THALES Automation System main features

Automation System and Integrated Telecommunications for Air Navigation Services/ System-Wide Information Management (SWIM) Workshop
EMX0074 CNS

Mexico City, April 21-22, 2014
ICAO North American, Central American and Caribbean Regional Office
Whenever critical decisions need to be made, Thales has a role to play. In all its markets — aerospace, space, ground transportation, defence and security — Thales solutions help customers to make the right decisions at the right time and act accordingly.

World-class technology, the combined expertise of 65,000 employees and operations in 56 countries have made Thales a key player in keeping the public safe and secure, guarding vital infrastructure and protecting the national security interests of countries around the globe.

A balanced revenue structure

<table>
<thead>
<tr>
<th>Defence</th>
<th>Civil</th>
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<td>55%</td>
<td>45%</td>
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Revenues in 2012

€14.2 billion euros

Shareholders
(at 31 May 2013)

- French State: 27%
- Dassault Aviation: 26%
- Float: 47% of which employees 3%
Global leadership

N 1 worldwide
- Payloads for telecom satellites
- Air Traffic Management
- Sonars
- Security for interbank transactions

N 2 worldwide
- Rail signalling systems
- In-flight entertainment and connectivity
- Military tactical radiocommunications

N 3 worldwide
- Avionics
- Civil satellites
- Surface radars

€14 billion in revenues
Welcome to Thales ATM
Enriched portfolio to help customers optimize their operations
ICAO ASBU ready

- All set for ICAO’s Aviation System Block Upgrades: Block 0 & Block 1 compliant

NextGEN

- Streamlining departure processes with Data Comm at Memphis International and Newark Liberty International Airports

SESAR

- Ready for SESAR Common Project deployment
Thales is trusted by 180 countries

TopSky
ATM Solutions
Shaping Tomorrow’s Sky

2 out of every 3 planes take-off and land safely thanks to Thales

- More than 130 Air Traffic Control Systems
- Over 3,000 Controller Positions
- Over 25 Tower Systems in operation
- 1,800 ADS-B & Multilateration Equipment
- Over 7,000 Nav aids
- Over 680 radars in operation
- Over 20 ADS-C equipped ATC Centres
- Over 180 countries trust Thales
1,800 controllers using TopSky - ATC systems in Latin America
Handling over 100 million passengers a year with 25 APP/ACC Thales
TopSky-ATC, with 4 ACCs, 12 APP handles the entire Mexican Airspace.

One of the busiest network in Latin America.
TopSky-ATC functionalities and more...

Range of software components supporting different levels of automation & functionalities

- **ATCO HMI**
- **Surveillance**
- **Flight Plan**
- **Coordination**
- **Experimentation**
- **Simulator**
- **Safety Nets**
- **Conflict Detection**
- **Datalink**
- **Sequencing Tool**
- **Flow Management**
- **Tower**

Based on experience, designed for future
40% of the world’s airspace is controlled by TopSky - ATC
Description

- Solution **driven by ATC operational experts**
- Evolutionary design guaranteeing long life span
- Integrated, fully consistent HMI
- From paper strip/ electronic strip to Stripless environments
- Various **visual tools** as a support for decision making (MTCD, SAP support, Vertical Aid Window, Stack Manager)

Operational benefits

- Providing the **right information** at the **right time**
- Limitation of routine tasks
- Supports **automated** inter-FIR and inter-sector coordination / transfer
- "Human-centric" solution: **intuitive** interaction, easy to learn

A cutting edge controller HMI already in operation
**Description:**

- **Multi Sensor Tracking System** handling all surveillance sensors data sources
- Processing & **Fusion** of all relevant downlinked data
- **Stand Alone** components or fully **integrated** as **main or fallback** tracker
- **Single system track** for all sensors (Radars, ADS-B, WAM)

**Operational benefits**

- Accurate & unique track for EnRoute/TMA/RNW/ Apron
- Improved positional data update rate of ~ 1 report/s thanks to MLAT/ADS-B
- Opportunity to use for Parallel Runway Monitoring
- Validated Down-linked Aircraft Parameters (**DAPs**)

**Global Surveillance concept**

**Radar, ADS-B, WAM Fused System Tracks**

**Field-proven trackers for civilian and defence tracker**
**ATC required adaptations/modifications**

- Surveillance Data Processor (Front-End, Tracker)
- Safety Nets (To be adapted to new means)
- Controller Working Position (HMI) (Symbols, New tools (e.g. RAIM Outage for ADS-B))
- Ancillary functions (By-pass, Recording and replay, Simulator)

