ATM international

MODE S MONOPULSE SURVEILLANCE RADAR

September-2017
OVERVIEW

- New generation of Monopulse Secondary Surveillance Radar (MSSR)
- More than 40 years of experience
- Contrasted functionality, improving reliability, maintainability
- Worldwide installed (more than 200 installations)
- Complies with all international standards
- Faces future needs
INDRA SOLUTION FOR MSSR MODE S

CONFIGURATIONS AVAILABLE

- Co-mounted
- Stand-alone (both transportable or fixed)

INTEGRAL SOLUTIONS PROPOSED

- Analysis of the necessities
- Coverage and site analysis
- Requirements definition
- Sensors manufacturing
- Project management
- Installation & Civil works
- Commissioning & Optimization
- Maintenance
INDRA SOLUTION FOR MSSR MODE S
INDRA SOLUTION FOR PSR S-BAND + MSSR MODE S

ANTENNA SYSTEM

SURVEILLANCE RADAR STATION

PRIMARY SURVEILLANCE RADAR

MODE S INTERROGATOR

PEDESTAL CONTROL BOX

PEDESTAL TOP CONTROL BOX

DUAL REDUNDANT CONTROL AND MONITORING POSITIONS (LOCAL)

DUAL REDUNDANT DATA COMBINERS

DUAL REDUNDANT SWITCHES

ASE – AUXILIARY EQUIPMENT INTERFACE

AUXILIARY EQUIPMENT

RADAR MAINTENANCE DISPLAY

DUAL REDUNDANT NTP TIME SERVERS

FAR FIELD MONITOR (FFM)

ATCC

CONTROL AND MONITORING POSITIONS (REMOTEE)

COMMUNICATIONS SYSTEMS (REMOTE)

WAN

(ETHernet, X.25, Frame relay, Optical Fiber...)

TOOLS

PRINTER

DUAL REDUNDANT COMMUNICATIONS SYSTEMS (LOCAL)
INDRA SOLUTION FOR MSSR MODE S

Stand-alone configuration
INDRA SOLUTION FOR MSSR MODE S

Co-mounted with 3D L-Band PSR
INDRA SOLUTION FOR MSSR MODE S

Co-mounted with S-Band PSR
MSSR MODE S - BENEFITS OF INDRA SOLUTION

**HIGH DUTY CYCLE MODE S TRANSMITTER**

- Peaks of 65% over 2.4 ms periods (Eurocontrol requires 63.7%)
- More than 6.57% continuously (Eurocontrol requires 5%)

**EARLY ACQUISITION OF TARGETS**

- Targets are acquired and reported to ATC in the first scan
  - Digital Video Processing based on very high density FPGA
  - Powerful in airport areas (for departures)

**TEST AND SUPERVISION UNIT ABLE TO PERFORM TESTS REMOTELY**

- Replies and target generation in RF level
- Measurement of interrogator signals.
- Continuous Wave generation.
- Maintenance costs reduction
MSSR MODE S - BENEFITS OF INDRA SOLUTION

**HIGHEST TARGET CAPACITY**

HIGH DENSITY TRAFFIC SUPPORTED
- More than 1080 targets per scan (Eurocontrol requires 900)

**HIGHEST COVERAGE ACHIEVED**

HIGH RANGE IN THE MARKET WORKING IN ENHANCED MODE S
- Adaptive mode S Interrogation schedule
- Allowing the highest range (256 NM) working at 15 rpm

**ADS-B INTEGRATED**

MSSR-S SYSTEM WITH ADS-B RECEPTION AND PROCESSING CAPABILITIES
- Delivers ASTERIX 021 dataflow
- Improved performances and benefits in MSSR operation
MSSR MODE S - BENEFITS OF INDRA SOLUTION

FULLY DIGITAL RECEIVER
MSSR MODE S - BENEFITS OF INDRA SOLUTION

FULLY DIGITAL RECEIVER

MOST ACCURATE

DIGITAL RX CHAIN

DIRECT 1090MHz SAMPLING

BETTER COVERAGE

SUBSTANTIAL IMPROVEMENTS

- Sensitivity and accuracy of the monopulse detector
- Fully digital process is achieved
- No down-conversions adding noise to the signal
- No intermediate frequency losing information

BETTER DETECTION PERFORMANCE AND ACCURACY OVER LONG DISTANCES (>200NM)

- Substantial improvement in the signal / noise ratio
- Higher sensibility of the unit
- Extended dynamical range
MSSR MODE S - BENEFITS OF INDRA SOLUTION

FULLY DIGITAL RECEIVER

- NO ANALOG COMPONENTS
- RELIABILITY & ROBUSTNESS
  - Whole digital Rx chain (no analog components)
  - Free spare capability for future upgrade
  - Improved BIT mechanisms (noise floor, channels matching)
- ENHANCED PROCESSING CAPABILITIES
- SIMPLIFYING MAINTENANCE ACTIVITIES
  - Complete supervision and adjustments by means of CMS
  - Automatic detection & solving of installation troubles
  - Amplitude and phase mismatches in the RF cables
MSSR MODE S - BENEFITS OF INDRA SOLUTION

