



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

THALES
Together • Safer • Everywhere

Collective intelligence for a safer world

Whenever critical decisions need to be made, Thales has a role to play.

In all its markets — aerospace, space, ground transportation, defence and security —

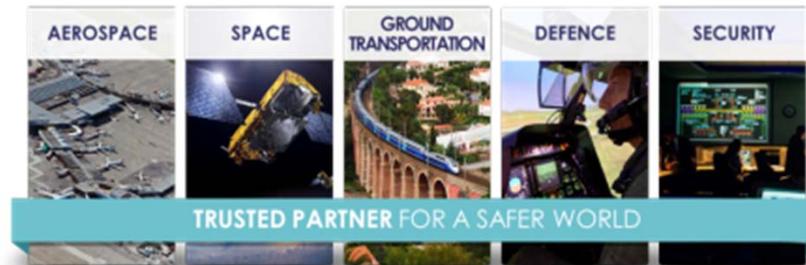
Thales solutions help customers to make the right decisions at the right time and act accordingly.

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.

GLOBAL REACH, LOCAL EXPERTISE



Dual markets Military & Civil



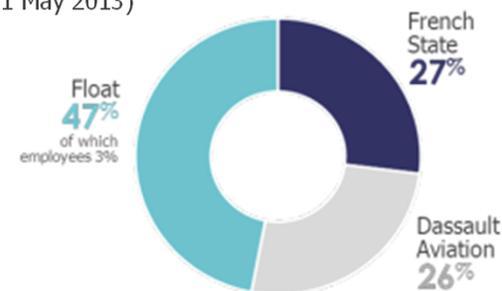
A balanced revenue structure



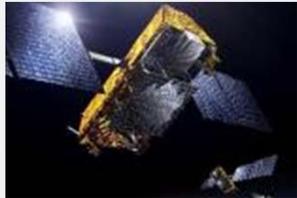
Revenues in 2012

€ 14.2 billion euros

Shareholders (at 31 May 2013)



THALES

N 1 worldwide	 Payloads for telecom satellites	 Air Traffic Management	 Sonars	 Security for interbank transactions
	 Rail signalling systems	 In-flight entertainment and connectivity	 Military tactical radiocommunications	€14 billion in revenues
	 Avionics	 Civil satellites	 Surface radars	



Welcome to Thales ATM

Thales Air Traffic Management Solutions

Automation

ATC Centres

- TopSky - ATC

Simulation/ Training

- TopSky - Simulation
- SCANSIM

Airport Towers

- TopSky - Tower

Flow Management

- TopSky - ATFM
- Maestro (AMAN/DMAN)

Aeronautical Information Mngt

- TopSky - AIM
- ATALIS

Communication

Aeronautical Messaging

- TopSky - AMHS

Air/Ground Datalink

- TopSky - Datalink
- DL-FEP, Pro-ATN

3rd Party Products

- VCCS
- VHF/UHF Radios

Navigation

Conventional Nav aids

- MLS 480
- ILS 420
- CVOR 431 & DVOR 432
- DME 415/435
- NDB 436
- TACAN 551 & TACAN 551

SatNav

- GBAS - DGRS 610/615

Surveillance

Radar

- STAR 2000 (S-Band)
- TRAC 2000N (L-Band)
- RSM 970S (Mode S)