**Focus on Mexico**

**Main ADS-B references**

> 1640

**References**

- **30 operational MSTS references**
  - **Australia**: Integration of multiple sensors in a very large FIR (Radar, ADS-B, ADS-C), processed and displayed @ Melbourne ATC, Brisbane ATC
  - **USA**: ADS-B & Radar data fused thanks to Thales MSTS components to feed US ACCs
  - **Mexico**: ADS-B combined to Radar in the Valley of Mexico to be processed and displayed @ Mexico City (ATC), Merida, Mazatlan, Monterrey ATCs and associated TCU’s. ADS-C soon processed and displayed at Mazatlan ACC
Description

- **Flight plan evolution managed** through internal states related to phase of flight, coordination status and controller jurisdiction.
- Associated processing to complement surveillance data in forming the basis for safety nets and conformance monitoring processing.
- Realistic calculation of **aircraft 4D trajectories** based on controller inputs and external data (as weather).
- Fully integrates radar, CPDLC and Coordination data.
- **What-if** capability to check the validity of proposed clearances.
- Integration of the latest Flexible Use of Airspace (FUA) concepts.

Operational benefits

- Benefits of the 4D concept
- Accurate trajectory prediction for predictive tools
- Military TSA management
- Dynamic and flexible flight Data distribution

More than a contract with pilot, a realistic view of the future
Description

- **Automated coordination** is supported between FIRs through data exchange, in accordance with standards.
- Advanced coordination intra-FIR in particular in case of **route change** with a sector list impact.
- Silent - coordination (**AIDC, OLDI, ADEXP**).

Operational benefits

- **Inter-sector** or **Inter-FIR silent notification, coordination and transfer** in operation.
- Combination of trajectory prediction & conditions driven coordination.
- Support for **Civil / Military coordination**.
- Color coding to segregate coordination status.

**Simplify coordination to focus on control.**
Description

- For Approach and En-Route contexts
- As stand Alone component or fully integrated in ATC syst
- Standard alarm to assess conflicts (pair of tracks, Track/vol) as STCA, MSAW, APW, DPM, APM, AIW … with optimised algorithm
- Innovative alarms for example, wake turbulence (WTEA) or aircraft trajectory (RAM, CLAM, HAM, HVI, DSAM, CPDLC reminder)
- Advanced Hypothesis algorithm

Operational benefits

- Securing airspace while increasing air traffic capacity handling
- Increase confidence thanks to reduction of nuisance alerts
- Increase efficiency with early detection of conflicts

Controllers can rely on
**Description**

- Conflict detection is based on surveillance data, flight plan data and environment data (MTCD, SAP)
- Time period depends on control type (oceanic, radar) and operational method
- What-if and probing tools

**Operational benefits**

- Conflicts in innovative display: specific window, agenda
- Conflicts managed through label and route
- Vertical Aid window
- Conflict-free clearance

*Increase efficiency with early detection of conflicts*
Description

- COTS datalink solutions for any datalink networks (ATN, FANS-1/A+), Pre-FANS
- Supports applications including CPDLC, ADS-C, D-ATIS, DCL, PDC
- User-friendly Datalink Air and Ground Simulation tools

Operational benefits

- Air and Ground view through an harmonised development with Thales Avionics
- Involved in standardization team to ensure correct implementation

References

- Provider for larger FIR: Tahiti, Chile, Australia
- Leader in European implementation
- Partner of SITA and Harris in USA

Key datalink player
Description

- Integrated AMAN/DMAN solution
- A multi-airport and multi-runway decision-support tool for one or several Terminal Approach Areas (TMA)
- Collaborative solution with airlines and airport
- Holding window in case of heavy traffic

Operational benefits

- **Paris**: 30% capacity in Extended TMA
- **Copenhagen**: +10% runway capacity
- **Sydney**: 7.1 MAUS$ fuel consumption saved
- **Paris-CDG**: 2 minutes of taxi out saved

References

**CDG airport, France**: AMAN / DMAN and A-CDM for the larger airport in Europe

More than 28 airports worldwide
**Description**

- Innovative collaborative Air Traffic Flow Management solution
- **Slot Management**: slot messages among ATC and airline operators and optimised processing
- **Capacity-load** balancing by predicting overload conditions and facilitation resolution with multi-criteria what-if.
- Weather and traffic avoidance through automatic or manual re-route

**Operational benefits**

- Efficient, pre-tactical, tactical airspace capacity
- Flexible, dynamic airspace use
- National/regional common situational awareness by fusing surveillance data, capacity and weather information
- Propose delay and reroute solutions

**References**

Operational in **South Africa** since 2010 FIFA world Cup
Green Aviation by saving $2.2 million of fuel and 10.3 Megatonnes of CO2 emissions annually in South Africa

