Range at 100 ft	0.25 NM
Low Level Coverage on Departure	1 NM
Height	66,000 ft
Elevation	0.3 - 45.0 Deg
Repetition Frequency	50 - 250 Hz
Rotation Period	4-10 sec
Maximal Number of Aircrafts per Scan	1,000
Maximal Number of Aircrafts in a 10° Sector	150
Interrogation Modes (Interlace Modes: Single, Dual, Triple)	1, 2, 3/A, C, S Modes

Surveillance Position Accuracy (Mean-Square Error)

Azimuth	0.068 Deg
Range Accuracy, Mode A/C	30 m
Range Accuracy, Mode S	15 m

Surveillance Position Accuracy (Systematic)

Azimuth, Elevations between 0 Degrees and 6 Degrees	0.022 Deg
Azimuth, Elevation Higher than 6 Degrees	0.033 Deg
Range	14 (1/128 NM) m
Time Stamp	100 ms
Detection Probability, No Smaller	0.99
Code Detection Probability, No Smaller	0.98
Probability of Code Validation	
Mode A/C, Better Than	98%
Mode-S, Better Than	99%
Mode 3/A, C Code Correctness (on Average), No Smaller	99.90%
Multiple Target Reports by Splits, No Higher	0.1 % from Total

SMR

SURFACE MOVEMENT RADAR SYSTEM

- Suitable for Integration with A-SMGCS System
- Printed Parallel-Fed Array – Zero Squint with Frequency
- Circular polarisation for weather penetration and Inverse Cosec^2 beamshape to minimise effects of rain clutter
- Solid state transceiver - frequency selection across 9.0 to 9.5 GHz X-band for maximum flexibility
- Parallel feed array - no squint with frequency
- Sub 0.33 degree azimuth beamwidth
- Gain: 35.5 dBi at 9.5GHz
- Rotation rate (typical): 60 RPM
- Anti-Icing Option Available
- Tailored Spares, Maintenance & Upgrade Packages available

Easat Solid-State, Dual Redundant X-Band Transceiver

The Easat X-Trac Surface Movement Radar (SMR) provides Radar Surveillance of Aircraft, vehicles and other objects within the Airport Perimeter (Runways, Taxiways, Parking, and Apron Areas) for the Air Traffic Controllers. The Design of the Radar System helps ensure Detection and Tracking of very small targets in severe clutter (Rain, Fog, Snow) and other Reduced Visibility Conditions.

Easat's X-Trac SMR can be supplied as a stand-alone Surface Movement Radar System or integrated into Advanced Surface Movement and Guidance Control System (A-SMGCS) without any modification or enhancements required.

Easat's State-of-the-Art SMR Radar Sensor, 79 in operation worldwide, includes Several Unique Beneficial Features:

- Printed Parallel-Fed Array – No Squint with Frequency
- Simple, IP66, Lightweight, Low-Cost Installation without the need for a Radome
- Narrow Azimuth Beam-Width for high resolution on small targets
- Circular Polarisation
- Inverse Cosec^2 Beam-Shape
- Sub 0.4° Narrow Azimuth Beam-Width
- Coverage to -40° below the Horizon

Range	500m	1,000m	1,500m	2,000m
EA7401M	2.7m	5.4m	8.1m	10.8m
21ft SWG	3.3m	6.6m	9.9m	13.2m
Improvement over 21ft Slotted Waveguide Antenna	**0.6m**	**1.2m**	**1.8m**	**2.4m**

Specifications*

RF Frequency Range	9.0 - 9.5 GHz
Output Peak Power, >	50 W
Pulse Width, Short	25 ns
Azimuth Coverage	360°
Antenna Rotation Speed	60 RPM
Processing Delay (Raw Video)	<250 ms
Overall Dynamic Range	140 dB
Noise Figure	Amplifier Noise 2 dB Overall Noise figure ≤ 4 dB built-in circulator and limiter
Range Cell Size	1.875 m
Range Resolution	≤ 5 m
Range Accuracy	≤ 3.5 m
Azimuth Resolution (up to 2 Km)	≤ 15 m
Azimuth Accuracy (up to 2 Km)	≤ 5 m
Report position accuracy as Defined by ICAO (up to 2 Km)	≤ 5 m
Target Displacement Detection in any Direction (up to 3 Km)	≤ 5 m
Temperature Range	**Transceiver** 0 to +35 °C **SMR** -40 to +55 °C
Relative Humidity	10 - 80 %

PAR

PRECISION APPROACH RADAR

- High Performance, Solid-State, Dual Redundant X-Band Transceiver / Receiver
- Integration to ATM Automation System
- Automatic Target Tracking
- Fully Coherent Processing and Frequency Diversity
- Fully Configurable Signal and Data Processing Algorithms
- Advanced Control & Monitoring System (CMS) with Remote Support Capabilities
- Radar Maintenance Display & Tools for Radar Performance Monitoring;
- Extensive Built-In Test Equipment (BITE)
- Fully-Remote Operation via Data Links
- Temperature and Humidity Controlled Equipment Shelter or Room
- Uninterrupted Power Supply
- Back-Up Generator
- Tailored Spares, Maintenance & Upgrade Packages available

Specifications*

Type	Shaped Reflector
Aperture Size	Azimuth: 4.05 x 1.5 m Elevation: 5.45 x 1.5 m
Total Weight	3,000 kg
Update Period	1 sec
Design Life	20 Years
Wind Speed	120 KPH Operational 240 KPH Survival
Temp	-50 to +50°C
Humidity	5 - 99%
Altidude	Sea level to 3,500m
Protection	Suitable for Coastal Environments

