LEONARDO ELECTRONICS

MXC

Mode-S eXtended squitter Capability

MXC (Mode-S eXtended squitter Capability) is a high performance ADS-B (Automatic Dependent Surveillance Broadcast) Ground Station for en-route, approach, and airport surveillance applications compliant with the 1090 MHz Mode-S Extended Squitter standard.

Leonardo has designed and developed the MXC as a fail-safe, modular system complying with stringent operational requirements. MXC receives and processes broadcasted messages over 1090 MHz RF channel extended squitter (DF17/18) which reports identification, position, altitude, velocity, and other airborne derived data. MXC distributes the collected surveillance information to ground ATM systems (e.g. Tracker, Surveillance Data Processing, Flight Data Processing) using ASTERIX CAT. 21 standard format over LAN or WAN communication infrastructures. MXC also complies with:

- FAA CAT033 and CAT023
- EUROCONTROL CAT021, CAT023, and CAT247 surveillance reports on redundant 1 GBit LAN connections
- FAA CAT033 and EUROCONTROL CAT062 target reports for generation of TIS-B and ADS-R uplinks in either 1090 ES or UAT link formats

SYSTEM ARCHITECTURE

The basic MXC configuration includes:
- 1090MHz Receiver unit
- Low Noise Amplifier
- High gain antennas (sectorised or omnidirectional)
- Ground-station Data Processing (GDP)
- UTC time reference subsystem via GPS receiver
- Ground-station Maintenance Monitor (GMM)

The modular design allows for easy system expansion and specifically tailored MXC configurations. This extends the capability of the basic system with additional Data-Link technologies and/or applications. For instance:
- 1090MHz transmitter, enabling MXC to broadcast TIS-B (Traffic Information Surveillance Broadcast) messages
- VDL Mode 4 base transponder, enabling MXC to support dual link while maintaining the same interface with ATM systems

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SYSTEM DESCRIPTION

MXC consists of two components, a 1090 radio unit and an UAT radio. Both units are mountable in an industry standard 19" rack, operating with 48 VDC power. The 1090 Radio Unit integrates all communication equipment, including a 1, 2, or 4 channel 1090 receiver, and a 1090/1030 agile transmitter.

The 1090 receiver can decode ATCRBS, Mode-S, and ADS-B surveillance replies and squitters, while meeting or exceeding degarbling requirements for DO-185B ATCRBS and DO-260B A3. The transmitter supports both generations of TIS-B/ADS-R target uplinks, at 1090 MHz, and interrogation legacy airborne transponders, at 1030 MHz. The 1030 MHz interrogator supports Mode-A, Mode-C, and Mode-S (DF4/5 or DF20/21) interrogations. The UAT Radio Unit integrates a 1 or 2 channel UAT transceiver with a 1030 MHz receiver. The UAT transceiver receives UAT ADS-B target reports, and generates TIS-B/ADS-R target uplinks and FIS-B uplinks. The 1030 MHz receiver decodes Mode-A, Mode-C, and Mode-S interrogations.

TECHNICAL FEATURES

MXC makes use of an advanced receiver and innovative processing of signals transmitted by targets. These characteristics guarantee high reliable detection of cooperative targets in the most demanding scenarios. Features include:

- Surface Position messages (BDS0,6)
- Airborne Position messages (BDS0,5)
- Velocity messages (BDS0,9)
- A/C Identification & Type messages (BDS0,8)
- A/C Operational Status messages (BDS6,5)
- Emergency/Priority/Status messages (BDS6,1)
- UAT FIS-B uplink commands

- SNMP, SSH, SFTP, and web-based maintenance interfaces, supported by redundant surveillance LAN and a dedicated 1 GBit Maintenance LAN connection
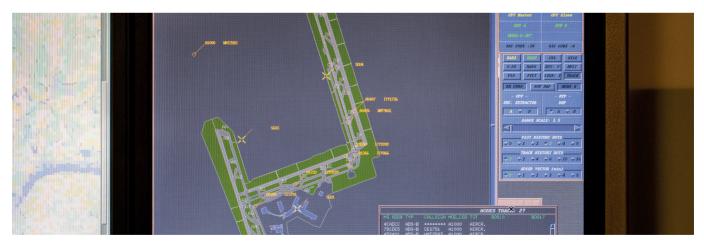- Basic maintenance performed via serial maintenance ports

In addition, MXC is capable to receive and decode other Mode-S defined messages transmitted by aircraft in reply to interrogations made by Mode-S radars:

- DF 4, 5 (surveillance altitude/identity reply)
- DF 11 (All Call Reply/Acquisition Squitter)
- DF 20, 21 (Comm-B altitude/identity reply)

After decoding, information received for each target are assembled, formatted in standard ASTERIX CAT 21 and distributed to ground users subscribing to MXC services. ASTERIX messages can also directly feed a local tracker hosted on board the MXC.

TECHNICAL SPECIFICATIONS

- Operating Frequency 1090 MHz
- Data Formats ASTERIX CAT21/CAT23 CAT2/CAT62
- Capacity Up to 60 targets
- Mode-S downlink formats DF17/18, DF 4/5, DF 11, DF 20/21
- Coverage up to 250 NM - 360°
- Availability 99.9%
- Continuity > 99.98% per hour of flight
- MTBF > 20000 hours
- Applicable Standards ICAO Annex 10, RTCA DO-260A (and Change1), RTCA DO-260 ED129 (ADS-B GS TS from WG51 SG4), VDL-4 SARPs ETSI EN 301 842-1, ETSI EN 301 842-2

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