ADS-B integrated in the MSSR (SMART INTEGRATION)
**MSSR MODE S - BENEFITS OF INDRA SOLUTION**

**SECTORIZED ANTENNAS**

**SECTORIZED ANTENNA CONFIGURATION**
- Better gain and coverage
- Sectorized antennas for 360° coverage

**MORE IN THE SAME**

**SAME INFRASTRUCTURE TO PROVIDE ADS-B AND RADAR DATA**
- Different or same dataflow for reports (AST CAT021)
- Sharing energy system, communications and other infrastructures
- Implementation costs are reduced significantly

**EASY INSTALLATION**

**THE DESIGN ALLOWS THE SYSTEM TO BE EASILY INSTALLED IN ALL THE CONFIGURATIONS**

**ADS-B integrated in the MSSR (SMART INTEGRATION)**
MSSR MODE S - BENEFITS OF INDRA SOLUTION

**ADS-B integrated in the MSSR (SMART INTEGRATION)**

- BEST ADS-B DETECTION PERFORMANCES IN VERY LONG DISTANCES (>250NM)

**ADS-B INFORMATION TO ENHANCE THE PERFORMANCES OF MSSR SYSTEM**

- Reduction of cone of silence
- Mode S target detection on-ground (passive acquisition)
- Supports surveillance while MSSR maintenance tasks
- Reflection process improvement

**BEST ADS-B COVERAGE**

**ADS-B & MSSR SINERGIES**

**CONES OF SILENCE REDUCTION**

**MODE S DETECTION ON-GROUND**

**REFLECTION PROCESS IMPROVEMENT**

**SUPPORTS MAINTENANCE ACTIVITIES ON LVA**

**II/SI CONFLICTS DETECTION & MITIGATION**

**AND MORE…**
MSSR MODE S - ADS-B COMPONENTS INTEGRATED

ADS-B integrated in the MSSR (SMART INTEGRATION)
MSSR MODE S - TEST AND SUPERVISION UNIT (UTS)
MSSR MODE S - TEST AND SUPERVISION UNIT (UTS)

Synchronization signals
(TRG, VBR, ACP, ARP)
MSSR MODE S - TEST AND SUPERVISION UNIT (UTS)

TEST AND SUPERVISION UNIT (UTS) IS **DESIGNED TO CHECK** THE CORRECT OPERATION OF THE INTERROGATOR IN MAINTENANCE STATE

LOCAL AND REMOTE SUPERVISION OF MODE S STATION PERFORMANCES

- By means of CMS
- Minimizes works, manpower, travels...

TEST AND MEASURES ARE PERFORMED IN AN AUTOMATIC WAY

- Minimal intervention from operator

SIMPLIFIES MAINTENANCE ACTIVITIES

- Minimizing human errors

ENHANCES THE MAINTENANCE ACTIVITIES

- More tests available
- Repetition
MSSR MODE S - TEST AND SUPERVISION UNIT (UTS)

Test and Supervision Unit (UTS) is specifically designed for MSSR.

**Fully Integrated**
- With both interrogator channels
- In the Control and monitoring (Local and remote)

**Cost Reduction in Terms Of**
- Number of test equipments required
- Manpower

**Whole Transmission and Reception Chains Are Verified**
- Interrogations analysis
- Replies injection
MSSR MODE S - TEST AND SUPERVISION UNIT (UTS)

UTS PERFORMS TESTS IN SEVERAL WAYS
- Reply Generation.
- Target Generation.
- Target Pattern Generation.
- Measures.
- Continuous Wave.

RECEIVES AND INJECTS SIGNALS IN RF THROUGH THE SWITCH UNIT
- Main channel is connected to antenna
- Maintenance channel is tested

REMOTE SUPERVISION OF MODE S STATION PERFORMANCES
- From remote locations (by means of CMS)
- Minimizes maintenance activities
- Reduces maintenance costs.
RADAR DISPLAY MONITOR
RADAR DISPLAY MONITOR
ADVANCED GRAPHICS PROCESSING UNIT

- Full Earth terrain coverage by NASA SRTM Elevation Maps
- High plot tracking capacity (up to 3000 plots simultaneously)
- List of the Mode S aircraft under surveillance
- ASTERIX Multicategory support
- Recording and playback capabilities
CONTROL AND MONITORING SYSTEM (CMS)

ALL SENSORS INTEGRATED IN THE SAME APPLICATION

STATION IS FULLY CONTROLLED FROM BOTH LOCAL AND REMOTE POSITIONS

• Switch between operational states and modes
• (Re-) configure the equipment
• Obtain the current system status.
• Perform diagnostics, tests and other maintenance tasks.
• Retrieve logged data
• Access protection (user and passwords)
PRESENTED IN A GRAPHICAL USER INTERFACE

- User-friendly and intuitive interface
- Synoptic and physical diagrams in real time
- Color-code for status summary
CONTROL AND MONITORING SYSTEM (CMS)
MORE THAN 200 MSSR MODE S SYSTEMS CONTRACTED WORLDWIDE
RADAR REFERENCES
RADAR REFERENCES
RADAR REFERENCES

Australia