ATM operational concept, TBO and MET in SWIM

WMO EC-69 SPECIAL DIALOGUE
‘THE FUTURE OF AERONAUTICAL METEOROLOGICAL SERVICES’

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ICAO Global ATM Operational Concept (GATMOC)

- Collaborative decision making
- ATM Service delivery management
- Airspace organization and management
- Demand/capacity balancing
- Aerodrome operations
- Traffic synchronization

- Conflict management
  * Strategic conflict management
  * Separation provision (SEP)
  * Collision avoidance

- Airspace user operations
The core principle behind the GATMOC
A paradigm Shift for ATC

Past
Procedural Control
the current and planned a/c positions

Today
Radar Control
Know the current and estimate planned a/c positions

Future
Trajectory Management
Know & share the current & planned a/c positions
Translated in Strategic Business Needs

**MOVING FROM AIRSPACE TO 4D TRAJECTORY MANAGEMENT**
Integrating airspace users flight systems to build predictable time synchronised flight precision

**TRAFFIC SYNCHRONISATION**
Improving arrival/departure management and sequence building to allow flying closer to the optimum trajectories

**NETWORK COLLABORATIVE MANAGEMENT AND DCB**
Integrated with airport operations planning and airspace user flight planning

**AIRPORT INTEGRATION AND THROUGHPUT**
Integrating airports - time synchronised operations of surface trajectories and flight turn-around

**CONFLICT MANAGEMENT AND AUTOMATION**
Human operators concentrate on high value-added tasks

**SYSTEM WIDE INFORMATION MANAGEMENT**
The Intranet for Air Traffic Management
Today’s reality

European example

Air transport contributes €220 billion to European gross domestic product

Air Transport employs 3.1 million people

Aviation is estimated to account for 2% of the world’s CO² emissions

Air Traffic Management costs total €8 billion per year

Traffic reaches 30,000 flights per day during peak period

Air traffic is growing about 5% a year

Air transport delays reached very high levels at some airports

The shortcomings of the European ATM system are estimated to cost some €4 billion:

- €2 billion because of fragmentation of the ATM network
- €1 billion because of non-optimised flights
- €1 billion because of delays

Sources: Eurocontrol PRU, European Commission & Airbus
Fragmentation

European example
Defragmentation – FABs
European example
## Performance targets

**European example**

<table>
<thead>
<tr>
<th>Key Performance Area</th>
<th>Key Performance Indicator for EU-wide target setting</th>
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| **Safety**               | • All NSAs and ANSPs to achieve EoSM levels C/D (respectively) by 2019  
  • All NSAs and ANSPs to adopt the RAT methodology by 2019                                                                                                                 |
| **Environment**          | By 2019, average horizontal en-route flight efficiency:  
  Of last filed flight plan (KEP): 4.1%  
  Of the actual trajectory (KEA): 2.6%                                                                                                                                 |
| **Capacity**             | Annual average en-route ATFM delay (all causes) of 0.5 minutes per flight, to be reached for each year                                                                               |
| **Cost-efficiency**      | Determined unit rate for en-route air navigation services (expressed in real terms €2009):  
  | Year | 2015 | 2016 | 2017 | 2018 | 2019 |
  | Rate | €56.64 | €54.95 | €52.98 | €51.00 | €49.10 |
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SITUATIONAL AWARENESS

Yeah it's important
Current Norm in ATM Information Exchange

Store and forward

A
send
receive

B
send
receive

C

D

time
System Wide Information Management

- System Wide Information Management, SWIM, is the notional intranet of Air Traffic Management. It enables seamless information interchange between all providers and users of ATM information.
SWIM Principles
As adopted by ICAO (Doc 10039)

- Separation of information provision and information consumption
- Loose system coupling
- Using open standards
- Using Service Oriented Architecture

Implemented as a suite of interoperable services, that can be used in a flexible way within multiple separate systems from several business domains
SWIM consists of standards, infrastructure and governance enabling the management of ATM information and its exchange between qualified parties via interoperable services.
ONLY HALF THE BATTLE
The typical questions under consideration

• What is essentially the MET information that needs to be shared to create a sufficient level of common situational awareness and support collaborative and/or informed decision making?

• Who are the ‘qualified parties’ that can provide MET information?

• What is good enough?
Paradigm shifts

Example 1

VERSUS
Paradigm shifts

Example 2

- TAF
- SIGMET
- ATC Winds
- Warnings
- Airport CDM Support Information
- Etc.
Back-up slides
Translated in Strategic Business Needs

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WX Integration Concept

SYSTEM WIDE INFORMATION MANAGEMENT

The Intranet for Air Traffic Management
Impact Assessment / Risk Management

MET INFORMATION

TRANSLATION
of information into aviation constraints

IMPACT ASSESSMENT
Conversion of translated information into operational impact on ATM Actor processes

DECISION
Impact mitigation

MET Information Provider Capability

ATM Actor Capability
Levels of Integration

**Level 0: No integration**
‘I need to do it all in my head..’

**Level 1: ‘Weather on the glass’**
‘It is easier to figure out the impact..’

**Level 2: Constraint**
Translation to ATM Constraint

**Level 3: Impact**
Conversion to ATM Impact

**Level 4: Decision Support**
Generation of Hierarchical Solutions

Sources: Mitre, FAA, Eurocontrol, ICAO
Probabilistic Trajectory Prediction

Example

Enables improved knowledge based decision making, e.g.:

- Trajectory uncertainty (thus cost) is visible
- Cost index could use these (flight time) uncertainties
- Balancing flight time adherence vs total cost

Sources: SESAR WP E.02.40 Draft D2.2