Easat Solid-State, Dual Redundant X-Band Transceiver

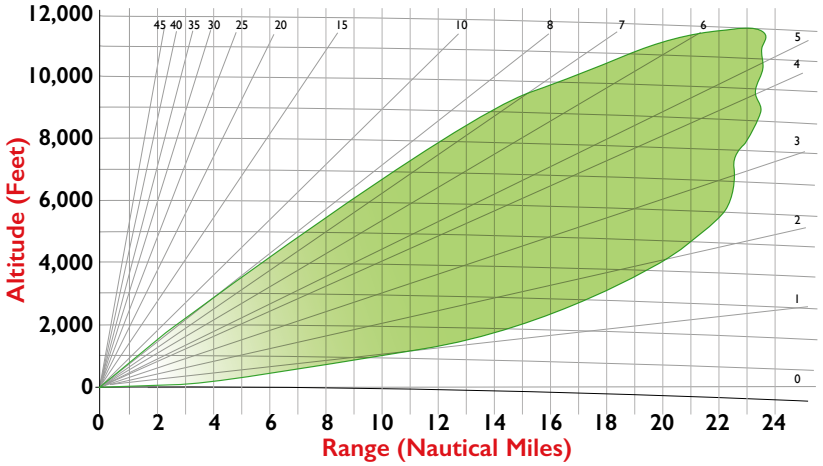
Easat's Precision Approach Systems are optimised for aircraft approach and air traffic control applications.

The Precision Approach Radar is a solid-state, state-of-the-art system that meets and exceeds international ICAO annex 10 standards, its provides excellent performance characteristics, high reliability, long-life and low cost of ownership.

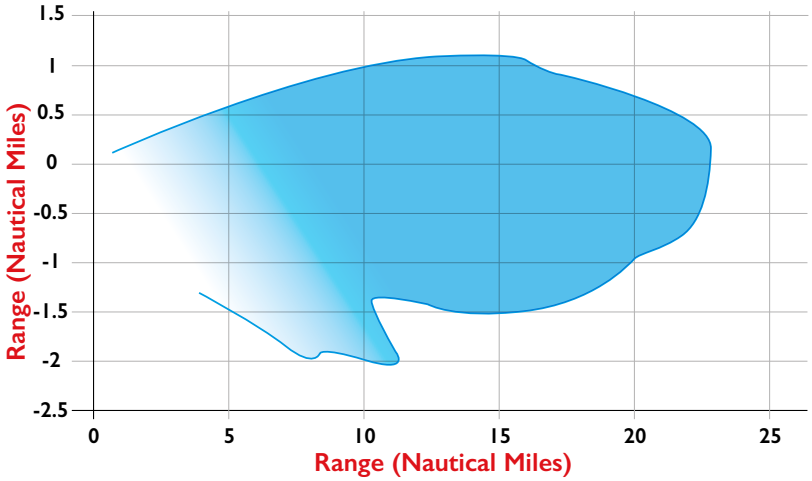
The PAR is a Radar intended for Directing the Approach and Landing of all types of Aircraft. The PAR provides Automatic Target Tracking from the entering Descent Trajectory until the Touchdown Point on the Runway. The PAR measures Elevation Angle and Azimuth Position of Targets and provides Output Radar Data to the ATM System by means of ASTERIX Cat 34/48 Data Format.

The System consists of a High Power, Solid-State, Dual-Redundant X-Band Transceiver coupled with PAR Antenna System.

Easat Course Range Blake Chart*



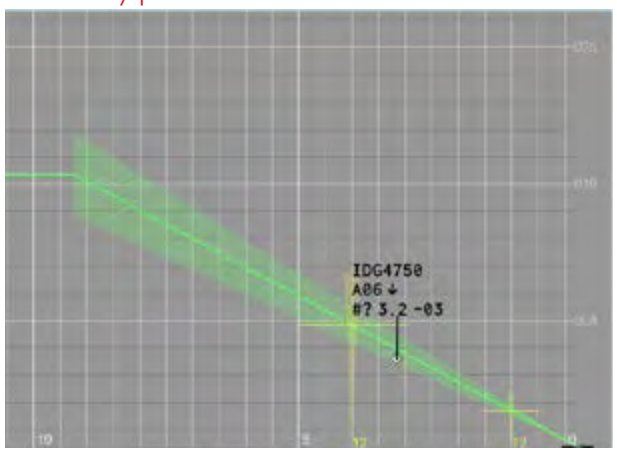
Easat Glide Range Blake Chart*



Specifications*

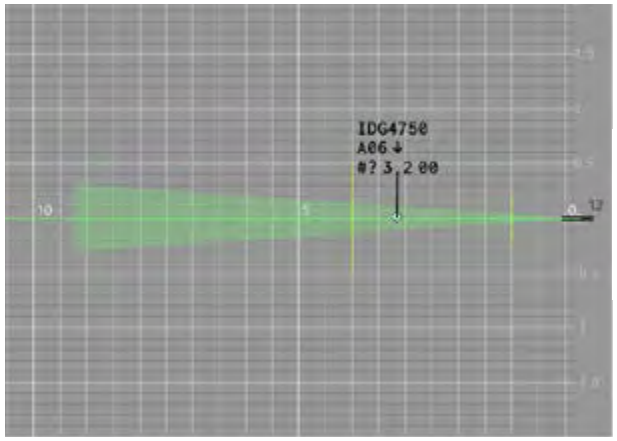
Frequency Range	9.0 - 9.5 GHz
Elevation Coverage	-1° to +9°
Azimuth Coverage	30° (±15°)
Polarisation	Circular
Encoder Resolution	14 Bit
Peak Output Power	>300 W
Monochrome Pulse Width, Short	300 ns
Non-Linear Frequency Modulated Pulse Width, Long	30 µs
Pulse Compression	100
Receiver Bandwidth	6 MHz
Receiver Dynamic Range	70 dB
Noise Figure	4 dB
Maximum Range Pd = 80%, RCS = 5 m^2	42.5 km (23 NM)
Instrumental Range	42.5 km (23 NM)
Range Resolution	120m
Elevation Resolution	≤0.6°
Azimuth Resolution	≤1.2°
Range Cell Size	18.75m
Range Accuracy	<20m
Antenna Course Gain	39.7 dB
Antenna Glide Gain	36.4 dB

Typical PAR Glide Path



Range (Nm)

Typical PAR Course Path



Range (km)

X-BAND TRANSCEIVER

The X-Trac, X-Band Solid-State Transceiver is design for use in SMR, PAR and Coastal Radar Systems. It utilises advanced signal processing techniques to detect small targets in harsh environmental conditions.

