SELEX
Sistemi Integrati
A Finmeccanica Company

Predictable results
for unpredictable threats

ADAM/AWAM SYSTEMS: MULTILATERATION SOLUTIONS BY SELEX SISTEMI INTEGRATI

SELEX Sistemi Integrati ADAM and AWAM systems represent two product lines enhancing A-SMGCS functionalities of ATM.

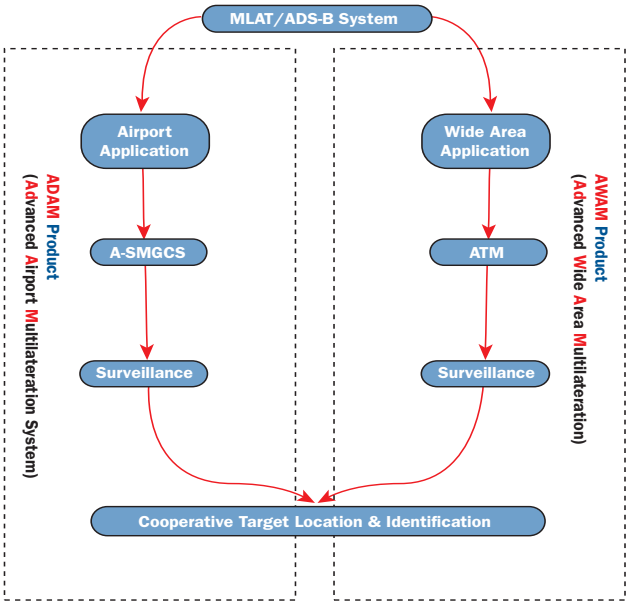
The Advanced Airport Multilateration System (ADAM) provides high-performance and accurate all-weather surveillance, supporting full control of the airport surface and near-airport airspace.

The Advanced Wide Area Multilateration (AWAM) System is dedicated to the surveillance of terminal airspace up to the en-route area.

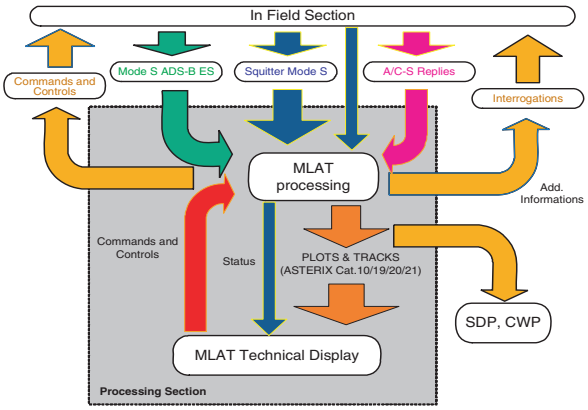
Such systems utilise outstanding advanced sensor design and innovative target processing, in a flexible and reliable architecture.

They identify with continuity targets approaching the airport and stationary or moving co-operative targets in the airport area.

ADAM systems are currently in operation at the major Italian airports: Milan Malpensa (MXP) and Rome Fiumicino (FCO).



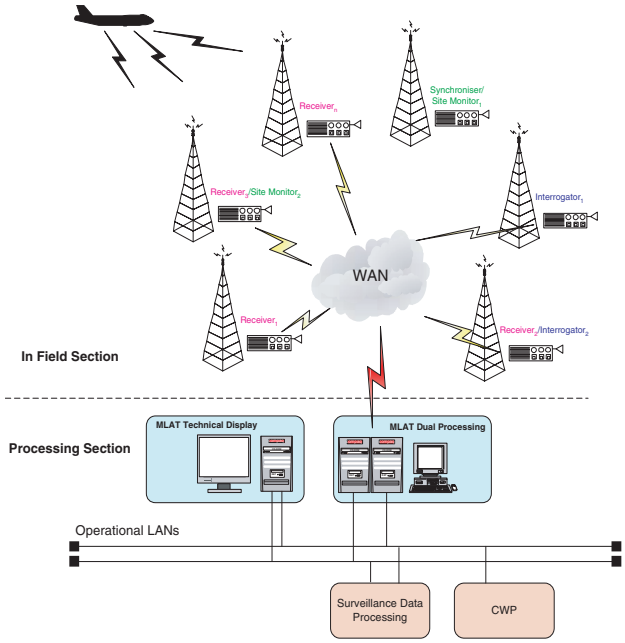
ADAM and AWAM Systems are compliant with EUROCAE ED-117 MOPS, WG-70 Technical Specifications (on-going activity) and RTCA DO-260/260A MOPS with low life-cycle cost.



