Future Operations with FF-ICE and SWIM

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### Differences between FF-ICE and FPL2012

**FF-ICE defines “services” with “related messages” – more than the data format**

<table>
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<tr>
<th>FPL2012</th>
<th>FF-ICE</th>
<th>Projected Benefits</th>
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<tbody>
<tr>
<td>In many ANSPs, no response on whether the flight plan will be cleared as it as filed</td>
<td>Status feedback on all submissions</td>
<td>• Flight planners have a chance to change the plan to something favorable</td>
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<td>• Clearances will more often match OFP</td>
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<td>Most ANSPs do not respond to flight plan filings with constraints specific to the flight</td>
<td>Constraints will be included in responses (and pre-published)</td>
<td>Operators can change plans to meet constraints in ways that are operationally favorable</td>
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<td>Cannot get feedback before filing</td>
<td>Planning service allows feedback in advance</td>
<td>Airline system automation can execute complex, multi-disciplinary plans in advance</td>
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<td>Cannot get feedback without committing</td>
<td>Trial request allows feedback for “what if”</td>
<td>Airline system automation can identify beneficial changes to plan that ASP is likely to accept</td>
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<td>Trajectory mismatches between ANSP and AU models</td>
<td>Detailed trajectory information exchanged</td>
<td>Reduction in false rejections of plans when mismatches show a constraint violated but the AU intends to meet it</td>
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<td>Simple changes to FPL were difficult and costly</td>
<td>XML format is more easily extensible</td>
<td>Changes can be made with lower cost and risk as new procedures and capability are introduced</td>
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Planning Service enables robust, optimal operations

- Automated analysis of “tomorrow’s flights today” includes responses from ASP – staff or automation can monitor, modify, resubmit
- This analysis – and re-analysis – will be coupled with other domains (operation control, crew, maintenance, passengers)
- Airlines can optimize their operation as a logistics problem, focusing on optimal payload delivery, not optimal routing of individual flights
- Stochastic optimization for robust pre-tactical planning will be more tractable with ASP responses
Trial Requests enable collaboration with ASP

- Automatic recalculation based on changes to independent variables can be submitted to ASP before being shown to OCC staff or flight crew.
- Resources don’t waste time evaluating options that will not be accepted.
SWIM/FF-ICE impact on Flight Plan Optimization process

**Pre-Desk Assignment**
Although a routine to create an initial flight plan may be performed, the output is based on a largely singular view of the operating environment.

**At Desk Assignment**
Once the flight is assigned to a desk and works its way down the dispatcher’s queue, the dispatcher begins to manually compile and analyze information about the intended operation.

**Plan**
Referencing the information gathered regarding the flight, the dispatcher enters or updates any necessary information and creates a new flight plan. After reviewing the output and filing the plan the flight is released and distributed to the crew.

**Pre-Departure**
Prior to departure, an SAA constraint, which had precluded optimal routing, is removed ahead of schedule. The operator is not made aware of this change and misses an opportunity to take advantage of it.

**Enroute**
While enroute, the strategic decision making performed by the AOC largely gives way to tactical the decision making between the flight crew and ATC.

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**Pre-Desk Assignment**
Prior to desk assignment, early intent for the proposed flight has been established by taking advantage of automated PFPL negotiations (including continuous monitoring & trial flight plan requests as needed).

**At Desk Assignment**
Once the flight is assigned to a desk, the planning status, combined with schedule data, allows the dispatcher to easily and accurately prioritize any necessary actions.

**Review**
While reviewing the optimized flight plan, the dispatcher edits, iterates and files the plan (as needed) before distributing flight releases to the crews.

**Pre-Departure**
Prior to departure, an SAA constraint, which had precluded optimal routing, is removed ahead of schedule. The dispatcher is alerted to this change and takes action to re-optimize, updating the plan with the ASP and the flight crew.

**Enroute**
While enroute, the strategic decision making performed by the AOC continues throughout the flight (enabled by continuous monitoring, trial flight plans and a connected flight deck [post FF-ICE/1]).
Handling of mixed-mode

- The current state builds experience for us in mixed-mode already
  - FPL regional variations
  - IFPUV and B2B in Europe
  - SWIM (FAA and EuroControl) fused with legacy data sources (NOTAMS, text Wx) – users presented with harmonized information and situational awareness

- The technical portion will be seamless to the user, but workflow will vary. Our UI will help users manage the workflow variations

![Diagram showing context-sensitive help on process variations and flight plan data flow]

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Petabytes of electronic data and information generated from airline operations.