MAGS

- ADS-B
- MLAT/ WAM

FOD Detection System

- FODetect

Enriched portfolio to help customers optimize their operations

Increase capacity

Improve safety

Reduce the environmental

Cut ATM operating costs



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



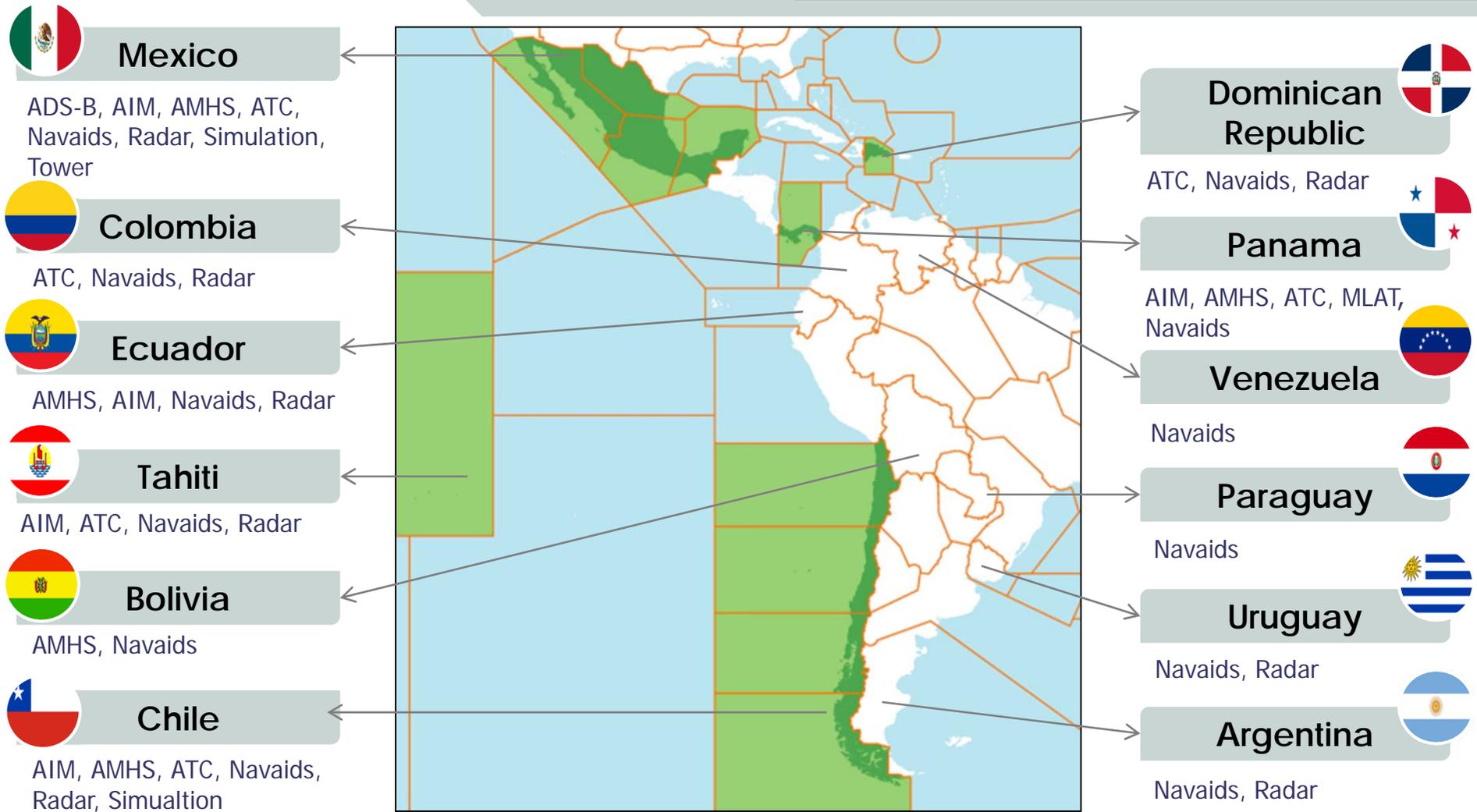
SESAR

◆ Ready for SESAR Common Project deployment



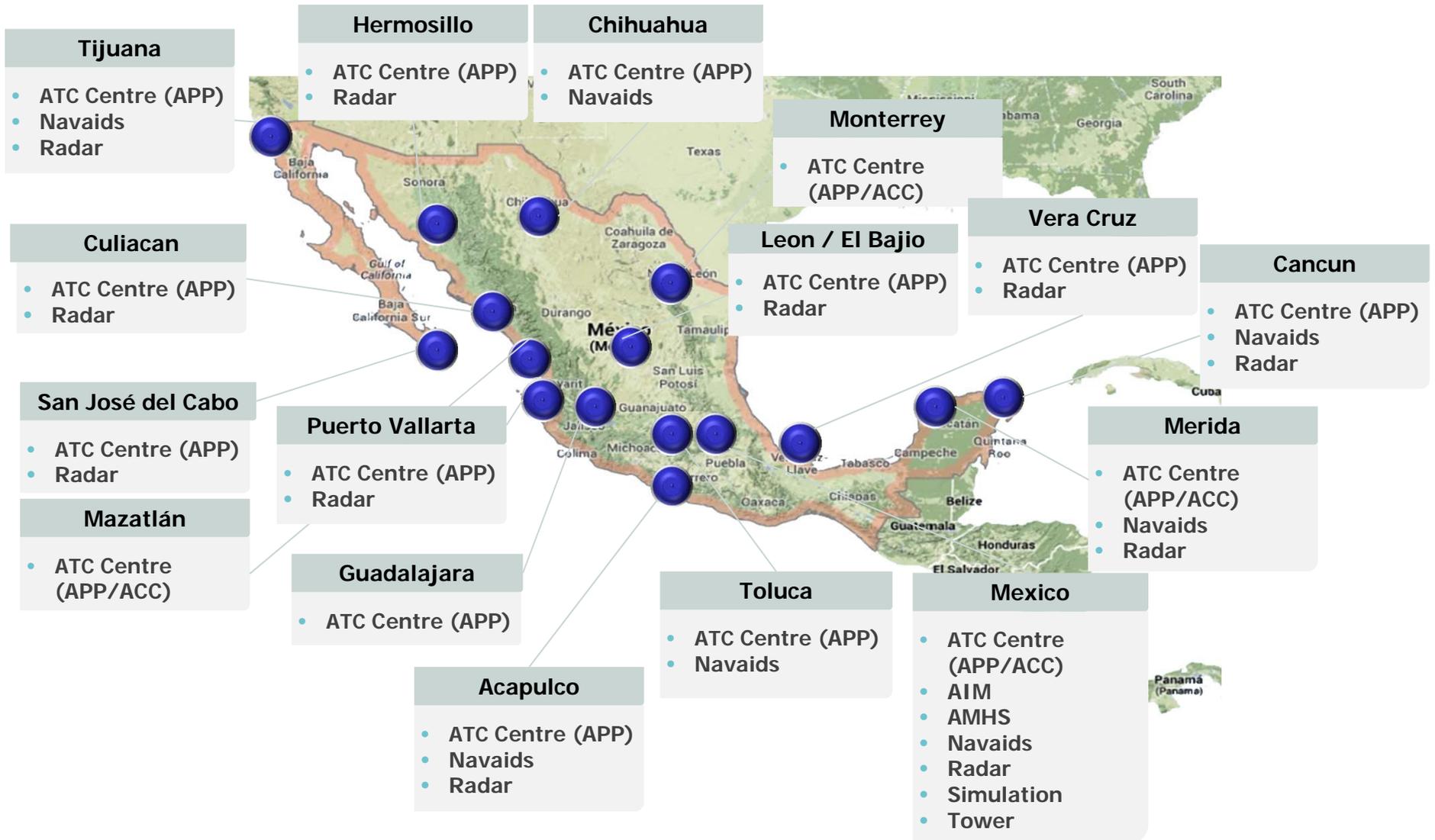


Thales's Key ATM Projects in Latin America



1,800 controllers using TopSky - ATC systems in Latin America
Handling over 100 million passengers a year with 25 APP/ ACC Thales