The transceiver delivers high-performance, low-maintenance, high availability and reliability surveillance with customisable system parameters, such as pulse frequencies and compression, frequency diversity and equipment redundancy.

Coherent, solid-state pulse compression transceiver

Digital configuration customizable through software-defined capability

Fully integrated BITE functionality

Operational frequencies are fully configurable (501 carrier frequencies)

Super-heterodyne linear receiver

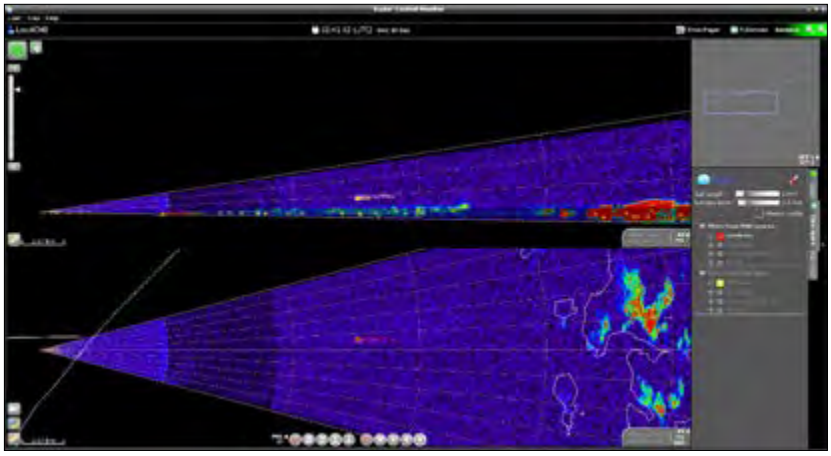
Overall dynamic range 140 dB is provided by an additional EDR channel

Easat's X-Band Transceiver comes equipped with a State-of-Art Control and Monitoring System (CMS) and Built-In-Test-Equipment (BITE).

- Local and Remote Terminals (Computer, Display, Keyboard, and Mouse)
- Various Built-in-Test-Equipment Sensors and Controllers distributed in Radar System and Auxiliary Equipment
- Telecommunications and Network Equipment
- Software for System Status Visualisation. The Software package is Fully Field-Proven by usage in numerous Installations as part of PSR, MSSR, PAR, ADS-B and SMR Systems
- Identify the Current Radar System Operating Mode and Settings
- Determine the failed components and sub-systems of the Radar System
- Display Radar System Status on LCT/RCT screens, Unit Panels and Shelters
- Provide Visual and Audible Alarms in case of Failure
- Reconfigure the Radar System when Failure state is detected. Such Reconfiguration can be done Automatically or Semi-Automatically
- Provide Repair recommendations in case of failure
- Provide Formalised Reliability Reports and Logs based on Recorded Data
- Tailored Spares, Maintenance & Upgrade Packages available

SMR Raw display on CMS

SMR Control Monitoring System Display



PAR Raw display on CMS

PAR Control Monitoring System Display

M-LAT

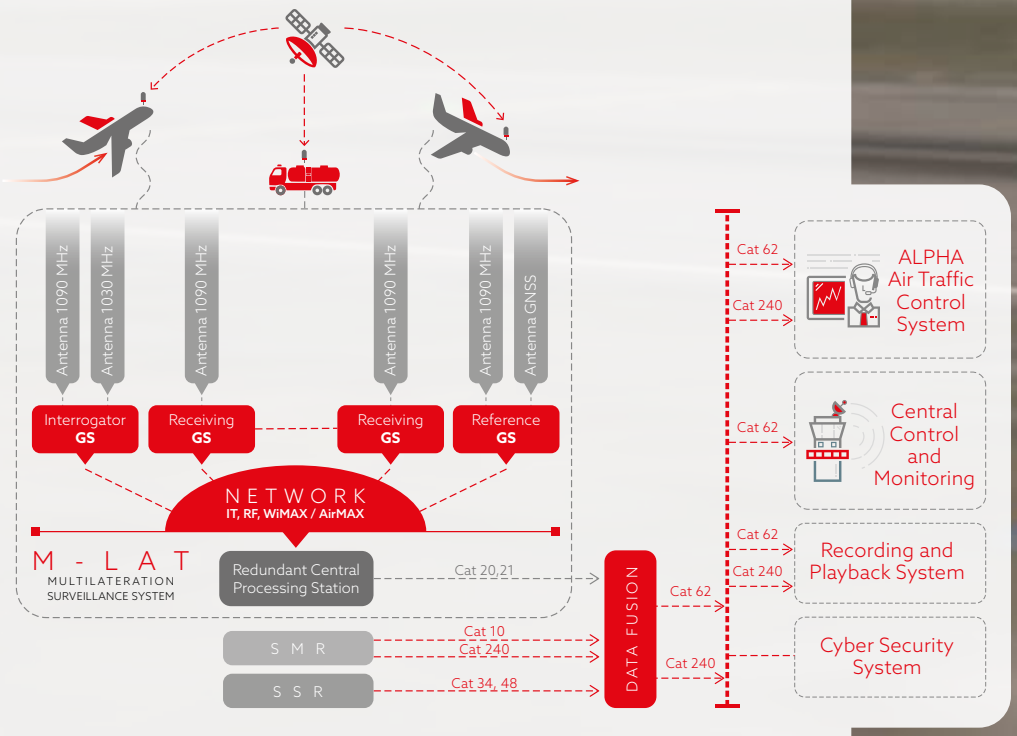
MULTI-LATERATION RADAR SYSTEM

Easat's MLAT System meets all ICAO and EUROCAE Standards and is intended to provide Cooperative Surveillance of Aircraft and Vehicles.