SWIM value is tied to data growth
In a data-rich environment, unfiltered data leads to cognitive overload and sub-optimal decisions.

More precise data enhances context — **comprehension** is often a function of the data not presented.

Similarly, precisely targeted analytics enhance the user’s ability to **project** system state.

... the value of data is in its context
Many roles coordinate to optimally deliver payload

**Ops Center**
- Operations Managers
- Flight Planners
- Operations Controllers
- Maintenance Controllers
- Crew Controllers

**Gate**
- Agents
- Passengers

**Crew**
- Pilots
- Flight Attendants

**Ramp**
- Ramp Staff
  (coordinate baggage, cargo, fuel, catering and duty-free)
Mobile device adoption enables timely responses

Passengers: airline apps on their personal phones

Pilots and cabin crew: dedicated tablets and smartphones

Ground crew: wearables
SWIM: extracting value from real-time data

Current and predicted state (airspace, airports)

Operational Decisions

Predicted System State

Analytics

Internal Airline Information

Historical Data

Airline Actors

Other ATM Actors

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Jeppesen SWIM/FF-ICE Status

- SWIM being introduced directly and indirectly (including real-time analytics services for optimization, decision support, and situational awareness)
- Validation exercises with FAA established data formats, connectivity, and information flows
- Will implement FF-ICE to EuroControl when appropriate – participating in FPFDE TF, monitoring service maturity and FIXM release timetable
Welcome
Contact

Your presenter is: Ekkehard Pfannenstiel
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We build integrated solutions that smart airlines use to run safer missions at lower cost

With the Total Mission Optimization (TMO) approach, Lufthansa Systems is bringing their market-leading Flight Planning Solutions, Pilot Solutions and Data Solutions close together.

Through this, strong functional and data integration is achieved, which enables the airline operation center and the flight crew to collaborate in an effective way.

https://www.lhsystems.com/lido-vision
The future Airline Operation will be much more integrated from system and process perspective

More information together with more details gives all actors a much better picture of the situation
SWIM assures ‘the provision of commonly understood quality information delivered to the right people at the right time’ (Sesar factsheet, 2011)

1. SWIM is the technical enabler for improved operational processes
2. SWIM delivers technical benefits
3. SWIM establishes the basis for FF-ICE
To achieve maximum benefit all systems of Airline Operation need to be SWIM enabled

1. Only SWIM enabled systems can deliver benefits and can benefit from SWIM.

2. Full process integration requires all systems in the ops context to be connected.

3. Full integration brings maximum process optimization.
With SWIM all Requests will receive Answers

Receiving answers for all requests impacts processes.

All connected systems need to handle requests/responses.

This high dependency of all actors requires a deeper integration than today.
The handling of new formats needs to be evaluated from

- system,
- user and
- process perspective

e.g. an eFPL need to be made human readable
The concept of FF-ICE is fundamentally different from ICAO2012

4D trajectories are exchanged
eFPL include much more details than ICAO2012
Less room for interpretation
The concept of FF-ICE is fundamentally different from ICAO2012

Every eFPL enabled Air Navigation Service Provider

- need to be addressed separately
- can reply with an adjusted trajectory
First FF-ICE Flight Services are available at Eurocontrol

Lufthansa Systems and the Network Manager are testing the exchange of eFPL

Details about the exchanged content are currently discussed

The Lido Flight service for eFPL filing will be released end of 2019!
Thank you very much!
Flight Plan Manager – SWIM, FF-ICE and TBO

Dave Whitehead
Product Management - Sabre

October 2019
Sabre Flight Planning Products

Flight Plan Manager – Flight Planning Solution
Flight Explorer – Graphical Flight Following Solution
OpsComm – Communication and Messaging solution
eFlight Manager – Electronic Flight Bag solution
The Future - SWIM - FF-ICE and TBO

What?

➢ SWIM is the enabler to transition from legacy data transfer and messaging to a business to business data exchange model
  ➢ Provides the immediate availability of data and message exchange
  ➢ Allows for greater automation, greater granularity of detail and increased accuracy
  ➢ Reduced cost (legacy data transfer is costly)

Why?