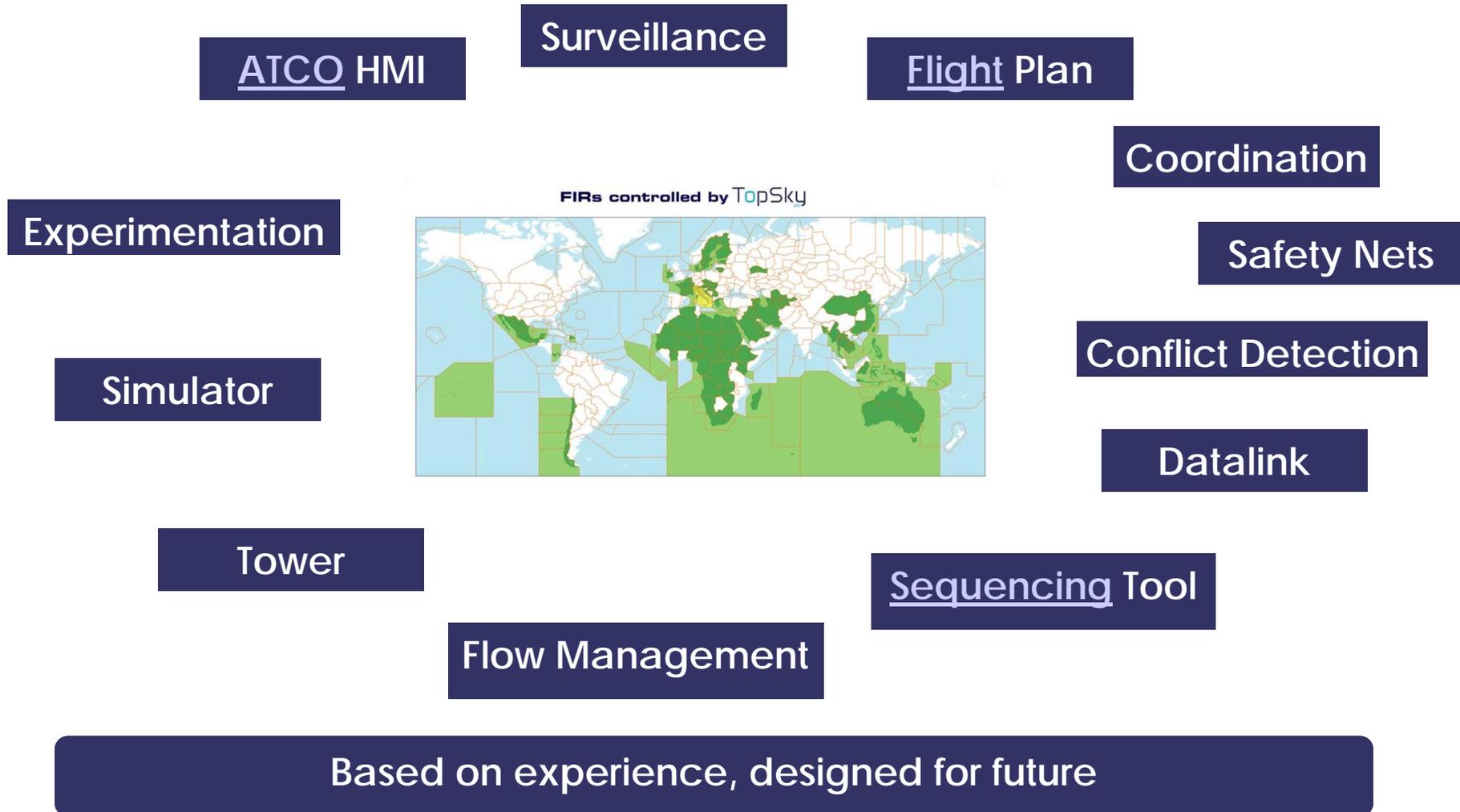




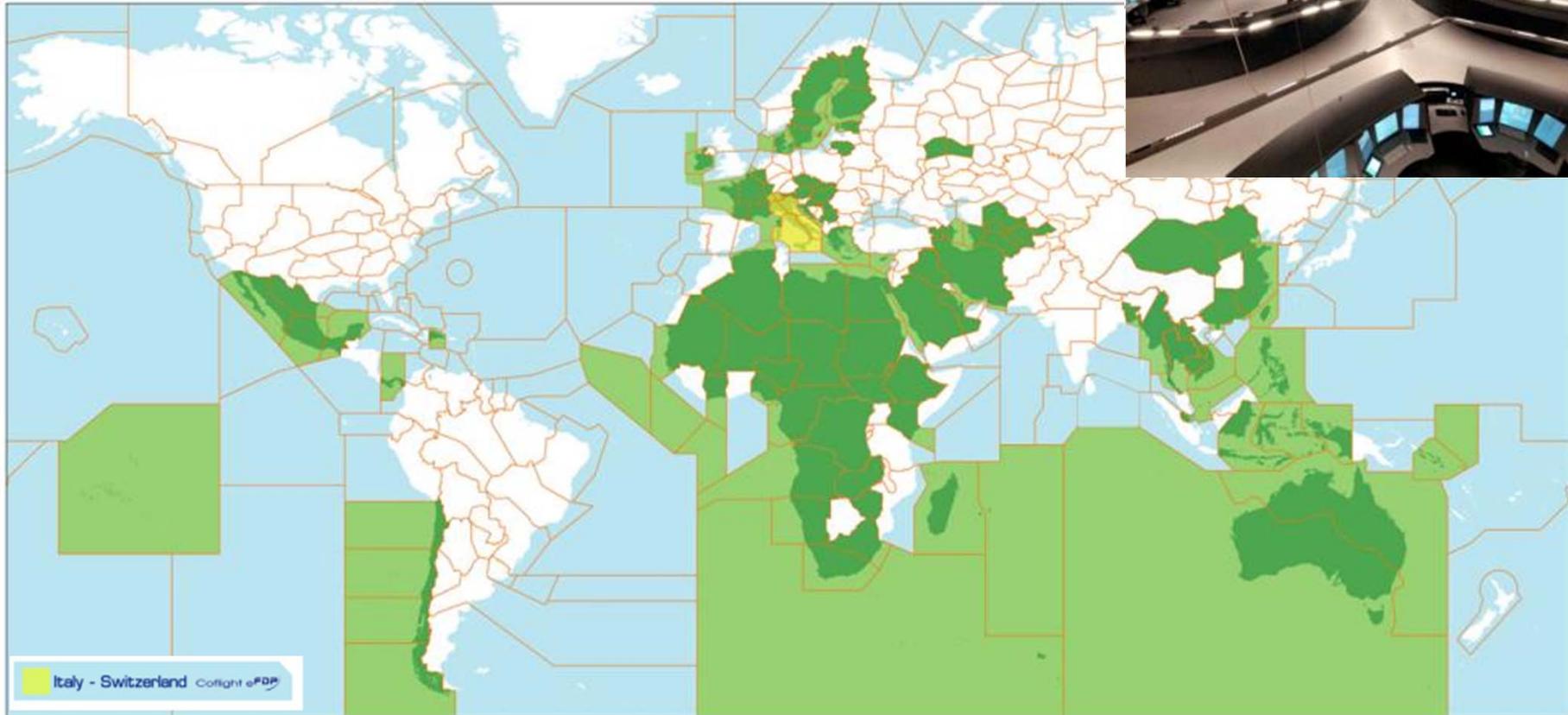
TopSky-ATC , with 4 ACCs, 12 APP handles the entire Mexican Airspace
 One of the busiest network in Latin America



Range of software components supporting different levels of automation & functionalities



FIRs controlled by TopSky



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 (MTCO, 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



