GADSS & TBO

IFALDA/EUFALDA
Atlanta, 8th May

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NORTHWEST

Global Aeronautical Distress and Safety System (GADSS)

The WHY

Different levels of

Alerting and SAR needs

Instant and accurate information
Instant cooperation
Instant action
Global

Need for a consistent "overlay"

Maritime example:
GMDSS: Global Maritime Distress and Safety System;
LRIT: Long Range Identification and Tracking

The Need

Vulnerability

Timely identification and location of aircraft in distress

Availability and sharing of valuable information

Effective and regularly trained procedures

- Know where aircraft fly
- Know when aircraft are in distress
- Enhance ability to rescue
- Enhance ability to recover

Global Aeronautical Distress and Safety System Overview

Global Aeronautical Distress Safety System

AT — Aircraft Tracking

ADT — Autonomous Distress Tracking

PFLR — Post Flight Localisation & Recovery

ALERT

SAR

Accident Investigation

High Level GADSS Objectives

- Ensure timely detection of aircraft in distress
  - To timely initiate SAR actions
- Ensure tracking of aircraft in distress and timely and accurate location of end of flight
  - To accurately direct SAR actions
- Enable efficient and effective SAR operations
- Ensure timely retrieval of Flight Recorder Data

Aircraft Tracking

“A process, established by the operator that maintains and updates at standardised intervals a ground based record of the four dimensional position of individual aircraft in flight (Annex 6)”

MTOW > 45.500 kg → Shall
MTOW > 27.000 kg → Should

Aircraft Tracking with Automated Surveillance

Surveillance ≤ 15min

Normal

ATSU

AOC

Information Sharing & Procedures

Distress

Repository
AO PoC
RCC PoC
ATSU PoC

RESCUE COORDINATION CENTER

Aircraft Tracking without Autom. Surveillance

Com.

Tracking / 15 min.

