Digital collaboration is the key to optimizing aviation flight operations

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 operations rely on optimization of the route, staff, crew, network, airspace and more. Better data leads to better decisions and better results.
Why do we need big data and collaborative systems?

- Different organizations have different drivers
  - ANSP = safety focused
  - Airlines = efficiency focused
  - Airport = capacity focused

- Global standards for data sharing missing

- Most valuable and inaccessible data is captured in each stakeholder’s systems

- Incentive to share data is low – very little optimisation between stakeholders

Small gains in aviation operations efficiency = large value / benefits
Key Customer Pain Points and Industry Drivers

**ANSP PRODUCTIVITY**

0.86

**FLIGHT DELAYS**

10-20 MIN per

**FLIGHT HOURS** per

**ATC OPS HOURS**

**SCHEDULED FLIGHT TIME INCREASE**

+9-33% in PAST 15 YEARS

Increased productivity is the key to ANSP performance.
Planning & coordination is the key to improved airline performance.
Same City Pair – Very Different Flights!

Track 1
01 JUL 05

Track 2
20 FEB 05

2692 NM
Operations performance improves through coordination

- Flight route, distance & time uncertainty
- Airport slot acquisition
- Flight block time buffering to ensure airline network performance
- Big data analytics to refine planning
- Flights added or canceled in anticipation of specific issues (special event, natural disaster, strike, etc)
- Policy, procedure & technology

- Real-time digital coordination & collaboration
- Optimization tools to support decision making
- ATFM measure coordination (delays, cancel, swap, reroute)
- Global tracking & data sharing
- Prioritization & operational adjustment

Airlines, ATC & Airports are following analogous processes to plan, refine and operate their services.

Performance improves thru collaboration & data sharing.
**TopLink “Flight Rerouting” Use Case 1: improved horizontal diversion**

**Actual scenario:**
«last minute deviation» based on Weather Radar info, to avoid severe convection over the Pyrenees

**TOPLINK expected benefit:**
Early rerouting decision 45 mn in advance (western avoidance route)

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**BEL7FP**
13/09/2016
BRU-AGP

<table>
<thead>
<tr>
<th></th>
<th>Planned</th>
<th>Actual</th>
<th>TOPLINK benefit vs actual (est.)</th>
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<tbody>
<tr>
<td>Take-off</td>
<td>15:28</td>
<td>15:24</td>
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<tr>
<td>Arrival</td>
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<td>18:08</td>
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<tr>
<td>Track miles</td>
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<td>1039 NM</td>
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**Impact of weather**

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<tr>
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<th>Planned</th>
<th>Actual</th>
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<tbody>
<tr>
<td>Arrival delay</td>
<td>0</td>
<td>+11 mn</td>
<td>- 7 mn</td>
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<tr>
<td>Extra flight duration</td>
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<tr>
<td>Extra track miles</td>
<td>0</td>
<td>57 NM</td>
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<tr>
<td>Extra cost (est.)</td>
<td>0</td>
<td>+599 €</td>
<td>- 420 €</td>
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</table>
TopLink “Flight Rerouting” Use Case 2: Avoid diversion

**Actual scenario:**
20 mn holding over BIO due to severe thunderstorm, then diversion to MAD
Then PAX back to BIO by bus (395 km)
Aircraft back to BIO through ferry flight

**TOPLINK expected benefit:**
Ground delay at departure in BRU 60 mn then flight as planned
Extending ATC View beyond the “Local” Situation

Air Traffic Control Centres typically do not have access to location & status of flights outside their airspace.

Flight path is substantially impacted by weather / winds.

Flight time is impacted by airline / airport operations & congestion in airspace from origination & destination.

Therefore there is a high degree of uncertainty as to when and where a flight will arrive for ATC management.
Leveraging Big Data to Enable Better Predictions & Results

Flight and weather behavior predicted using models and historical behavior (machine learning).

Interactions between weather and flights predicted creating alerts. Flight rerouting used to address alerts and maintain safe flight operations.

Updated flight routes and times reflected in air traffic controller workload allowing sector combination / splitting to adjust staffing levels and costs of service provision.

Controller “workload”

Nowcasting = fast forward through predicted future

Low workload = sectors can be combined

High workload = split sectors or reroutes

Alert list of flights impacted by weather

Delayed flights identified

Low workload = sectors can be combined

High workload = split sectors or reroutes

Controller “workload”

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Allocation of ATFM/CDM functions to logical organizations / facilities

In complex environments, close coupling is required between all operational roles to achieve optimization while ensuring fairness and equity.

ATFM/CDM blends policy, procedures and technology.

* Provided by airport in some locations
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

- Big Data Analysis
  - ROT
  - ETA
  - ...

- ATFM Measures
  - Arv/Dep metering
  - Rerouting
  - ...

- Situation awareness
  - Traffic & alerts
  - Airport & sector load
  - ...

- Military coordination
- Sectorisation
- Airport cfg plan
- Correlated tracks
- Flight profiles
- Arv/Dep sequencing

- Other ASNP

- SWIM

- EFB

- Airlines

- Pilot

- Supervisor

- Flow Manager

- ATCO

- Airports

- Thales

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THANK YOU FOR YOUR ATTENTION