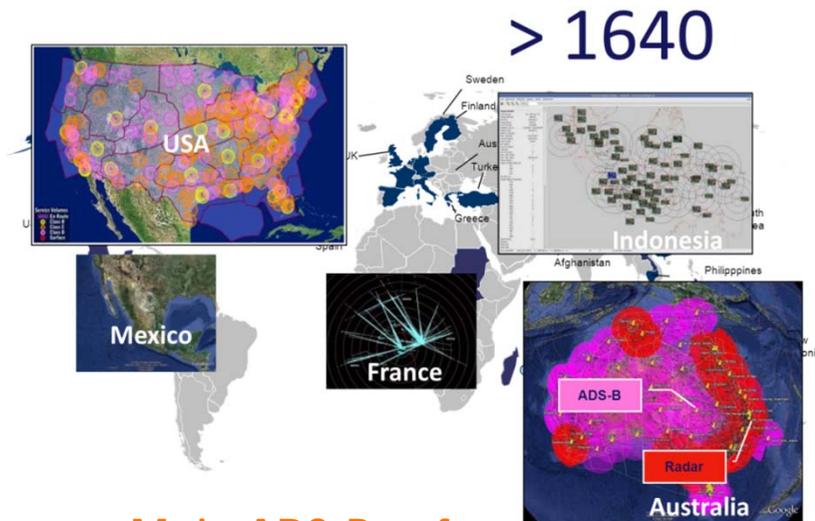
Radar, ADS-B, WAM Fused System Tracks

Field-proven trackers for civilian and defence tracker

ATC required adaptations/modifications

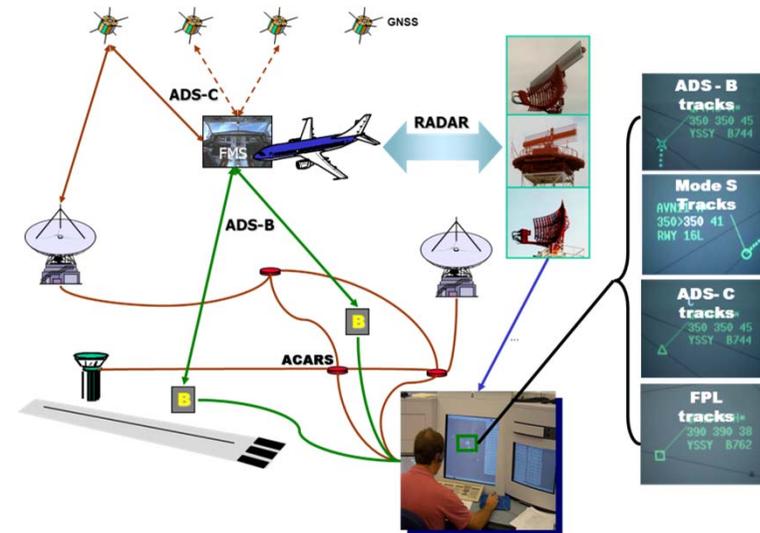
- ➔ Surveillance Data Processor (Front-End, Tracker)
- ➔ Safety Nets (To be adapted to new means)
- ➔ Controller Working Position (HMI) (Symbols, New tools (e.g.RAIM Outage for ADS-B))
- ➔ Ancillary functions (By-pass, Recording and replay, Simulator)

Focus on Mexico



> 1640

Main ADS-B references



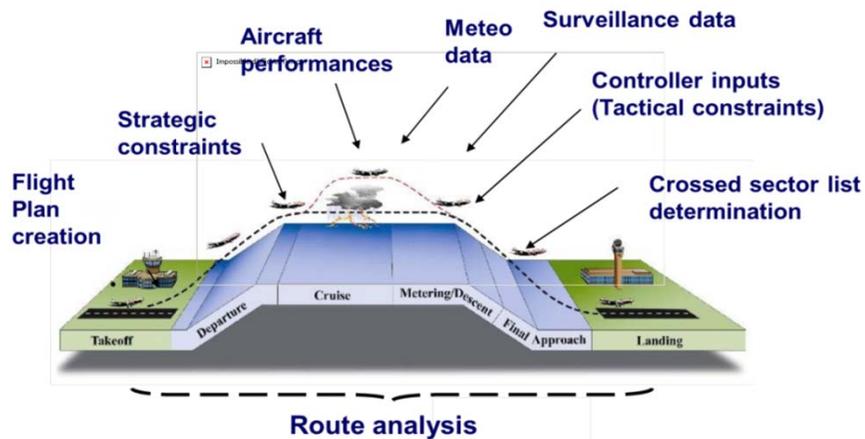
References

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



Operational benefits

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

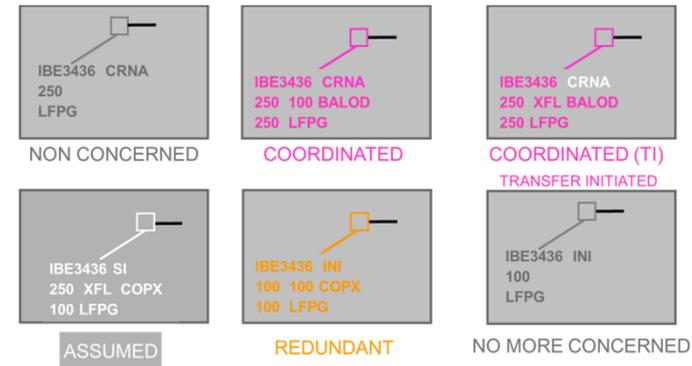
Description

- ◆ **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

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

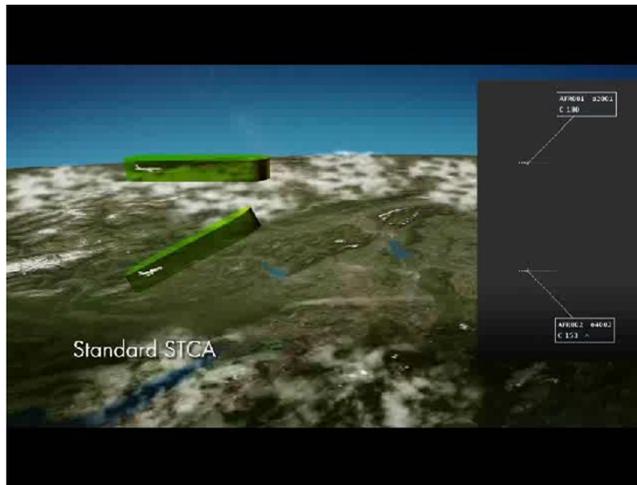
- ◆ Inter – sector or Inter-FIR silent notification, coordination and transfer in operation
- ◆ Combination of trajectory prediction & conditions driven coordination
- ◆ Support for **Civil / Military coordination**
- ◆ Color coding to segregate coordination status



Simplify coordination to focus on control

TopSky

Safety Nets



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

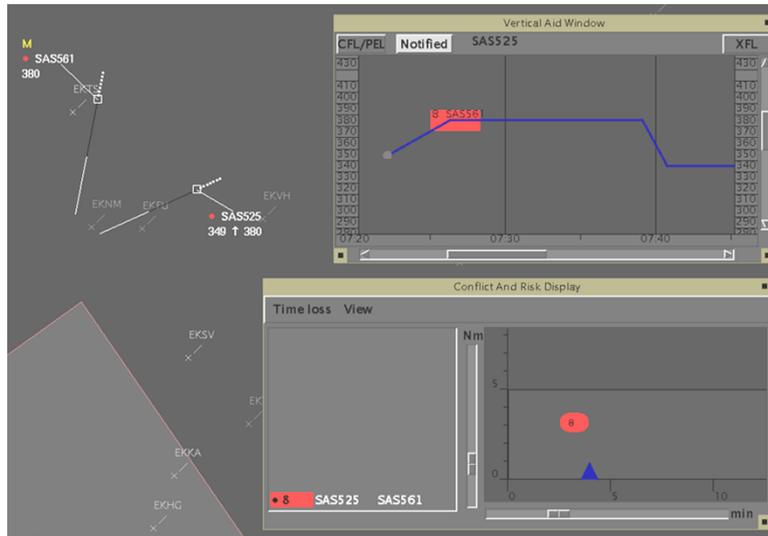
- ◆ Securing airspace while increasing air traffic capacity handling
- ◆ Increase confidence thanks to reduction of nuisance alerts
- ◆ Increase efficiency with early detection of conflicts



