ICAO CAR/SAM electronic Terrain and Obstacle Data (eTOD) Seminar
Mexico City - Nov 23rd - 25th, 2015

Dejan Damjanovic, Managing Director, FANS Group
Agenda Topics

1. AIXM, FIXM, WIXM - and the Life Cycle
2. Case Study - A.S.U.R. Airport Authority
3. Deliverable Review,
4. Value Proposition of eTOD & AMDB’s
5. Thank you!
Air Transportation has reached the Saturation Point in 2015..............
Everything starts with the Global Air Navigation Plan..


- The GANP allows countries to package their upgrades according to available resources.
- This provides a clear, planned & structured pathway towards the Future Air Navigation System (FANS) for all ICAO nations.
- The US is implementing these Operations Concepts into the system known as Next Generation Air Transportation System or NextGEN.
- In Europe, this is known as Single European Sky or SESAR.
- Mexico’s DGAC (a FANS Group Customer) is a Strategic participant to the Block Upgrade process in Latin America & North America towards supporting NextGEN & SESAR.
Cornerstone of FANS is PBN
Structure of the GANP

▲ Our ASUR project is one of the earliest steps towards adoption of Blocks Zero (0) & One (1), enhancing present and future air traffic in the 9 ASUR airports- Mexico’s largest and most valuable Tourist Destinations.
Key Block Upgrade themes require eTOD & Airport Digital Maps.

▲ Airport Operations.
   ▶ Require knowledge of Obstacles to optimized Arrival & Departure procedures.
   ▶ Require knowledge of Airport Map to optimize Surface Movements.

▲ Globally Inter-Operable Systems & Data.
   ▶ Require knowledge of Obstacles and Airport Map to share with all relevant stakeholders - ATM, Airline, Military, and others.

▲ Optimum Capacity & Flexible Flights.
   ▶ Require knowledge of Obstacles and Airport Map to implement PBN Arrivals and Departures to improve hourly capacity.

▲ Efficient Flight Paths
   ▶ Require knowledge of Obstacles to minimise flight times, noise, and carbon emissions, while maximizing Safety and Revenues.

To succeed, we need a Common Language....
AIXM is the data glue for FANS

- Aeronautical Information eXchange Model (AIXM)
- An XML specification for all Aeronautical Information
  - Replaces paper Aeronautical Information Publications (AIP)
  - Allows all 200+ ICAO signatory countries to electronically share their AIP information in a common data format
  - Enables the use of Digital NOTAMS, where the critical airmen’s information is tied to a database record, not just text

- A companion format known as Flight Information eXchange Model (FIXM) delivers Aircraft Position reporting in 4D
  - Improved Collision Avoidance and Spacing Performance

- A 3rd companion format - Weather Information eXchange Model (WIXM)
  - Reports weather worldwide in a standard format.
Life Cycle of FANS Flight Ops

NextGEN or SESAR – the Life Cycle is the same..
## Where is eTOD required in Flight Ops?

<table>
<thead>
<tr>
<th>Life Cycle Phase</th>
<th>Why it requires eTOD data</th>
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<tbody>
<tr>
<td><strong>Departure Management</strong></td>
<td>• Terrain data for Engine-Outs</td>
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<td>• Obstacle data for Engine-Outs</td>
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<td></td>
<td>• Airport Maps to minimize taxiing</td>
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<td></td>
<td>• Cadastral &amp; Environment data for Departures</td>
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<tr>
<td><strong>PBN Flight Operations</strong></td>
<td>• Terrain data for PBN separation</td>
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<td></td>
<td>• Obstacle data for PBN separation</td>
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<tr>
<td></td>
<td>• Terrain data for Drift-Down/Let down</td>
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<tr>
<td><strong>Metroplex</strong></td>
<td>• Terrain data for SID/STAR</td>
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<tr>
<td></td>
<td>• Obstacle data for SID/STAR</td>
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<td></td>
<td>• Cadastral &amp; Environment data for SID/STAR</td>
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<tr>
<td><strong>In-Trail Enroute</strong></td>
<td>• Terrain data for PBN separation</td>
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<td></td>
<td>• Obstacle data for PBN separation</td>
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<tr>
<td></td>
<td>• Terrain data for Drift-Down/Let down</td>
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<tr>
<td><strong>Continuous Descent</strong></td>
<td>• Terrain data for SID/STAR</td>
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<tr>
<td></td>
<td>• Obstacle data for SID/STAR</td>
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<tr>
<td></td>
<td>• Cadastral &amp; Environment data for SID/STAR</td>
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<tr>
<td><strong>Surface Movements</strong></td>
<td>• Airport Maps to minimize taxiing</td>
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</table>
ICAO has 3 Annexes on eTOD..

**Annex-4**

Aeronautical Charts

**Annex-14**

Aerodromes

**Annex-15**

Aeronautical Information Services
What does each provide us with?

