Air Traffic Flow & Capacity Management

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Why Do We Need ATFM/CDM?
Why do we need flow management?

- Large investments in IT infrastructure by all stakeholders
- Good optimisation of each stakeholder’s own operations
- Very little optimisation across the stakeholder boundaries
- Still > $9B in aviation system inefficiency per annum

Small gains in aviation operations efficiency = large value / benefits
Access to and integration of disparate data is the key to anticipating and optimizing aviation operations and passenger needs.

Transporting a passenger from one city to another can involve many distinct entities – multiple aircraft operators, airport authorities, ANSPs, MET offices.

Passenger experience and efficient service provision relies on optimization of the route, staff, crew, network, airspace and more. Better data leads to better decisions.
Airspace demand can vary significantly
What is Traffic Flow Management

Traffic Flow Management are the tools and processes to adjust aviation operations to demand / capacity imbalance.
What is Collaborative Decision Making

CDM is an approach whereby a group of stakeholders work together to solve common problems using agreed tools, processes and procedures.
Most significant airspace capacity factors

- ATM system availability (Controller’s equipment)
- Human factors (ATC workload)
- CNS system availability
- Air space design
- Weather
- Separation standards
Most significant airport capacity factors

- ATM system availability (Controller’s equipment)
- Weather
- Runways & Rapid Exit Taxiways
- Separation
- Aerodrome design
- Slots
Demand/Capacity Balancing Continuum (ATC perspective)

1 year to 1 week ahead
- Schedule-based Planning

1-2 months ahead
- Publish ATC Roster

1 week to 1 day ahead
- Refine the Planning (WX forecast, etc)

1 day ahead
- Publish Daily Plan

Day of operations
- National Traffic Mgmt. Initiatives
- Local Traffic Mgmt. Initiatives

KPIs, Analysis, Data Analytics & Lessons Learned after operations
Operations performance improves through coordination

Airlines, ATC & Airports are following analogous processes to plan, refine and operate their services. Performance improves thru collaboration & data sharing.
ATFM is much more than Slot Management

Increasing impact on flight schedule

OPTIMISE UTILISATION OF AVAILABLE CAPACITY

- Sector Management
  - Configuration
  - No. of Sectors
- Civil/Military Coordination
- Reduce Traffic Complexity
- Review Monitoring Value
- Holding Pattern
- Balancing Arrival/Departure Capacity

UTILISE OTHER AVAILABLE CAPACITY

- Rerouting
  - Flows
  - Flights
- FL Management
- Advancing Traffic

REGULATE THE DEMAND

- Slot Allocation
- Constraining Airborne Traffic

Need automation to apply the right action to the right flight at the right time
Thales Solution for ATFM/CDM
Thales ATFM Philosophy – blending best practices from around the world

- Don’t regulate traffic unless a problem is anticipated
- Use the correct tool (measure) for the problem faced
- Target equitable sharing of any operational impacts
- Provide airspace users the ability to share & select preferences
- Do not over-constrain flights
- Create incentives to encourage participation and compliance
- Combine policy and procedures with technology
- Use the analytics to improve forecasts and decisions
Prioritized approach for managing demand/capacity imbalance

- **Address airport issues where demand approaches or exceeds capacity**
  - Ration by schedule allocation of flights to available airport capacity (metering)
  - Load balance runways to accommodate demand
  - Calculate take-off times and metering point times (upstream metering)
  - Utilize sequencing (AMAN) to maximize utilization of available capacity
  - Balance departure flows (DMAN) with arrival flows to ensure smooth operations

- **Address airspace issues once airport flows are planned**
  - Identify hot spots (capacity / complexity overload) which require management
  - Evaluate available measures (route, speed, level, rate, time, sectorization, etc)
  - Implement changes to flights or flows (including coordination with stakeholders)
  - Monitor impact and continue to adjust as needed
Example: En route flow constraint management

ANSP Flow Manager uses reroute tool to find efficient weather avoidance routes for flights impacted by severe weather. Reroutes are sent to ATC system as proposals to be reviewed/accepted by ATCOs.

Ground delay program implemented with impacted airports to reduce demand on constrained sectors.

Coordinated

Coordinated

CTOT

Not Coordinated

ATOT = Actual Take Off Time
CTOT = Calculated Take Off Time
MIT = Miles or Minutes in Trail
TTA = Target Time of Arrival
ECOSYSTEM

a data-driven solution, providing
decision support for improved aviation operations
ECOsystem HMI

[Image of a map with flight paths and data]

THALES GROUP INTERNAL
ECOsystem Historical Timeline

Operational concepts explored through progressive SESAR demonstrations

- **Topmet**
  - SESAR 1 Demos

- **Toplink**
  - SESAR 1 Demos

- **Sesar 2020 Demos**

- **Big Data Research**

- **Demand and capacity/ATFM HMI Research**

- **ATFM Functionality added to Topsky-ATC**

- **ATFM Product**
  - Camu System

- **EcoSystem Product**

Timeline:
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
TopSky-ATC and ECOsystem work together to improve decisions

**Global data sources:**
- Surveillance
- Flight Plans
- Aero data
- WX/Meteo
- Flight Schedules
- Remote ATFM measures
- Remote airport status

**Local data sources:**
- Surveillance
- Flight Plans
- Aero data
- WX/Meteo
- System status

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**TopSky**

- Military coordination
- Correlated tracks

**ECOSYSTEM**

- Big Data Analysis
  - ROT
  - ETA
  - ...
- ATFM Measures
  - Arv/Dep metering
  - Rerouting
  - ...
- Situation awareness
  - Traffic & alerts
  - Airport & sector load
  - ...

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**Other ASNP**

- SWIM
  - EFB
  - Airports
  - Airlines
  - Pilot
  - Supervisor
  - Flow Manager
  - ATCO

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THALES GROUP INTERNAL
ECOsystem – Solutions for Efficiency & Capacity Optimization

- **Efficiency & capacity-oriented solution**
  - Companion to safety-oriented TopSky-ATC

- **Modern Big data and web-technology based platform and architecture**
  - Flexible, modular, scalable and cost-effective
  - Able to host specific local/regional algorithms and applications

- **Targeting major sources of aviation system inefficiency**
  - ANSP cost and controller productivity
  - ANSP flow management – airspace and airport optimization
  - Airline flight operations cost
  - Airline schedule reliability
  - Airport operations
THANK YOU FOR YOUR ATTENTION