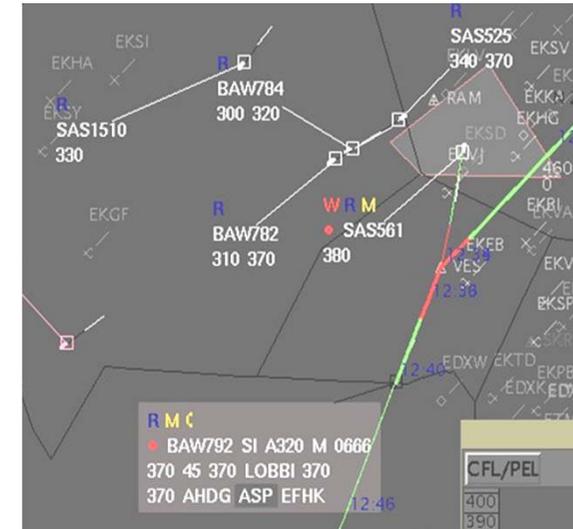
Controllers can rely on

Description

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



Segregated Area Probe			
BAW792	LSD01	5606N00910E	1240
SAS561	LSD01	5637N00839E	1226



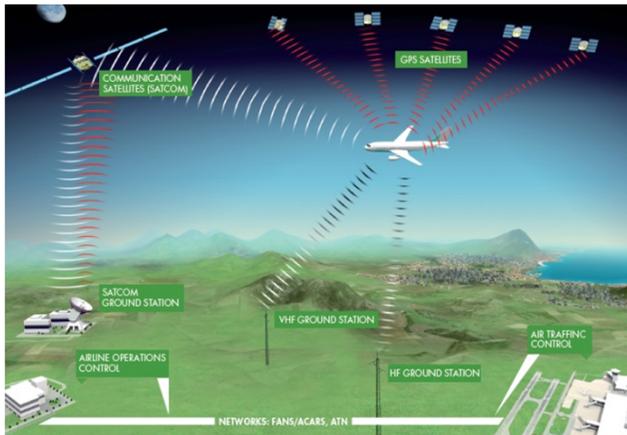
Operational benefits

- ◆ 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

Sector List (1) 0/0

View	Font	COPN/ETO/PEL	CFL	ASP	ASSR
C/S		ETO	PEL	COPN	
AFR111			320	M76	1234

W R 1234 SPD P LATE
AFR111 INI A320 M TSSR
AFL N0470 100▼ MOLEK 300
320 AHDG M76 LFPG

CPDLC MESSAGE

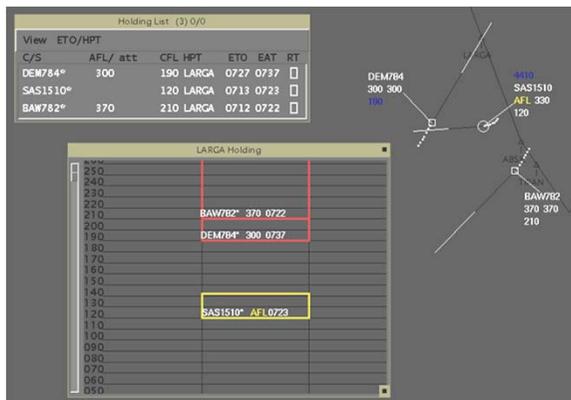
DIALOG	TIME	C/S	MESSAGE
	1321	AFR111	▲ SQUAWK 1234
	1319	AFR111	▼ STANDBY
	1318	AFR111	▲ INCREASE SPEED TO 0.780M

Key datalink player

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Description

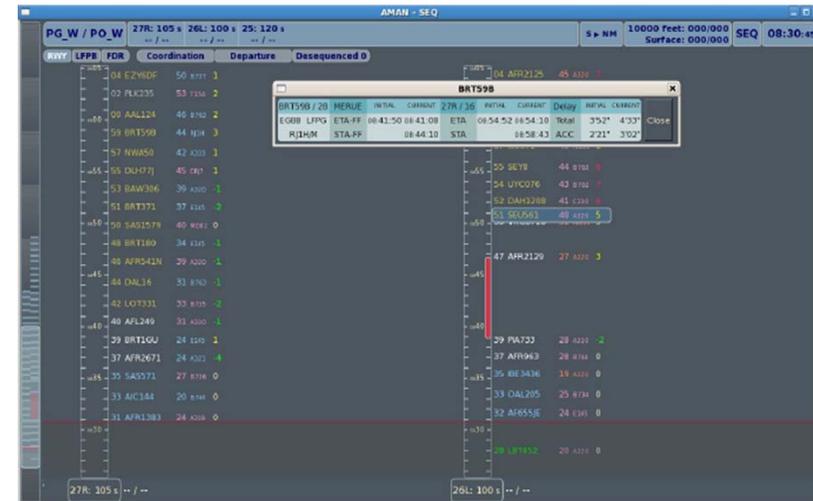
- ◆ Integrated AMAN/DMAN solution
- ◆ A multi-airport and multi-runway **decision-support tool** for one or several Terminal Approach Areas (TMA)
- ◆ Collaborative solution with airlines and airport
- ◆ Holding window in case of heavy traffic



References

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

More than 28 airports worldwide



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

Arrival and departure sequence optimisation

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**

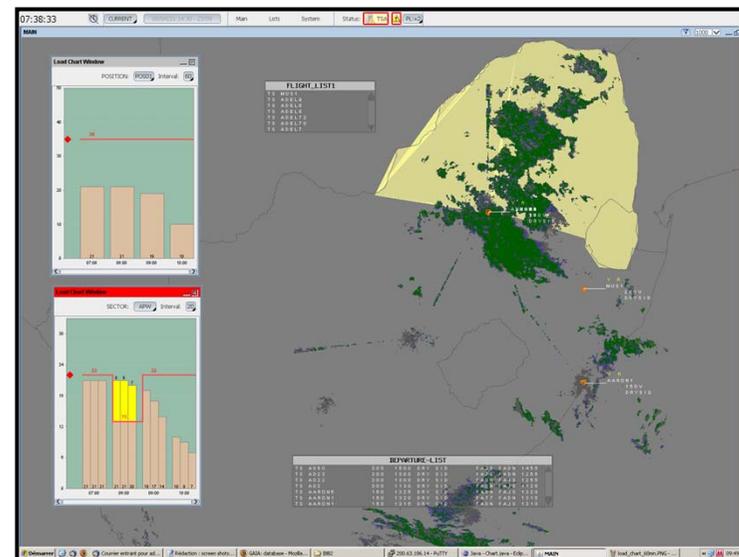
Operational benefits

- ◆ 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



Jane's ATC Enabling Technology Award

THALES

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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