Oceanic
Area

Normal

Tracking / 1 min

Record

4D position

ATSU

AOC

Distress

Information Sharing & Procedures

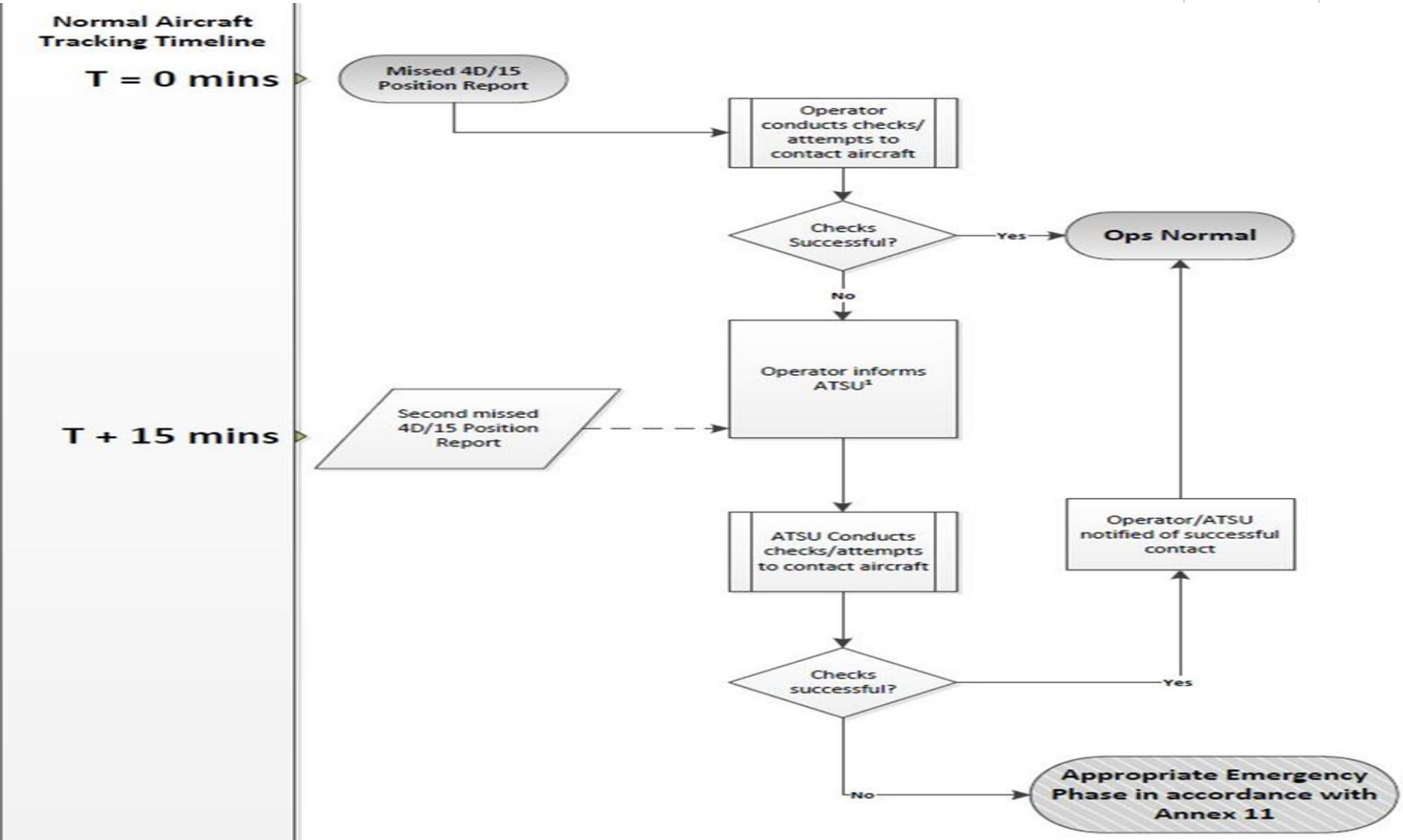
Repository
AO PoC
RCC PoC
ATSU PoC

RESCUE COORDINATION CENTER

Aircraft Tracking - practical

- Aircraft Operators to assess their route network
  - Oceanic airspace
  - Surveillance services
  - Update rate
- When necessary: implement tracking solution
  - 3rd party possible
- Implement processes
  - Detection of missing reports
  - Initiating contacts with ATSU's

Missed position report process

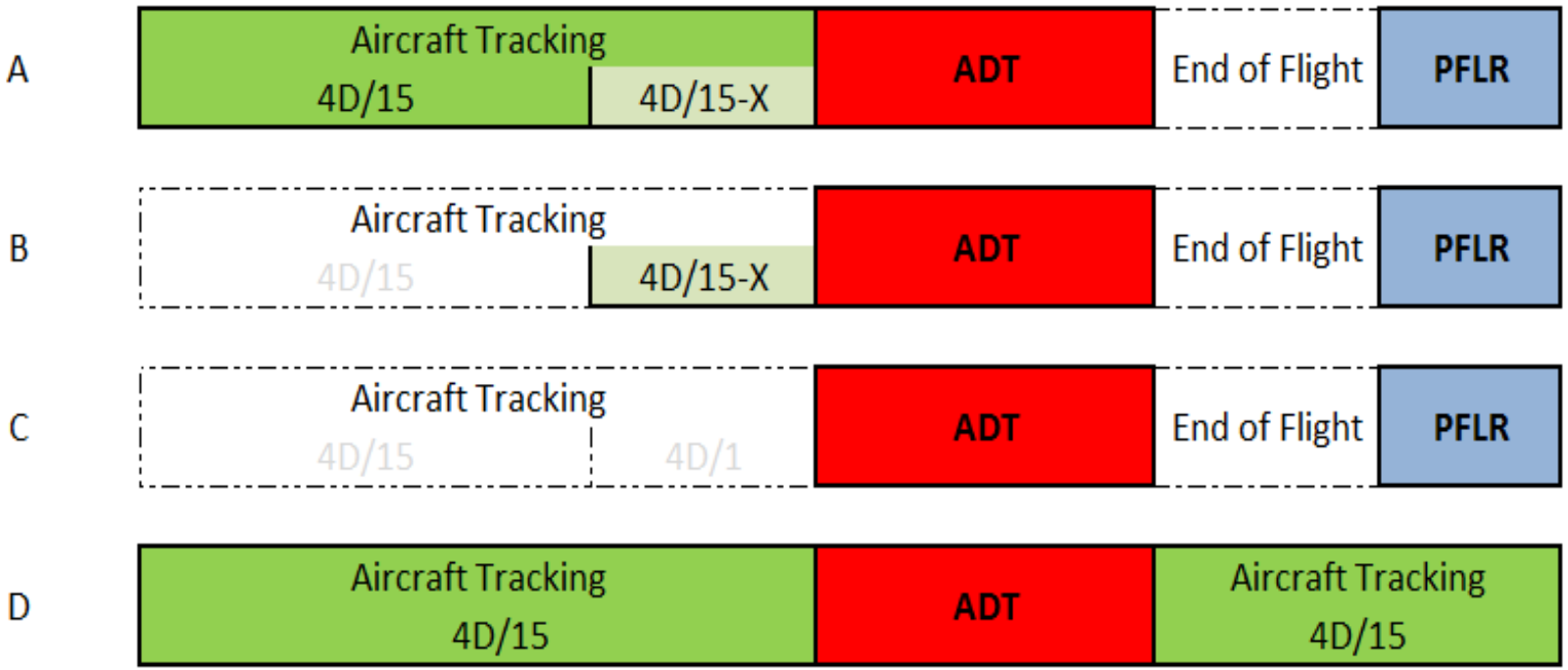


***Note 1**: The operator should contact the relevant ATSU as soon as they have reason to believe there is concern regarding the aircraft. This should occur no later than the second missed 4D/15 report.*