**Annex-4**
- Defines the Take Off Flight Path Area (TOFPA).
- Used in **Type A Obstacle Charts**.
- **Type A** no longer required if Annex-15 eTOD data is available

**Annex-14**
- Defines the traditional and Precision Surfaces used before Annex-15 was revised.
- Used in **Type B Obstacle Charts**.
- **Type B** no longer required if Annex-15 eTOD data is available

**Annex-15**
- New concept of Area-1, Area-2, Area-3, Area-4
- Encompasses much larger area around each Runway to better support PBN Operations.
Case Study: Mexico eTOD Project
Grupo Aeroportuario del Sureste, Wide blend of Air Traffic: Intl Airline, Regional, Business, GA

Objective: Meet ICAO Annex 15, Chapter 10 eTOD requirements by Nov-2015

- **CANCUN:**
  - Annual PAX 17.5M, 2nd largest apt in Mexico
- **COZUMEL:**
  - Annual PAX 0.5M, growing tourist destination
- **HUATULCO:**
  - Annual PAX 0.5M, Canadian Tourist hub
- **MERIDA:**
  - Annual PAX 1.4M, ATC Area Control Center
- **MINATITLAN:**
  - Annual PAX 0.1M, mostly Business & GA
- **OAXACA:**
  - Annual PAX 0.5M, highly terrain challenged
- **TAPACHULA:**
  - Annual PAX 0.1M, southernmost airport
- **VILLAHERMOSA:**
  - Annual PAX 1.1M, regional tourist destination
- **VERACRUZ:**
  - Annual PAX 1.1M, major Port of Mexico
2h/4h/6h/8h Flight Radius to NextGEN, SESAR...
Case Study: eTOD for ASUR airports

**Terrain & Obstacles delivery**

- Database standard is EUROCAE ED-98(A).
- Obstacle Criteria is ICAO Annex 4, Annex 14 (1st Phase) and Annex-15 (2nd Phase).
- Coverage is ICAO Area-2ABC.
- Formats include: **AIXM**, SHP, AutoCAD, KML/KMZ

**Airport Mapping delivery**

- Airport Mapping Database (AMDB) standard is EUROCAE ED-99(B).
- All features include building or obstacle ground elevation, and height of structure or feature.
- These AMDB are suitable for all ICAO requirements, as well as being used in Airline Electronic Flight Bag systems such as iPads.
- Formats include: **AIXM**, SHP, AutoCAD, KML/KMZ
- Provides pathway to FAA and EUROCONTROL D-NOTAMS.
The ANSP & CAA are already moving towards FANS & AIM....

[Diagram showing SENEAM and ASUR with their respective systems and services, including THALES TopSky, AIRBUS Metron ATFM, AIXM Airport Maps for Digital NOTAMS, and AIXM eTOD for PBN Procedures.]

Example Airport: MMBT
ICAO Annex-15 Compliance:

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<tr>
<th>Type</th>
<th>Count</th>
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<tbody>
<tr>
<td>Point</td>
<td>1268</td>
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<tr>
<td>Line</td>
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<tr>
<td>Polygon</td>
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</table>
ICAO Annex-14 Compliance:

- Point: 75
- Line: 2
- Polygon: 59
ICAO Annex-4 Compliance:

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Important Lesson: Must begin with Annex-15, to support all others!
### Value Proposition: Airline benefit

<table>
<thead>
<tr>
<th>Airline</th>
<th>Airline</th>
<th>Airline</th>
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<tbody>
<tr>
<td>Aeroflot</td>
<td>Delta Air Lines</td>
<td>Southwest Airlines</td>
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<tr>
<td>Aerolíneas Argentinas</td>
<td>EuroAtlantic Airways</td>
<td>Spirit Airlines</td>
</tr>
<tr>
<td>Aeroméxico</td>
<td>Finnair</td>
<td>Sun Country Airlines</td>
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<tr>
<td>Aerotúcan</td>
<td>Interjet</td>
<td>Thomas Cook Airlines</td>
</tr>
<tr>
<td>Air Berlin</td>
<td>Jetairfly</td>
<td>Thomas Cook Airlines Scandinavia</td>
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<tr>
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<td>JetBlue Airways</td>
<td>Thomson Airways</td>
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<tr>
<td>Air Canada Rouge</td>
<td>LAN Airlines</td>
<td>Transaero Airlines</td>
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<tr>
<td>Air Europa</td>
<td>LAN Peru</td>
<td>Transportes Aéreos Guatemaltecos</td>
</tr>
<tr>
<td>Air France</td>
<td>LOT Polish Airlines</td>
<td>Tropic Air</td>
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<tr>
<td>Air Transat</td>
<td>Magnicharters</td>
<td>TUIfly operated by Arkefly</td>
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<tr>
<td>AirTran Airways</td>
<td>Maya Island Air</td>
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<td>Alaska Airlines</td>
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<tr>
<td>Cubana de Aviación</td>
<td>SATA International</td>
<td>XL Airways France</td>
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All of these airlines fly into some or all of the ASUR airports. They can all benefit from improved:

- Two-Engine Take-Off Performance,
- Engine-Out Performance,
- New fuel-efficient PBN Procedures,
- Electronic Flight Bag Airport Maps

This project provides for new potential Revenues for ASUR & it’s partners!
Value Proposition: PBN Implementation

NEXT GEN Components: RNAV/RNP
Moving to Performance-Based Navigation

Conventional Routes
Today's airways connect ground-based navigation aids

RNAV
Area Navigation (RNAV) routes follow defined "waypoints"

RNP
Required Navigation Performance (RNP) routes within specified "containment area"

Limited Design Flexibility

Increased Airspace Efficiency

Optimize Use of Airspace

Source: Federal Aviation Administration

FANS Group
Value Proposition: Digital NOTAMS
Value Proposition: Better Airport Management

- (AMDB) helps Airport in development of airport real estate
- (AMDB) helps Airport in Neighborhood Noise Management
- (Obstacles) helps Airport improve takeoffs with tree removals
- (AMDB) helps develop better Road & Rail links to Airport
Conclusions:

- The Air Transportation industry can only solve its problems by the structured implementation of ICAO Block Upgrades as defined in the GANP.
- Most Block Upgrades require a sound foundation of eTOD and Airport Mapping information.
- ICAO Annex-15 provides a reliable standard for how to collect eTOD and Airport Maps.
- FANS Implementations such as NextGEN and SESAR will reward those Airports who embrace eTOD and Airport Maps sooner with opportunities for increased traffic.
Thank you for your time

<table>
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