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

- ◆ 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



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

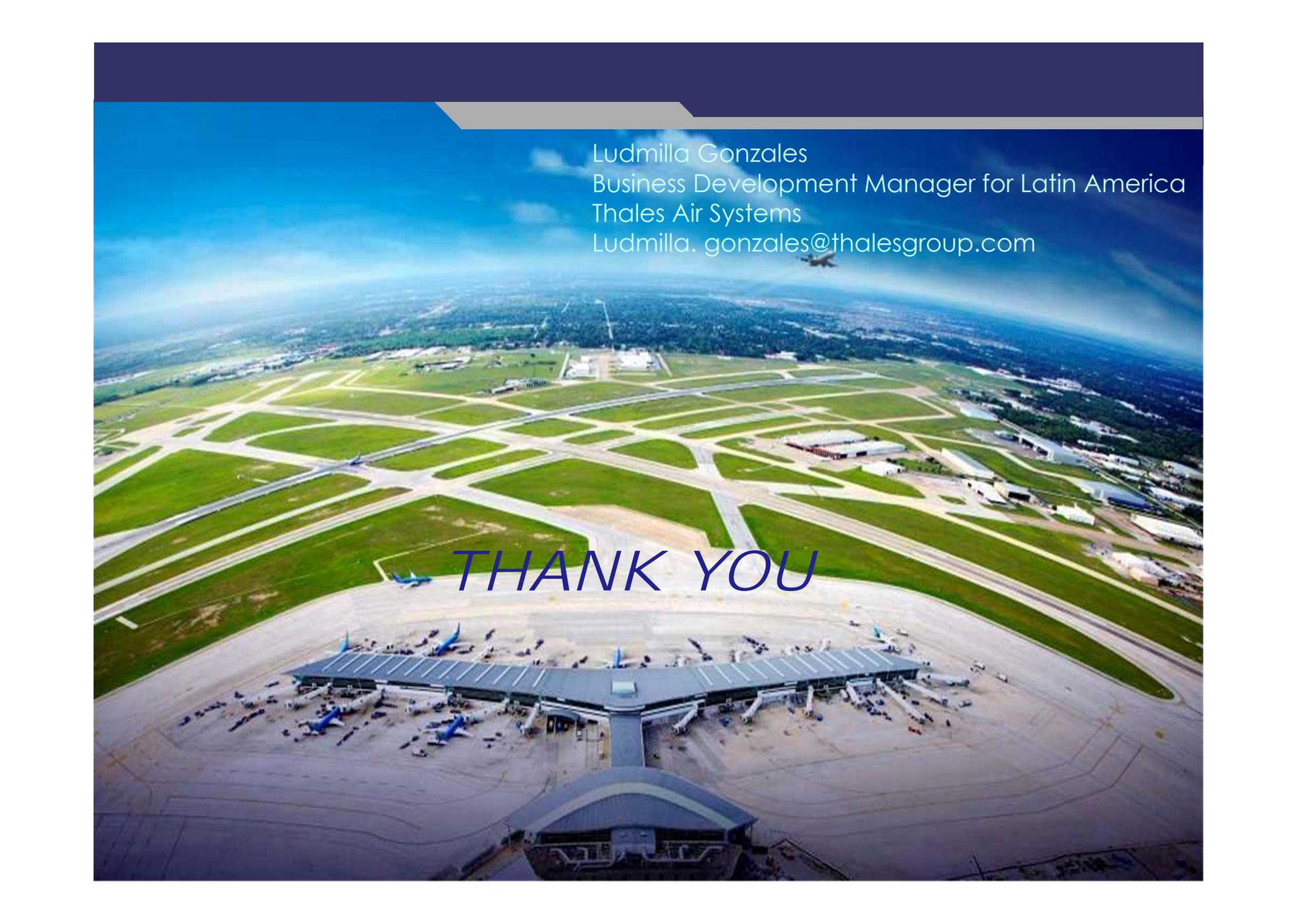
References

- ◆ 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

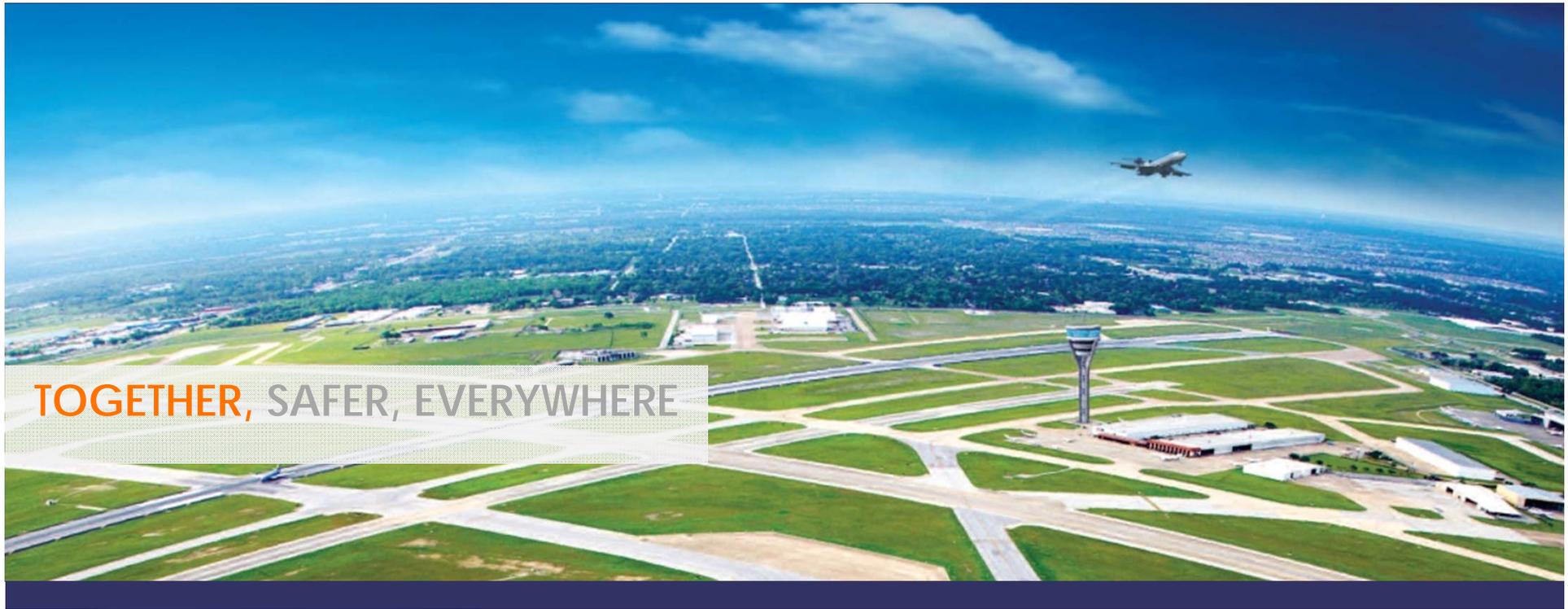
- ◆ Recreate Operational Environment
- ◆ Communication with ATCO at early stage
- ◆ Functionality prospective
- ◆ Fine tuning of operational centric tools as surveillance, safety net, conflict detect components