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**Jane’s ATC Enabling Technology Award**
Operational benefits

- Complete ground surveillance and monitoring of A/C and vehicle
- **Improved safety, efficiency and optimised ground capacity performance**
- Reduced workload by flight plan data consistency
- Seamless operations with silent coordination (in TWR and with APP)
- **Increase capacity** with integrated DMAN
- **Optimise taxiing route, reducing taxiing time** and optimising runway occupancy thanks to Routing function

Description

- Stand alone or integrated A-SMGCS (1-4), EFS & DMAN capabilities
- Interoperability with ATC and airport agencies and equipment: Meteorological conditions and airport equipment status displayed
- Supporting all standard interfaces
- Supporting the most advanced SESAR and NextGen developments

TopSky - Tower as the validation platform for SESAR activities at France’s Charles de Gaulle Airport for validation by the French DSNA
Description

- Civil or Military, En-route/Approach/Tower, Radar or Procedural, with datalink if needed
- Compliant with ICAO and Eurocontrol licencing rules thanks to a partnership with ENAC, French Civil Aviation Academy
- Used as autonomous simulators or emulator for TopSky-ATC ou TopSky-Tower
- Integrated with innovative tools as Maestro
- Powerful debriefing tool, allowing instructor – student confidence

Operational benefits

- Consistent environment information through the various simulators
- An exercise preparation tool recognised as user-friendly and allowing cutting down time to prepare correct scenario
- An cost effective pilot positions by minimising the number of operators

References

- Dual partnership with academy and ANSP: France, Australia
- In TopSky-ATC equipped centres
- In academy, for Egypt, Qatar, South Africa, Bangladesh, Ethiopia, ASECNA, EAMAC, French Navy, EVAV, Skyguide, Eurocontrol

From Ab-initio to refresh training, consistency and savings
Experimentation

Description
- Support from internal ATCO team
- Support from internal Human Factor team
- Dedicated tools for debriefing
- Agile approach for shorting prototype development
- Dedicated facilities: SkyCentre in Rungis, France and CASIA in Melbourne, Vic, Australia

References
- For SESAR, experimentations with French Controllers at CDG airport
- Prototyping sessions with COOPANS controllers at SkyCenter
- An experimentation campaign with French controllers to finalise En-Route ATCO HMI.

Operational benefits
- Recreate Operational Environment
- Communication with ATCO at early stage
- Functionality prospective
- Fine tuning of operational centric tools as surveillance, safety net, conflict detect components

Replace paper by early hands-on experience
THANK YOU

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Thales Air Systems  
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ADS-B in ACC of Mexico
Thales Systems in Mexico

- Tijuana
  - ATC Centre (APP)
  - Navaids
  - Radar

- Culiacan
  - ATC Centre (APP)
  - Radar

- San José del Cabo
  - ATC Centre (APP)
  - Radar

- Mazatlán *
  - ATC Centre (APP/ ACC)

- Acapulco
  - ATC Centre (APP)
  - Navaids
  - Radar

- Hermosillo
  - ATC Centre (APP)
  - Radar

- Chihuahua
  - ATC Centre (APP)
  - Navaids

- Leon / El Bajio
  - ATC Centre (APP)
  - Radar

- Vera Cruz
  - ATC Centre (APP)
  - Radar

- Cancun
  - ATC Centre (APP)
  - Navaids
  - Radar

- Monterrey *
  - ATC Centre (APP/ ACC)

- Merida *
  - ATC Centre (APP/ ACC)
  - AIM
  - AMHS
  - Navaids
  - Radar
  - Simulation
  - Tower

- Mexico *
  - ATC Centre (APP/ ACC)

TopSky-ATC, with 4 ACCs, 12 APP handles the entire Mexican Airspace
One of the busiest network in Latin America
Mexico Surveillance Coverage

Coverage of SENEAM Radars 2013

21 Radars to cover the entire Mexican Airspace

Coverage of SENEAM ADS-B 2014

10 ADS-B ground station to complete the radar coverage
Plan to integrate ADS-B data in Mexico city ACC then Merida ACC, Mazatlan ACC, Monterey ACC & associated APPs

- To enhance current operational Mexican ACCs/APPs in processing & displaying ADS-B data
- To better survey Helicopters in the Valley of Mexico flying at low alt.
- To complete Radar coverage

On-going installation of ADS-B stations (WAM compatible)

Upgrade of ATC system with:

- Multi Sensor Tracking MEDISIS (ADS-B & Radars data merged in 1 single tracks) and
- SW upgrade: HMI, SNMAP, DAF, Simulator
- 2 additional sectors positions dedicated to helicopters surveillance