The Systems can easily be expanded to provide seamless Coverage from the ground to En-Route Airspace through the addition of Remote Ground Stations, without the need for Additional Processing Hardware

Being a key Subcomponent in applications ranging from Advanced Surface Movement Guidance and Control Systems (A-SMGCS) to nationwide Air Traffic Management systems, MLAT provides:

- High Precision Passive Surveillance
- Accurate Real-Time Position of all Objects Equipped with a Mode A/C/S, ADS-B Transponder in all Weather Conditions
- ADS-B Data Processing
- Relevant Identification of Targets
- Track Reports Delivery to External Systems
- System Status Reporting
- Suitable for Integration to an A-SMGCS System
- Tailored Spares, Maintenance & Upgrade Packages available



- Cost-Effective and the Most Accurate Ground Surveillance System
- Meets Current and Future Air Traffic Management Needs
- Independent Surveillance – Own Measurement of Position
- Stable Accuracy and High Position Update Rate
- Full Integration WITH ads-b Systems
- Supports Surface Movement Applications
- Improves Situational Awareness through Aircraft Derived Data;
- Uses all Existing Avionics: Mode A/C, Mode S and ES
- Own Mode A/C/S Interrogator;
- No Dependance on GNSS - Own Transceivers used for Time Synchronisation
- Great Flexibility and Scalability due to Modular Approach
- Ability to Communicate Internally using a Variety of Available Link Technologies
- Simple Coverage Expansion
- Rapid Deployment
- Low Ground Equipment Costs
- Suitable for Operation in the Most Difficult Environments
- Minimal Number of Components;
- Multiple Levels of System Redundancy
- High Availability through the Implementation of N1/N-2 System Design
- End-to-End Testing, Remote Control and Monitoring of the System down to LRU Level
- Low Maintenance
- The Lowest Life Cycle Costs

Specifications*

Parameter	Ground Station (GSR)	Ground Station (GST)	Reference Ground Station (RGS)
Mode	Receive-Only	Receive and Transmit	Receive and Transmit
Functions	Detects, Time Stamps, Processes Target Messages	Detects, Time Stamps, Processes Target Messages Elicitation of Replies from Targets using 1030 MHz Interrogations	Detects, Time Stamps, Processes Target Messages Distribution of Reference Timing Information throughout the System via 1090 MHz Signals
Main Components	1090 MHz Receiver UPS/Battery Backup Network Equipment	1090 MHz Receiver 1030 MHz Transceiver UPS/Battery Backup Network Equipment	1090 MHz Receiver 1030 MHz Transceiver UPS/Battery Backup Network Equipment
Typical Power Consumption	25 W	100 W	50 W

Number of Data Output Interfaces	2 x Ethernet Network Technologies for Further Data Transmission – in Accordance with the Requirements of the Customer
Autonomy	> 1 Hour
Operation Temperature	-40 °C … +55 °C
Operation Humidity	95% Non-Condensing
Enclosure IP Rating	IP66 robust outdoor enclosure
MTBF	> 20,000 Hours
MTTR	< 30 Min
Availability	0,9999

Receiver Sensitivity	-91 dBm for Mode A/C/S
Update Rate	Not more than 1 sec
Horizontal Position Accuracy on the Runways	Within 7.5m with confidence of 95% Within 12m with confidence of 99%
The maximum delay in the processing of informant	Not more than 1 sec
Number of Simultaneously Processed Targets	Not Less than 250

ADS-B

AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST

Easat's ADS-B Ground System meets all ICAO and EUROCAE Standards and is intended to provide Cooperative Surveillance of Aircraft and Vehicles equipped with ADS-B Transponders and is fully integratable with ATM System.

The ADS-B Ground System is a fault-resistant versatile and open system solution, based on COTS components and easily adaptable to customer needs due to its modularity, scalability and flexibility.

A complete ADS-B Ground System consists of four main subsystems:

- ADS-B Ground Station(s)
- Traffic Situation Display (TSD)
- Control and Monitoring System (CMS)
- Central Processing Station (CPS)
- Tailored Spares, Maintenance & Upgrade Packages available

ADS-B Ground Station(s)

This is the basic subsystem to be installed and operated unattended at remote sites as a surveillance sensor. It is a fully functional element of the system, capable of outputting data directly to external systems.

Traffic Situation Display (TSD)

This is a Human Machine Interface (HMI) subsystem intended to display surveillance area maps and target labels with identification, position and other information regarding aircraft, vehicles and other relevant targets.