Both systems comprise:

- An In-Field section consisting of a network of receivers and/or receivers-interrogators, placed in strategic surveillance locations in or around the airport and/or terminal areas, providing the required coverage, accuracy and continuity of service
- A Processing Section that collects sensor data, performing target identification, presentation, and technical monitoring

ADAM and AWAM systems use the Mode-S "squitter" transmission and asynchronous transponder replies as well as the responses to interrogations made by the systems themselves. The two systems also handle DF17/DF18 ADS-B Extended Squitter messages from aircraft/vehicles as an integrated independent surveillance data flow.



The system architecture presents the best solution to meet operational performance requirements. The architecture is compliant with the current international standards, provides an intrinsic level of modularity to meet the advanced requirements of a modern Air Traffic Control (ATC) system, and is capable of integrating further functionalities.

Sensor design is precise, allowing an accurate Time Of Arrival computation at receiver level. In detail the In-Field Section handles:

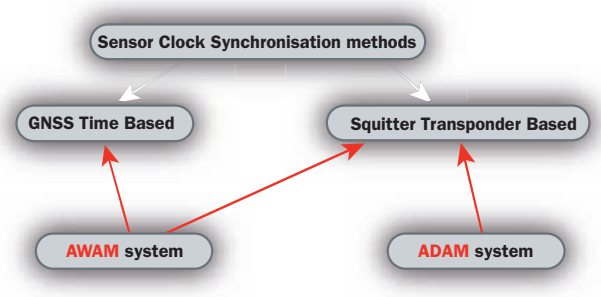
- Mode-S Short Squitter (DF11)
- Mode-S ADS-B Extended Squitter (DF17/DF18)
- Mode-S replies (Downlink Format 4, 5, 20, and 21) related to selective interrogations made by sensors with overlapping coverages
- Mode 3A/C replies sent by conventional transponders

Furthermore, the sensor hardware design is modular, allowing local/remote monitoring (via resident built-in tests) of each module. Relevant replacement in case of failure does not require power supply interruption.

SYSTEM ARCHITECTURE

The multilateration principle requires a distributed system in order to enable the simultaneous reception of signals at multiple locations. Time Synchronization is fundamental and various synchronization technologies can be used. SELEX SI employs two different time synchronization methods to meet the most demanding requirements according to the coverage volume which has to be surveyed. The Squitter Transponder synchronization method uses reference transmissions from a Squitter Generator Unit to synchronize clocks at each receiver unit.

The GNSS time synchronization method refers to a GNSS timing receiver embedded in each receiver unit. This method is a GNSS-dependent, but allows wider sensor baselines suitable for TMA/En-Route applications. Unambiguous position/identification of each target is sent to MLAT Control and Monitoring Display Traffic System (CMDTS) platforms and disseminated to the Controller Working Positions (CWP) for air traffic monitoring and control, flight plan correlation, and alarm detection.



ADAM/AWAM BENEFITS

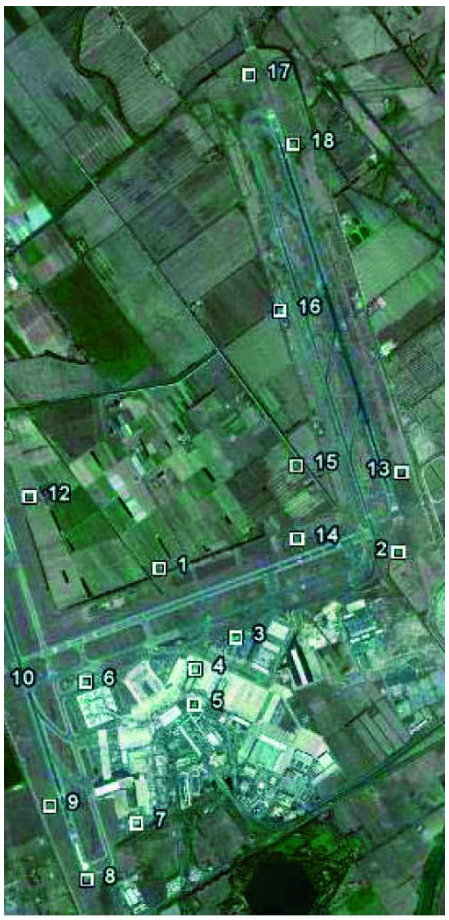
- High accuracy and update rate
- Integration of ADS-B Extended Squitter application
- Surface Movement Applications
- Runway Incursion Avoidance
- Adaptability to specific environments
- Situation Awareness
- Low and easy maintenance
- Possibility of closely spaced parallel runway operations
- Increasing of routing efficiency
- Reduction of controller workload

