ATM Surveillance Data
Display, Distribution, Processing

Eighth Eastern Caribbean Network Technical Group (E/CAR/NTG/8), Sixth Eastern Caribbean Radar Data Sharing Ad hoc Group (E/CAR/RD/6), and Fourth Eastern Caribbean Civil Aviation Technical Group (E/CAR/CATG/4) Meetings
Saint George’s, Grenada, 3 - 7 September 2018
ATM Surveillance Data Display, Distribution, Processing

Eighth Eastern Caribbean Network Technical Group (E/CAR/NTG/8) Meeting,
Sixth Eastern Caribbean Radar Data Sharing Ad hoc Group (E/CAR/RD/6) Meeting,
Fourth Eastern Caribbean Civil Aviation Technical Group (E/CAR/CATG/4) Meeting

Saint George’s, Grenada, 3 - 7 September 2018
Frequentis group 2017
Global market leader

275 M EUR
Total operating performance 2017*

1,697
Employees

75% STEM*

12%
R&D

Headquarters Vienna

95%
Export

1947
Established

Solutions partners and regional offices in 50+ countries

*) Science, Technology, Engineering, Math
FREQUENTIS COMSOFT

#1
Market leader in AMHS

300+
ADS-B/MLAT receiver units sold worldwide

1989
A pioneering role in surveillance communication since 1989

Located in a high tech region of Germany

80
Installed base in over 80 countries

FREQUENTIS
A member of the Frequentis group since January 2016

200
employees from diverse cultures

70%
of our staff hold university degrees
A Glance at the Frequentis Surveillance, Messaging, and AIM History

- **Entering the ATC market** with a contract for European Surveillance Network RADNET on behalf of EUROCONTROL

1989

- **RAPS product** is qualified as ASTERIX Reference & Test Tool

1997

- **Our AMHS solution** selected as candidate for European Communication Gateway

1998

- **Industrial Partner of EUROCONTROL** for Centralised ARTAS Maintenance and Support (CAMOS) until today

2001

- **New Generation of COMSOFT’s Surveillance Data Distribution System**

2006

- **Thanks to Quadrant** ISAVIA is the first European ANSP to provide air traffic control based on ADS-B

2007

- **Undisputed AMHS market leader**: our solutions are involved in virtually all AMHS connections worldwide

2012

- **We become a member of the Frequentis Group**

2016

- **Comsoft Solutions will be known as FREQUENTIS COMSOFT**

2018

- **New Generation of COMSOFT's Surveillance Data Distribution System**
## ATM Solutions for a Safer World

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</table>

### Surveillance data and VSAT networks
- **End-to-end network performance**
- **Surveillance data processing and tracking**
- **Improved situational awareness**
- **WAM and ADS-B surveillance technology in ATM**
- **Innovation and cost-optimisation**
- **Market leadership in AIM and message handling**
- **Tailored solutions for any deployment**
Surveillance ASD
Open standard interfaces throughout the complete surveillance chain

Sources
- Primary surveillance radar
- Secondary surveillance radar
- Quadrant ADS-B
- Quadrant MLAT

Distribution
- SDDS-NG (Surveillance Data Distribution)

Processing
- ARTAS services (ARTAS, SDPS)

Display
- ATM components (ASD, R2D2, DIVOS, RAPS)
Open Standard Interfaces throughout the Complete Surveillance Chain

Share and Distribute Data

Source: http://www.eurocontrol.int/services/surveillance-message-conversion-and-distribution-equipment-rmcde
Open Standard Interfaces throughout the Complete Surveillance Chain
Experience and Trusted, Stable Code Base

“Today ARTAS tracks close to 80 % of European daily flights operating at 31 ATC Centres in 40 European states. In total, around 100 ARTAS units are currently implemented or in the course of implementation.”