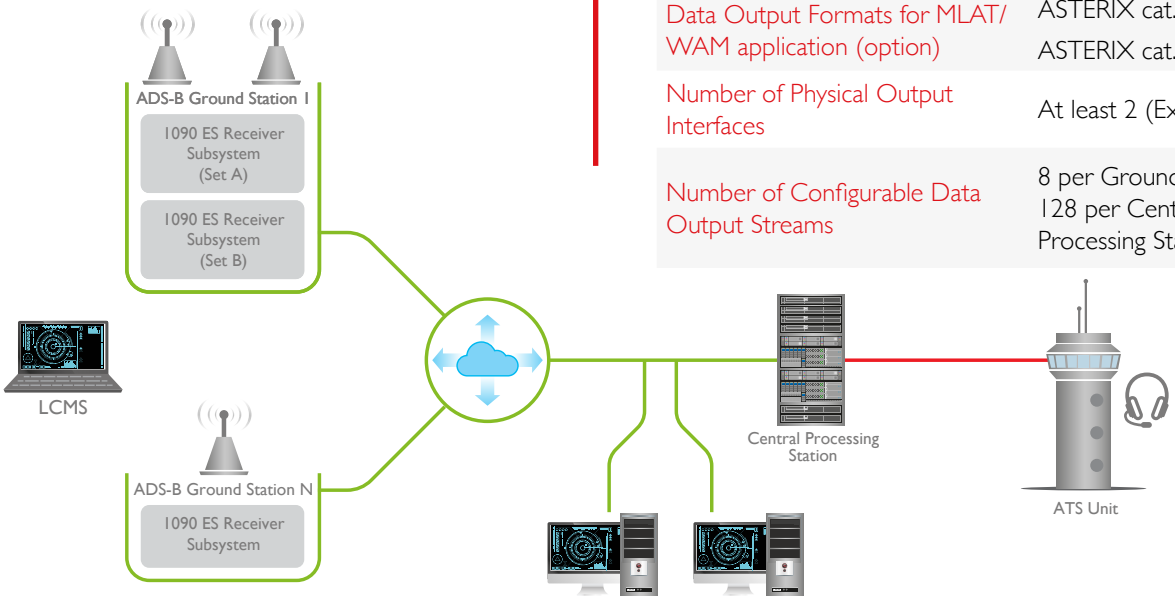
Control and Monitoring System (CMS)

Centralised and local Control and Monitoring Systems (CMS) are intended to monitor, configure and control the ground station(s) and the ADS-B Ground System as a whole. CMS has user-friendly HMI and built-in Traffic Situation Display (TSD) functions.

Central Processing Station (CPS)

The redundant Central Processing Station is a processing subsystem that collects surveillance data provided by ground stations, performs multi-sensor data fusion and surveillance data processing. The CPS provides advanced management of the surveillance output data flows and ensures data integrity.

Vehicle Transponder of the ADS-B System



Specifications*

Coverage

Detection Range	not less than 450 km / 250 nm (line of sight)
Detection Height	at least 0… 20,000 m
Azimuth	0 to 360°

Tracking Parameters

Number of Aircraft	at least 300 Aircraft / Second
Target Capacity	> 1000 Tracks
Probability of Data Updates Every 2 sec	not less than 0.98
False Alarm Probability	less than 0.00003
Latency	less than 500 ms
Number of Receiving Omnidirectional Antennas	2 (1090MHz + GNSS antenna)
Receiver Operating Frequency	1090 ± 1 MHz
Receiver Sensitivity	not worse than 93 dBm
Receiver Dynamic Range	-85 dBm and -10 dBm (SMR>99%)
Probability of Detection	> 90%
Supported GNSS for Time Synchronisation	GPS / GLONASS
Absolute Error of the Target Position and Velocity Reception Time relative to the UTC	not more than 25 msec
In case of Loss of Synchronisation, the Time Accuracy is Maintained	at least 30 Minutes;
Data Update Rate	1…10 sec
Data Output Modes	Periodic Data Driven
Data Output Formats over UDP/IP/Ethernet or HDLC	ASTERIX Cat. 021 ASTERIX Cat. 023 ASTERIX Cat. 247
Data Output Formats for MLAT/ WAM application (option)	ASTERIX cat. 019 ASTERIX cat. 020
Number of Physical Output Interfaces	At least 2 (Expandable)
Number of Configurable Data Output Streams	8 per Ground Station 128 per Central Processing Station

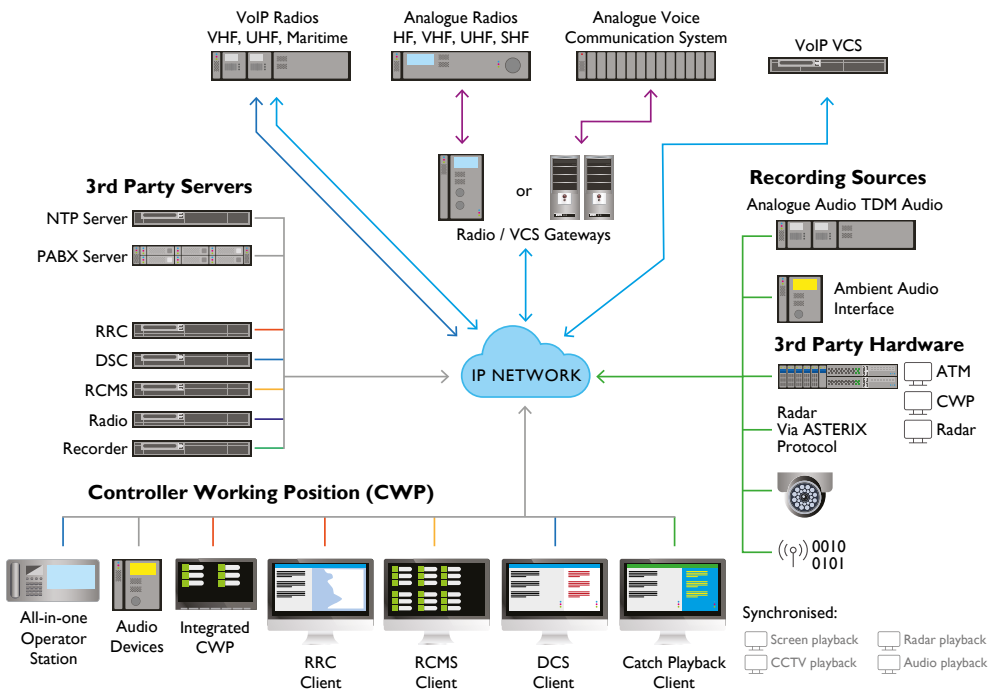
RADIOS, RECORDERS & COMMS SYSTEMS

To complement Easat's ATM and A-SMGCS Systems, Easat offer a range of VHF and UHF Radio Systems along with Recorders and Voice Communication Systems.