System central processing performs the following:

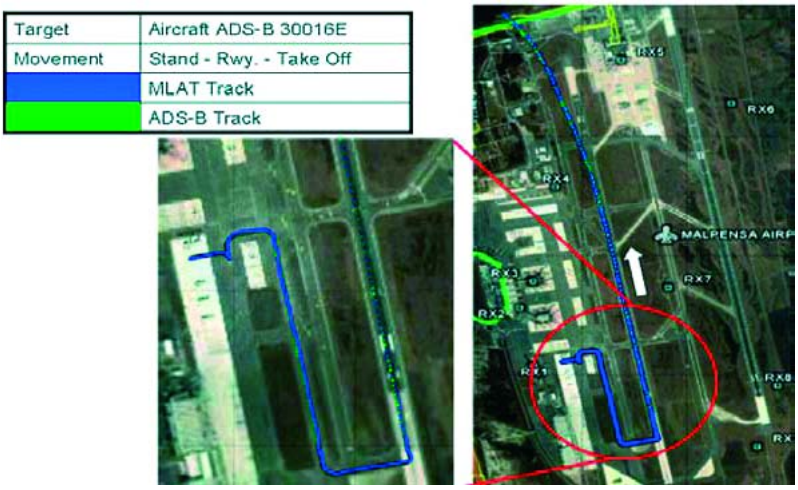
- Target Identification and Plot Extraction. Processor uses the formed TDOAs for a specific Weighted Least Square iterative method, supported by a non-iterative estimation method, enhancing the accuracy and convergence speed (local minimum solution and position divergence avoided), detecting and isolating false measurements
- System Time Synchronization. Processors continuously track sensor clocks and check the system by exploiting sensor reference time and dedicated Site Monitor Mode-S test messages.
- Interrogation scheduling and Target Identification.
- Processor manages interrogations deciding whether a system interrogation is required and which data has to be requested (e.g. altitude, Mode-A, call sign), then minimizes RF pollution while maintaining the requested extracted information refresh rate.
- Target Tracking.
- Processor performs a specific adaptive asynchronous Kalman target tracking, fed by the extracted plots, in order to suppress false tracks, resolve target ID ambiguities, and smooth MLAT plots.
- ADS-B Data Extraction.
- Processor handles DF17/DF18 ADS-B ES messages and outputs track data, the appropriate validity time, quality factor, and other information included in the ADS-B message.
- ADS-B Data Integrity Check.
- Processor monitors the performance of ADS-B based transponders. The ADS-B data can be checked and flagged against multilateration data in order to guarantee the avionic performance.
- Output Handling.
- Processors handle system data output. Plot/track data can be configured among the following formats:
  - ASTERIX CAT10 rev.1.0: Mode A/C/S and ADS-B plot/track
  - ASTERIX CAT20 rev.1.0 and ASTERIX CAT19 rev.1.0: Mode A/C/S plot/track
  - ASTERIX CAT21 rev.0.23 or rev.0.26: ADS-B plot/track only

ADAM/AWAM Receiver

ADAM/AWAM Receiver/Transmitter



ADAM installation at Rome Fiumicino Airport



ADAM installation at Milan Malpensa Airport)

ADAM SPECIFICATIONS & PERFORMANCES

Rx

Channel:	1090 MHz
RReply type:	Mode A/C, Mode-S (DF 4/ 5/ 11/ 17/18/ 20/21)

Tx Synchro Section

Channel:	1090 MHz
Bandwidth:	ICAO compliant
Squitter type:	DF11 or DF18 (configurable by local/remote)
ICAO/Non-ICAO Address:	configurable by local/remote

Tx Interrogator Section

Channel:	1030 MHz
Bandwidth:	ICAO compliant
Interrogator Type:	A/C All Call, UF4 / UF5 / UF20 / UF21

Antenna Section

Omni / Directional with low / medium / high gain depending on the application

Sensor Data Interfaces

Ethernet 10/100 BaseT (IEEE 802.3)
RS232 port for local monitoring configuration
RS485 port for local monitoring configuration

System Standards

ICAO Annex 10 Vol.IV
EUROCAE ED-117 MOPS
EUROCAE WG-70 WAM Technical Specification
RTCA DO-260
RTCA DO-260A
RTCA DO-260A Change 1

SELEX Sistemi Integrati S.p.A.
Via Tiburtina Km 12.400
00131 Roma - Italy
T +39 06 41501 • F +39 06 4131133

www.selex-si.com

Published by
SELEX Sistemi Integrati - External Relations
© SELEX Sistemi Integrati - All rights reserved
June 2008