Source: http://www.eurocontrol.int/artas
Air Situation Display – providing ATM automation from ground to en-route
Scalable solution based on extensive experience in advanced air traffic automation systems

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Fully expandable and modular</td>
<td>System designed to add functionality (Buy-as-you-grow)</td>
</tr>
<tr>
<td>Flexible configuration</td>
<td>Flexible configuration for tower-, approach- and en-route application</td>
</tr>
<tr>
<td>Plug &amp; Play installation</td>
<td>Plug and Play installation of legacy and new technologies into state-of-the-art surveillance networks</td>
</tr>
<tr>
<td>Throughput &amp; safety</td>
<td>Throughput &amp; safety Enhanced traffic planning Optimised traffic throughput Enhanced traffic awareness</td>
</tr>
<tr>
<td>SafetyNet</td>
<td>SafetyNet For visual and acoustic warnings and alarms</td>
</tr>
</tbody>
</table>

Designed by controllers for controllers, driven by ATC operational experts
Surveillance Sources: Quadrant ADS-B & Multilateration

**ADS-B**
- Plane
- Sensor
- CAT21
- Data Network

**Passive MLAT**
- Multiple Sensors
- MLAT FEED & CAT21
- Data Network
- Central Processor

**Active MLAT**
- Interrogators
- MLAT FEED & CAT21
- Multiple Sensors
- Data Network
- Interrogation Controller
- Central Processor
ASD for small and mid-size tower environments

Scalable solution concept – adaptable for different use cases, designed to cost

Main Surveillance Display

Use cases
- Small approach units
- Military and civil applications
- Gap filling (Radar outage)

Throughput and safety
- Assists visual identification
- Optimized traffic throughput
- Enhanced traffic awareness
Optimum trade-off between in-time conflict prediction and unessential alert rate

Optional ASD Module: Safety Nets

Short Term Conflict Alert
Detection of a potential or actual separation minima infringement between aircraft

Minimum Safe Altitude Warning
Detection of a potential violation of minimum safe altitude above terrain or obstacles to avoid controlled flight into terrain (CFIT) accidents

Approach Path Monitor
Detection of the increased risk of CFIT accidents during final approach (integrated in MSAW)

Area Proximity Warning
Detection of a potential or actual infringement of a required spacing to an airspace volume
GCAA, Abu Dhabi | First operational AMAN in the Middle East region

Reference surveillance displays

Pairing of surveillance data with up-to-date flight plans and presentation as integrated information to the ATCO

Complete ATM Automation System including Arrival Management (AMAN), Departure Flow Management and SafetyNets

Location: Sheikh Zayed Centre, Abu Dhabi
Armasuisse | ASR and PSR display system for approach control system
Reference surveillance displays at military airfields

5 military airfields in Switzerland

IF to airport surveillance radars (ASR) and precision approach radars (PAR)
Integration of working positions into the existing ATC and recording environment
Additional support and analysis options through flexible recording system R2D2
ATM Display Solutions

Air Situation Display
providing seamless air/ground awareness for Air Traffic Controllers

Remote Tower
Vital part of the FRQ group remote tower solution

Highlights

- Modular system design: enabling optional functionality such as Short Term Conflict Alerts (STCA), Area Proximity Warnings (APW) and Minimum Safe Altitude Warnings (MSAW)
- SafetyNet: displaying a prominent visual warning and graphical representation of the conflicts
- Flight Plan Database: matching data against current aircraft tracks, using their call sign, Mode S address or Mode 3/A code
- Tools & applications: can be used for TWR, APP and ACC applications

User Benefits

- Early operational readiness: Plug & Play installation
- From controllers for controllers: Based on extensive experience in advanced air traffic automation systems
- Buy-as-you-grow: Fully expandable and modular system design to add functionality
- Adaptable to different use cases: Flexible configuration for tower-, approach- and en-route applications

Remote Tower
## Separation Tools Time Line

<table>
<thead>
<tr>
<th></th>
<th>0 – 60s</th>
<th>0 – 120s</th>
<th>10 – X</th>
<th>10 – X</th>
<th>60 - X</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
<td>TCAS</td>
<td>STCA</td>
<td>VERA</td>
<td>MIN SEP</td>
<td>MTCD</td>
</tr>
<tr>
<td><strong>Primary Information Basis</strong></td>
<td>Inter aircraft communication</td>
<td>Surveillance</td>
<td>Surveillance</td>
<td>Surveillance &amp; Flight Plan</td>
<td>Flight Plan</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Immediate infringement resolution</td>
<td>Alerting</td>
<td>Minimum Separation (vectoring)</td>
<td>Minimum Separation (route adherance)</td>
<td>Raise attention to future issues</td>
</tr>
</tbody>
</table>
STCA checks probability of 2 A/C being horizontally closer than e.g. 5 NM.