- Customisable to Customer Specific requirements;
- VHF & UHF ATC Radios for Fixed and Mobile Ground Stations providing a Radio Connection to the Aircraft for Voice or Data ATC Communications;
- Compliant to ED-137 A, B and C ensuring Compatibility with IP-VCS Systems;
- Radios can be Configured as Main/Standby Pairs with Automatic Switchover in the Event of an Alarm or Failure;
- VHF Radios developed with Secure Software methodology in mind to achieve Eurocae ED-109A Software Assurance Level 5 (AL5);
- Offered Radios have Intelligent Built-in-Test Equipment which enables Radios to Continually Monitor own Environment and Performance and Alerts Operator with Diagnostic Information;
- All Radios offered with Remote Control and Management System (RCMS) for providing Peace Of Mind and Easy Configuration of the network from a Simple Web Interface, with Remote Testing and Monitoring.
- Recorder Systems that Captures, Replays and Analyses all Data, ready to deliver the Total Scenario when Reconstruction of an Incident is Imperative;
- Flexible Recorder Solutions for all sizes of ATC Systems.
- Recorder and Replay Systems for ATC with ability to cover:

  - Audio Recording;
  - Video and CCTV Recording;
  - Screen Recording;
  - Surveillance Recording;
  - Radar Recording;
  - Controller Working Position (CWP) Recording;
  - Metadata Recording;
  - Ambient Recording;
  - Crash-Alarm Recording;
  - For use in both Towers, for Simple ATC Audio Recording and also Large Regional and Nationwide ATC Recording Systems.

VCCS Console



CONTROLLER WORKING POSITIONS

Training Simulator / Virtual Control Tower

As part of the Easat ATM and A-SMGCS Systems, Easat can supply a large range of standard or bespoke Controller Working Positions (CWP's) to suit all ATC & A-SMGCS System requirements.

Key Benefits / Options:

- Tailor-Made Solutions
- Ergonomic Designs from High-Quality, Durable Materials
- Large Range of Configurations i.e. Linear, Angled or Curved Designs
- Modular Designs that can be Upgraded for Future Proofing
- Built-In Ventilation
- Built-In Cable Management
- Easy On-Site Assembly
- Variety of Colours available
- Touch Screens, KVM Extenders
- Integrated VCCS Systems
- Electronic Flight Strips
- Flight Strip Printer