Autonomous Distress Tracking

- The capability using transmission of information from which a position of an aircraft in distress can be determined at least once every minute which is resilient to failures of the aircraft's electrical power, navigation and communication systems
- Resilient to human factors
- Shall only be able to de-activate by the same mechanism that activated it.
- Objective: locating an accident site to within a 6 NM radius.

Tracking Scenarios

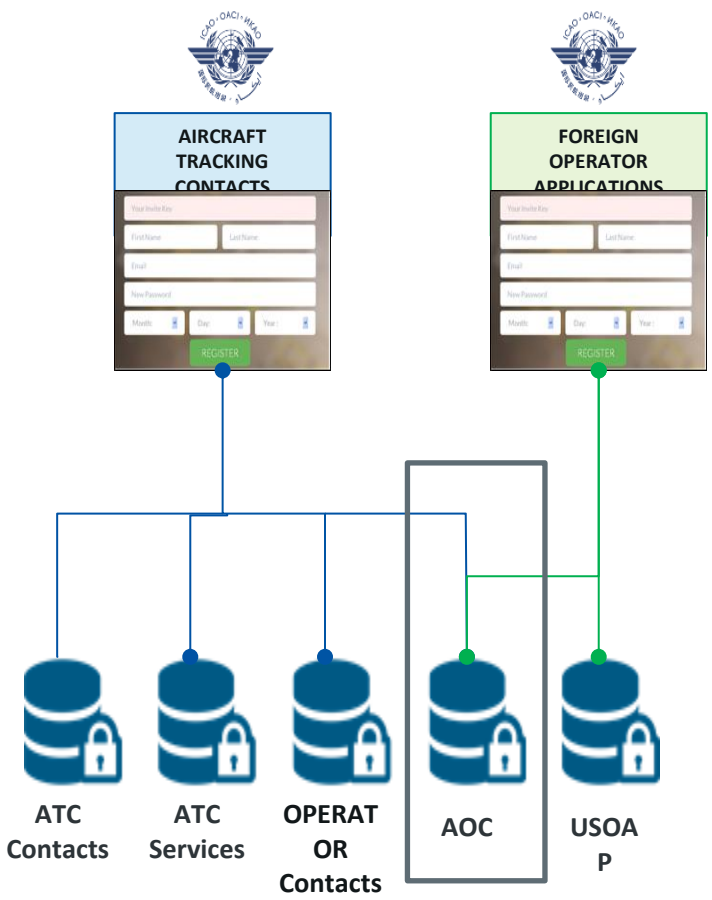


Information sharing

- Right information
- Right time
- Right place

- If ATSU detects a distress condition they will notify the RCC;
- If the operator detects a distress condition they will notify the ATSU who will in turn notify the RCC;
- If an ELT or ELT-DT is activated the RCC will be notified via the COSPAS/SARSAT system;
- The RCC may receive notification directly from outside sources.
  - Latitude
  - Longitude
  - Time stamp
  - Aircraft identification (i.e. registration)
  - 2Dt source (e.g. ELT, Iridium, INMARSAT)

DATA EXCHANGE PHILOSOPHY FOR DNA SERVICES



DNA Principles

- Single login for DNA Services
- Duplication of data elements avoided.
- User data is exchanged *at the sole discretion* of the User, based the rules of subscribed Services.
- SWIM enabled

Data Exchange
(Published once, consumed by many)

ICAO Documents

GADSS Ver 6

- Concept of Operations

Annex 6 Part I

- Operator's responsibility to track aircraft
- Location of an Aircraft in Distress
- Flight Recorder Data Recovery

Aircraft Tracking Implementation Guidelines (Cir 347)