➢ Global demand for:
  ➢ More capacity in our skies
  ➢ Reduction of operating costs
  ➢ Reduction in flight delays
  ➢ Reduction of fuel usage
  ➢ Reduction of carbon emissions
The Benefits - SWIM - FF-ICE and TBO

Where are the benefits to our industry?

➢ Airspace Capacity: Increased through better utilisation of airspace resources within and across airspace boundaries leading to reduction of flight delays.
➢ Operational efficiency: Increased through the availability of fully optimized routes/trajectories providing reduced fuel burn and emissions.
➢ Safety: Better knowledge of the air traffic environment, common situational awareness, and enhancement through reduction in controller workload.
➢ Reduced cost: Fuel, delays, resources and data exchange.

For CFSPs and ANSPs business cost is required to keep our products current with advances in capability. We are required to create interfaces, new business logic and data processing and storage without impacting system performance.
FF-ICE – Flight plan submission and use: legacy vs. B2B

- Legacy (ICAO 2012) flight plans provide a basic plan for a flight:
  - Routing, speed, altitude, airports, aircraft details etc.
  - Utilizes costly and outdated methods of transmission (e.g. telex based)

- FF – ICE provides for more data to be shared:
  - 4D Trajectory
  - Aircraft performance
  - Aircraft limitations

Provides ANSP with true 4 dimensional trajectory plan (time and place) for all parts of any flight
TBO – Plan flights using Trajectory Based operations

➢ FF – ICE enables TBO:
   ➢ Optimised free route trajectory for every flight
   ➢ Factors aircraft capability (e.g. ETOPS)
   ➢ Factors airspace capability (e.g. restricted area)
   ➢ Factors dynamic airspace capability
   ➢ Factors evolving airspace design (e.g. direct track between points)
   ➢ Factors other environmental or business needs to manage routing (e.g. weather avoidance)

Provides operator with truly optimized trajectory plan to fit the mission at best cost/duration
SWIM – System Wide Information Management

- SWIM is an integral part of the International Civil Aviation Organization (ICAO) Global Air Navigation Plan (GANP).
  - Provision of fixed airspace data using B2B (e.g. restricted area) (AIXM)
  - Provision of variable airspace data using B2B (e.g. NOTAM content (AIXM)
  - Provision of weather data exchange (WXXM)
  - Provision of 4D flight plan filing (FIXM)

Provides data consumers with access to truly real time data and allows business to business data transfer to be immediate and streamlined.
The Future – System and business usage

- SWIM brings greater availability of data to the airline and ANSP community
- The greater visibility of data – in particular that of ‘hot spots’ such as congested or closed airspace is of value to multiple business areas
- Data will inform in cross business decision support and situational awareness. Therefore data should be available to users with integration across multiple platforms
These changes will vary from region to region, and by types of operation too. Automated process will enhanced with proper use of the immediate availability of data as ell as by the greater content. Flight planning timelines may be better managed with the ability to manage change by exception, and within the unique rules of the business.

Also by operation the priorities may differ – delay reduction has a high value in short haul, whereas in long haul the value may shift to efficient fuel plan as well as payload management, so you could not say the TBO is a one stop solution, it is an enabler for collaborative decision making within the business unit. In flight re-calculation will become more frequently used too, based upon each operator requirements and enable better fuel and time decision points to be made.

Specifically to Dispatchers, processes will evolve, particularly through better automation, for example an automated calculation of a solution which then becomes a decision point for Dispatcher and pilot, rather than the legacy method of identifying the problem, creating a new route and then calculating it before negotiation.

Over short period of time historical data may also be gathered and applied. This will better assist the workload. That would add value to a daily view by the Dispatcher (and the business).
The risks

➢ These developments will be implemented globally - within different capabilities and regulation systems need to maintain both legacy and new methods until transition concludes

➢ These must be able to operate concurrently for the duration of the transition

➢ This may lead to misaligned data content (AIXM vs. legacy Navigational data)

➢ Data standards must be met globally – we are all aware of differences in NOTAM standards for example

➢ It would be difficult to integrate a single platform with varying standards of data particularly with the increasingly global reach of airline operations