CIVIL ENGINEERING

SITE SURVEY

DESIGN & CONSTRUCTION

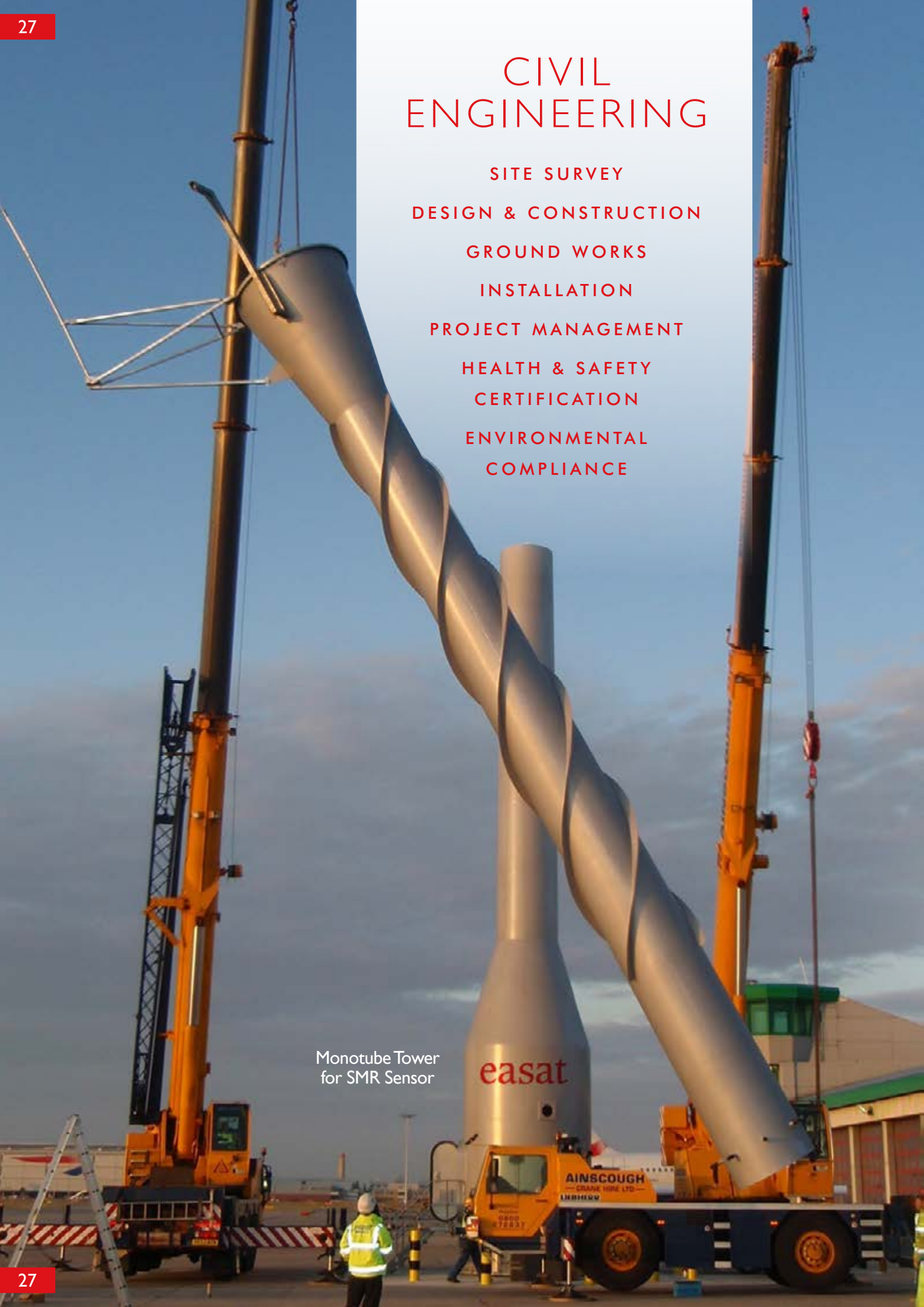
GROUND WORKS

INSTALLATION

PROJECT MANAGEMENT

HEALTH & SAFETY CERTIFICATION

ENVIRONMENTAL COMPLIANCE



Monotube Tower
for SMR Sensor

LATTICE TOWERS

- In-House Design, Manufacture and Installation
- Standard and Customer & Site Specific Designs available
- In-House Design, Manufacture and Installation of Environmental, Temperature & Humidity Controlled Equipment Stand-Alone Equipment Shelter
- Quick and Easy Integration with the Foundations
- Low Cross Sectional Area, Minimising the Foundation Size
- Bespoke Spares & Maintenance Packages available

MONO-TUBE TOWERS

- In-House Design, Manufacture and Installation
- Standard and Customer & Site Specific Designs available
- Built-In Environmental, Temperature & Humidity Controlled Equipment Room removing the need for a Stand-Alone Equipment Shelter
- Quick Erection that minimises the Site Disruption, Speeds up the Radar System Installation and On-Site Commissioning;
- High Stiffness / Low Deflection Characteristics, Improving the Radar System Performance
- Bespoke Spares & Maintenance Packages available

RADOMES

- Supply and Installation
- Standard Design or Site Specific Design Available
- Customisable Configurations Available
- Variety of Sizes Available for all types of Radar System
- Bespoke Spares & Maintenance Packages available

PSR

	System / Radar-site Location	Qty	Country/End User	Manu Date/ Del Date
1	RAPCON station (PAR-PSR-MSSR, ADS-B, VCCS, VHF/ UHF Radios,ATM, Recorder, shelter, UPS, Genset, workstations, displays) Dhaka Air Force	1	Bangladesh Air Force (BAF)	2020/2022
2	RAPCON station (PSR-MSSR, ADS-B, VCCS, VHF/ UHF Radios, ATM, Recorder, shelter, UPS, Genset, workstations, displays) - Wing 1 AFB, Korat - Flight Training School, Kamphang Saen	2	Thailand Royal Thai Air Force (RTAF)	2019/2022
3	Primary Antenna System (PAS) for ASR-NG Radar System	16	Germany	2018 / Present
4	PSR "MORAVA 10" co-mounted with Mode-S MSSR M10S and ADS-B - Almaty International Airport, Petropavlovsk Airport, Turkistan International Airport	3	Kazakhstan / State Enterprise	2017 / 2017
5	Primary Antenna System (PAS) ASR-NG Radar System	10	Australia / Air Force	2016 / 2016
6	Deployable Antenna System (DASS) for 3D ASR-NG	3	UK / MoD	2015 / 2015
7	PSR "MORAVA 10" co-mounted with Mode-S MSSR M10S and ADS-B / Astana Capital Airport	1	Kazakhstan / State Enterprise	2015 / 2015
8	PSR "MORAVA 10" co-mounted with Mode-S MSSR M10S and ADS-B / Kokshetan Airport	1	Kazakhstan / State Enterprise	2015 / 2015
9	PSR "MORAVA 10" for Balkhash Airport	1	Kazakhstan / State Enterprise	2014 / 2014
10	D-RAPCON Military Transportable PSR S and L-band Antenna with PSR Sensor	3	USA / Raytheon (USAF & ANG)	2013 / present
11	PSR "MORAVA 10" co-mounted with 3rd-party MSSR at Uljin Airport	1	Korea / KOCA	2013 / 2013
12	PSR "MORAVA 10" for Asmara Airport	1	Eritrea / ECAA	2012 / 2012

	System / Radar-site Location	Qty	Country/End User	Manu Date/ Del Date
13	Primary Surveillance S Band System installation with FB monotube tower and Civil works	1	UK / Birmingham Airport	2012 / 2012
14	Easat EA5025 PSR Antenna - Edinburgh Airport	1	UK / NATS	2009 / 2009
15	Primary Surveillance Radar and FB monotube tower and Civil works / Hawarden (Chester) Airport	1	UK / Airbus	2011 / 2011
16	PSR "MORAVA" - Uralsk Airport, Kostanai Airport	2	Kazakhstan / State Enterprise	2010 / 2010
17	PSR "MORAVA" - Palanga International Airport, Kaunas International Airport	2	Lithuania / State Enterprise	2009 / 2009
18	Primary Antenna System / Edinburgh International Airport	2	UK / NATS	2010 / 2011
19	PSR "MORAVA" - Zhezgazgan International Airport - Kyzylorda International Airport - Semey International Airport - Aqtau International Airport	4	Kazakhstan / State Enterprise	2008 / 2008
20	Tactical Military Transportable TPS-79 PSR Antenna with Integrated S & L-Band / Classified	21	USA / Lockheed Martin	2002 / 2002
21	EA45075 X-Band PSR Antenna Sensor	6	UK / Royal Navy	2005 / 2005
22	EA5025 PSR Antenna with S & L-Band Antenna / Columbia	3	Columbia CAA (Lockheed Martin)	2001 / 2001
23	PSR - EA5325, Special S-band (2.8 GHz - 3.2 GHz) Air surveillance radar sensor	7	RAYTHEON / Beijing, Mumbai, Delhi, Botswana, Zurich and Geneva	1997 / 1997
	EASAT ATC PSR GLOBAL INSTALLATIONS TOTAL	93		