Replace paper by early hands-on experience

An aerial photograph of an airport terminal and surrounding runways. The terminal is a large, modern building with a curved roof, situated in the foreground. The runways and taxiways are visible as a complex network of light-colored paths cutting through green grass. In the background, there are trees and some buildings. The sky is blue with some light clouds. The text is overlaid on the upper right portion of the image.

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Thales Air Systems
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THANK YOU

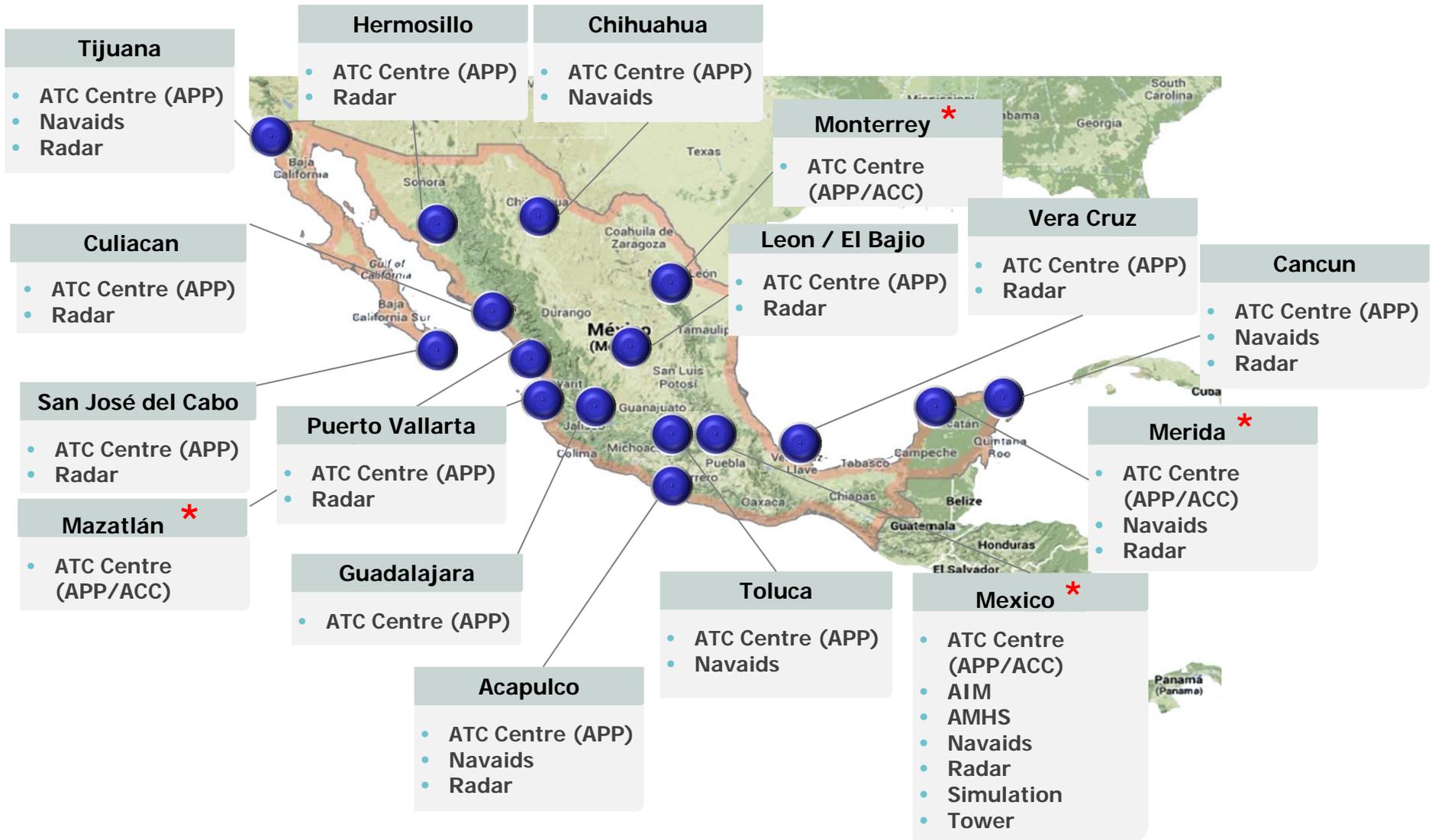


TOGETHER, SAFER, EVERYWHERE



ADS-B in ACC of Mexico

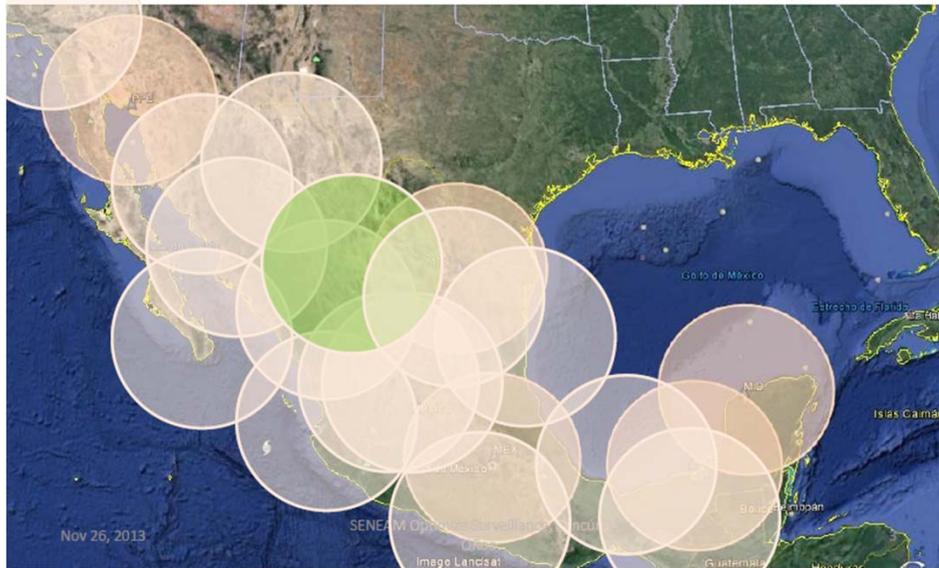
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TopSky-ATC , with 4 ACCs, 12 APP handles the entire Mexican Airspace
 One of the busiest network in Latin America