- Additionally: “Safe” geometry criteria in order to reduce nuisance alerts
  - “safe”: crossed + diverging + sufficient distance
Safety Nets – STCA – Depiction

- The STCA is depicted in the Air Situation Picture (highlight)
- An audible alert is raised (manual suppression)
- The alert is listed in a window
Minimum Separation Tool

- The Minimum Separation Tool uses the flight routes, current position and ground speed of two tracks to calculate their closest point of proximity.
- Constantly updated based on surveillance and flight plan data
Surveillance
Recording & Investigation
ATM trend: centralized operational recording concepts
Optimizing OPEX for distributed systems

Central synchronized ATM data reconstruction
→ Complete survey of an incident on different sites

Central system supervision and health monitoring
→ Reduced downtimes on non 24/7 operated sites

Central configuration suite for remote parameterization
→ Common configuration from a central hub
Legal recording, replay and analysis of audio and surveillance data

R2D2-V2/RMD-V2
Recording & Replay of Digital Data

Up to 300 Radar channels

Highlights

- Integrated FRQ product suite: R2D2 & DIVOS
- Compliant to the following standards
  - ICAO PANS-ATM (Doc 4444)
  - ICAO Annex 10, 11
  - EC No 1032/2006
  - EC No 29/2009
  - Eurocae ED-111
  - EUROCONTROL Standard for RADAR Surveillance (SUR.ET1.ST01.1000-STD-01-01)

User Benefits

- Legal Recording
- Incident analysis
  - Reconstruction of critical situations
  - Assessment of risks and decisions
  - Search and Rescue coordination
- System performance and tuning
  - Trajectory reconstruction
  - Sensor performance
  - Continuity and currency
- Training
  - Provide realistic training scenarios
  - Briefing and debriefing of training sessions

Radar channels
Up to 300
Recording & Replay – success stories

100 systems operational worldwide

2005
- Airport of Luxembourg, Luxembourg
- ANS (Air Navigation Services), Prague
- Armasuisse, Switzerland
- KVB (Cologne Public Transportation Service), Germany
- Luftwaffe (Air Force), Germany
- NATS, Great Britain
- RNLAF, The Netherlands
- Singapore, ST Electronics Singapore
- skyguide, Switzerland

2018
Surveillance
Control & Monitoring
Country-wide radar supervision infrastructure

- Configuration of CMS/XA system to monitor 20 en-route radar stations
- Control & Monitoring of close to 25,000 individual radar elements
- One of the most successful projects in NATS’ history saving millions of operating and maintenance costs

Country-wide control and monitoring system for military radar infrastructure at remote sites

- Data exchange over existing radar data network (MiRADNET)
- All 18 radar sites installed
- Ready for unmanned operation
Integrated control and monitoring system for control centres and remote sites
CMS/XA – Control & Monitoring

- **Fully unified solution**
  Supervision of a large number of remote sites simultaneously from one or several central locations

- **Utmost scalability**
  From local, single-PC based equipment to a fully distributed, integrated control and monitoring system with multiple data acquisition sites and multiple control centres and sub-centres

- **Flexibility**
  Modular design with high architectural flexibility enabling the system to accommodate any existing site and communication infrastructure

- **High reliability**
  Redundancy concepts for all its components on hardware, software and networking level

Dedicated to latest technology for data acquisition, processing and display

Uniform depiction of overall site conditions

User customisable rules for event processing

Versatile and flexible end-user tailoring to differing infrastructures

Observation of service level degree derivable from technical monitoring

25.000 individual radar elements monitored

25,000 individual radar elements monitored
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Regional Domain Sales Latin America and Caribbean