easat RADAR SYSTEMS

GLOBAL INSTALLATIONS

www.easat.com
info@easat.com

MSSR

	System / Radar-site Location	Qty	Country/End User	Manu Date/ Del Date
1	RAPCON station (PAR-PSR-MSSR, ADS-B, VCCS, VHF/ UHF Radios, ATM, Recorder, shelter, UPS, Genset, workstations, displays) Dhaka Air Force Base	1	Bangladesh Air Force (BAF)	2020/2022
2	RAPCON station (PSR-MSSR, ADS-B, VCCS, VHF/UHF Radios, ATM, Recorder, shelter, UPS, Genset, workstations, displays) - Wing 1 AFB, Korat - Flight Training School, Kamphang Saen	2	Thailand Royal Thai Air Force (RTAF)	2019/2022
3	Mode-S MSSR M10/S	1	Axion USA / Paraguay	2018 / 2018
4	PSR "MORAVA 10" co-mounted with Mode-S MSSR M10S and ADS-B - Almaty International Airport - Petropavlovsk Airport - Turkistan International Airport	3	Kazakhstan / State Enterprise	2017 / 2017
5	PSR "MORAVA 10" co-mounted with Mode-S MSSR M10S and ADS-B / Astana Capital	1	Kazakhstan / State Enterprise	2015 / 2015
6	PSR "MORAVA 10" co-mounted with Mode-S MSSR M10S and ADS-B / Kokshetan Airport	1	Kazakhstan / State Enterprise	2015 / 2015
7	Mode-S MSSR M10/S Iswahyudi Air Force	1	Indonesian MoD / Air Force	2015 / 2016
8	Mode-S MSSR M10S / Pangkalan Bun Iskandar Airport	1	Indonesia MoD / AirNav	2013 / 2013
9	Mode-S MSSR M10S and ADS-B station: - Kyzylorda airport - Zhezkazgan airport - Uralsk airport - Kostanai airport - Semey airport - Aqtau airport - Pavlodar Airport - Taraz airport - Balkhash airport - Beyneu radar site	10	Kazakhstan / State Enterprise	2012 / 2013
10	Mode-S MSSR Vertex 214S Antenna	1	UK /BAE Systems	2011 / 2011
11	Mode-S MSSR M10S/ Gabala Airport	1	Azerbaijan	2011 / 2011
12	Vertex 214s MSSR Antenna / (location Classified)	2	UK / BAE Systems (MoD)	2011 / 2011
13	Hog Trough SSR Antenna Refurbishment / UK	8	UK / MoD	2010 / 2011
14	Vertex 114 SSR	1	France / Thales	2009 / 2010
15	Vertex 214M SSR antenna / multiple sites	6	Belgium / Air Force	2005 / 2006
	EASAT ATC MSSR GLOBAL INSTALLATIONS TOTAL	40		

SMR

	System / Radar-site Location	Qty	Country/End User	Manu Date/ Del Date
1	SMR System, Monotube Tower UPS, Workstations, displays	2	Nigerian Airspace Agency (NAMA)	2021 / Ongoing
2	EA7401 SMR X-band Radar System / Edinburgh International Airport	1	UK / NATS	2013 / 2014
3	EA7401H Anti-Icing SMR antenna sub-system / USA, multiple sites	6	USA / FAA	2013 / 2013
4	EA7401M SMR X-band Radar System / Oslo International Airport	1	Norway / CAA	2011 / 2012
5	EA7401D Antenna sub-system / London Luton International Airport	1	UK / NATS	2011 / 2011
6	EA7401M X-band Radar System & full equipment room / Stansted Airport	1	UK / NATS	2011 / 2011
7	EA6501H Anti-Icing X-band SMR Radar System	2	USA / FAA	2009 / 2010
8	EA7401M X-band SMR Radar system & equipment room / London Heathrow (East)	3	UK / NATS	2008 / 2009
9	EA7401M X-band SMR Radar System & equipment room / London Heathrow (West)	1	UK / NATS	2008 / 2009
10	EA7401M X-band SMR Radar System / Helsinki International Airport	1	Finland / Finnavia	2007 / 2007
11	EA7401M X-band SMR Radar System / London Gatwick International Airport	1	UK / NATS	2007 / 2007
12	EA7401M X-band SMR Radar System / Manchester International Airport	2	UK / NATS	2007 / 2007
13	EA7401D SMR Radar System / Palma de Majorca and Asturias	2	Spain / AENA	2005 / 2005
14	EA7401M X-band SMR Radar System/ London Heathrow (South) International Airport	3	UK / NATS	2005 / 2006
15	EA7401M X-band SMR Radar System / Glasgow International Airport	1	UK / NATS	2005 / 2005
16	EA7401M X-band SMR Radar System / London Heathrow (North) International Airport	1	UK / NATS	2005 / 2006
17	EA7401 SMR Radar System / Brussels International Airport	2	Belgium / Belgocontrol	2002 / 2003
18	EA3462 X-band SMR Radar System / Abu Dhabi International Airport	1	UAE / UAE CAA (Raytheon Systems)	2003 / 2003
19	EA3462 SMR Radar System / Brussels International Airport	2	Belgium / Belgocontrol	2002 / 2003
20	EA7401M X-band SMR Radar System / Toronto, Vancouver, NCTI (Navcanada Training Institute), Montreal, Calgary, St. Johns, Ottawa, Winnipeg, Quebec City, Edmonton	14	Canada / NavCanada	2002 / 2003
21	EA3462 X-band SMR Radar System / Schipol International Airport	1	Netherlands / LVNA	2001 / 2002
22	EA7401M X-band SMR Radar System / Zurich International Airport	1	Switzerland / Skyguide	2000 / 2002
23	EA6501 X-band SMR Radar System / Civilian US Airports	29	USA / FAA (Raytheon & Sensis Corp)	2002 / 2002
	EASAT ATC SMR GLOBAL INSTALLATIONS TOTAL	79		

TURNKEY AIR TRAFFIC MANAGEMENT SOLUTION

SUPPLIED BY EASAT RADAR SYSTEMS

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* All Technical Parameters within ±5% due to Local Site Conditions.
** Easat will confirm exact technical performance at time of quotation.