Coverage of SENEAM Radars 2013



21 Radars to covers the entire Mexican Airspace

Coverage of SENEAM ADS-B 2014



10 ADS-B ground station
to complete the radar coverage



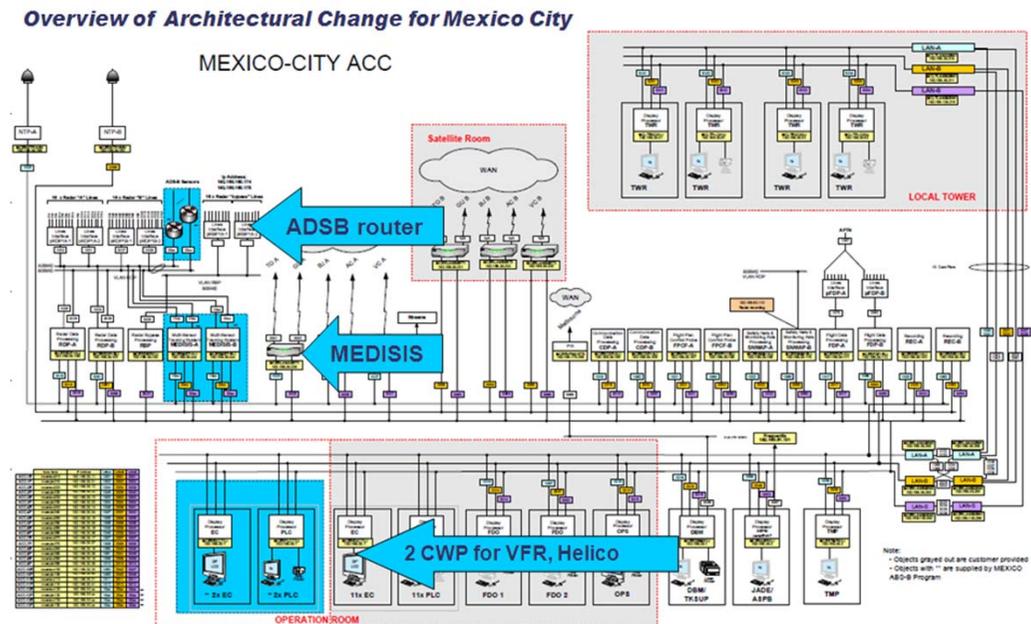
◆ Plan to integrate ADS-B data in Mexico city ACC then Merida ACC, Mazatlan ACC, Monterrey ACC & associated APPs

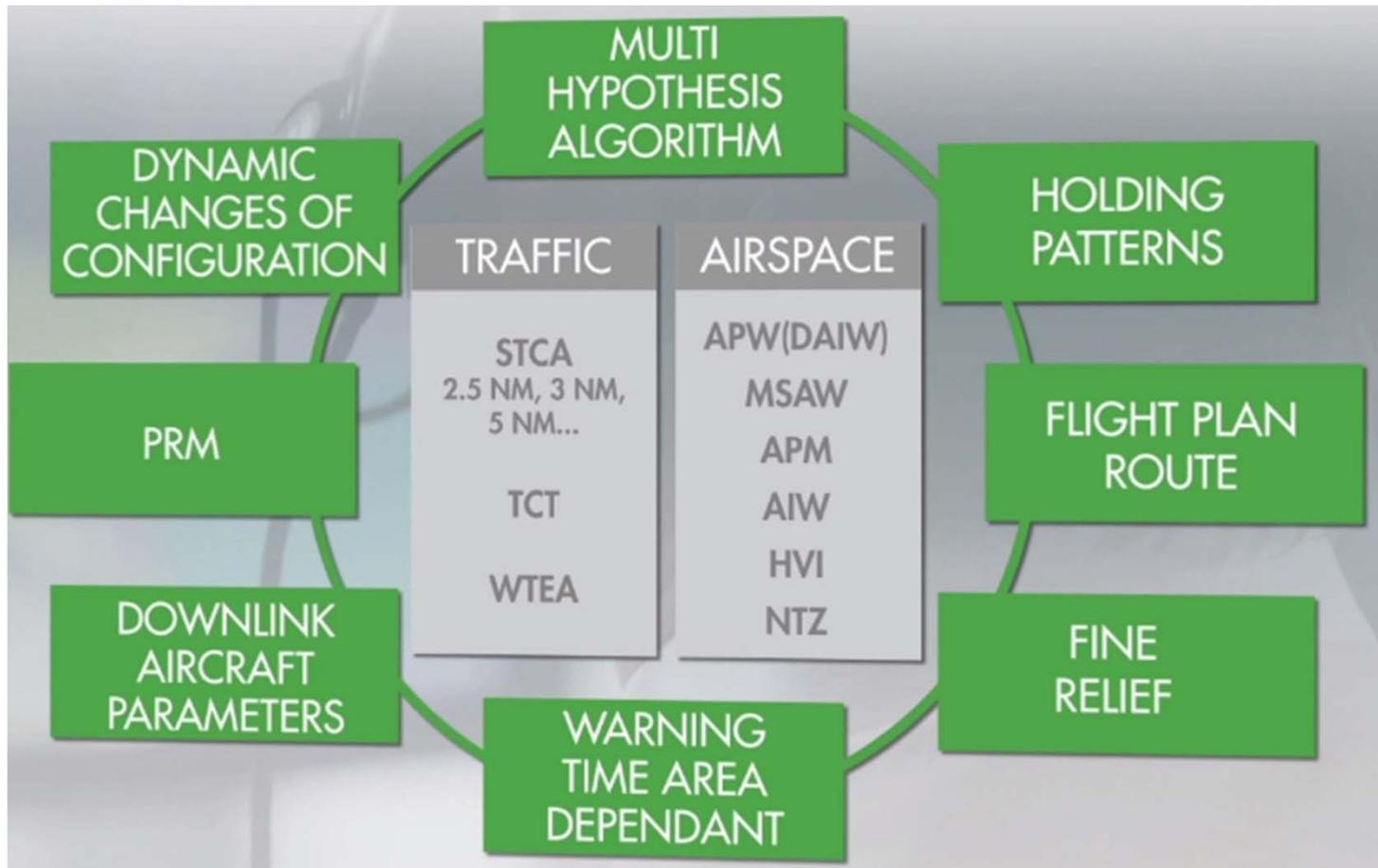
- To enhance current operational Mexican ACCs/APPs in processing & displaying ADS-B data
- To better survey Helicopters in the Valley of Mexico flying at low alt.
- To complete Radar coverage

◆ 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





MULTI HYPOTHESIS