- "Normal" aircraft tracking

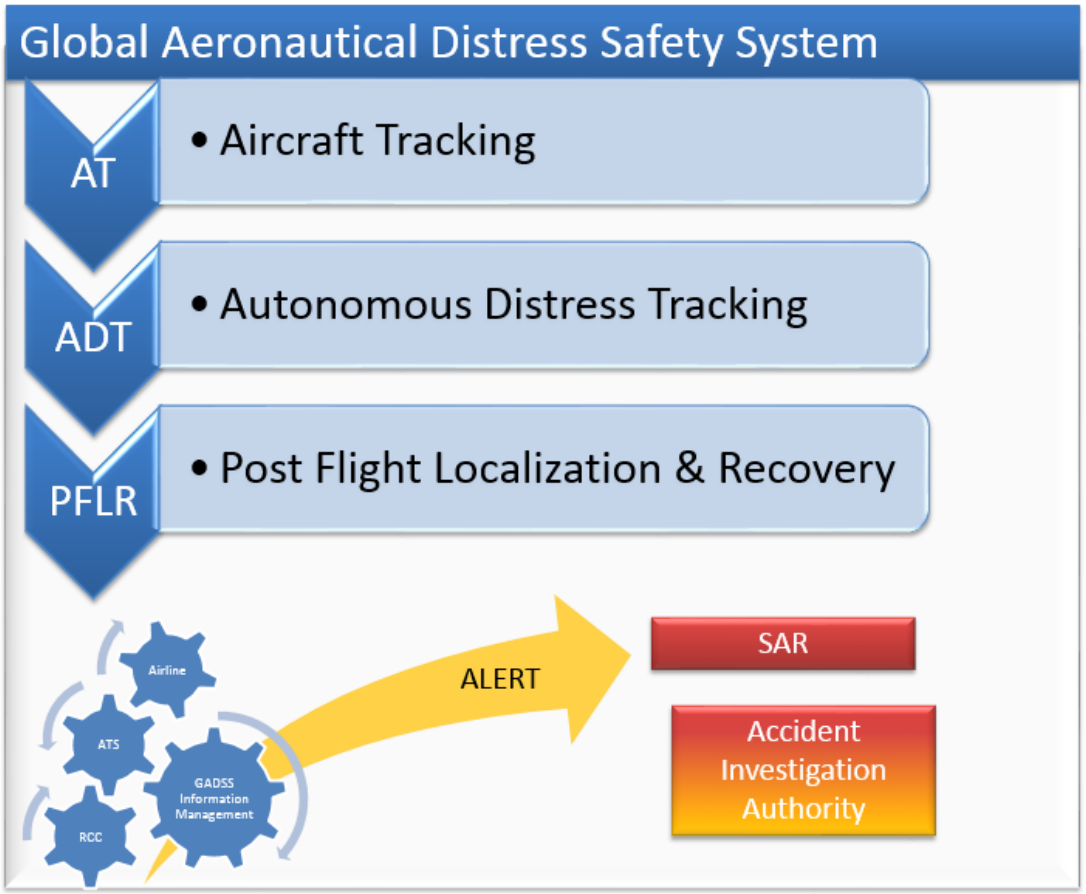
Manual on Location of Aircraft in Distress Flight Recorder Data Recovery (Doc 10054)

- "Distress" aircraft tracking
- Post flight localization and recovery

To be completed in Q1 2018

Global Aeronautical Distress and Safety System GADSS

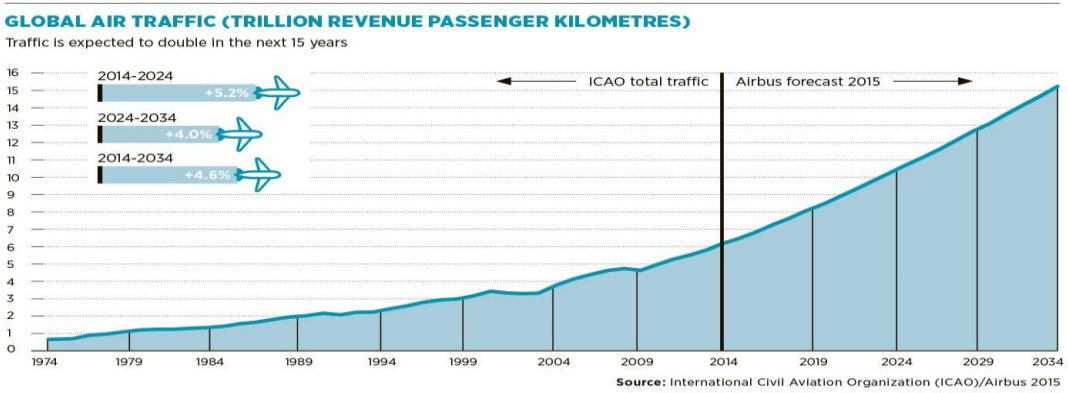
- Know where aircraft fly
- Know when aircraft are in distress
- Enhance ability to rescue
- Enhance ability to recover

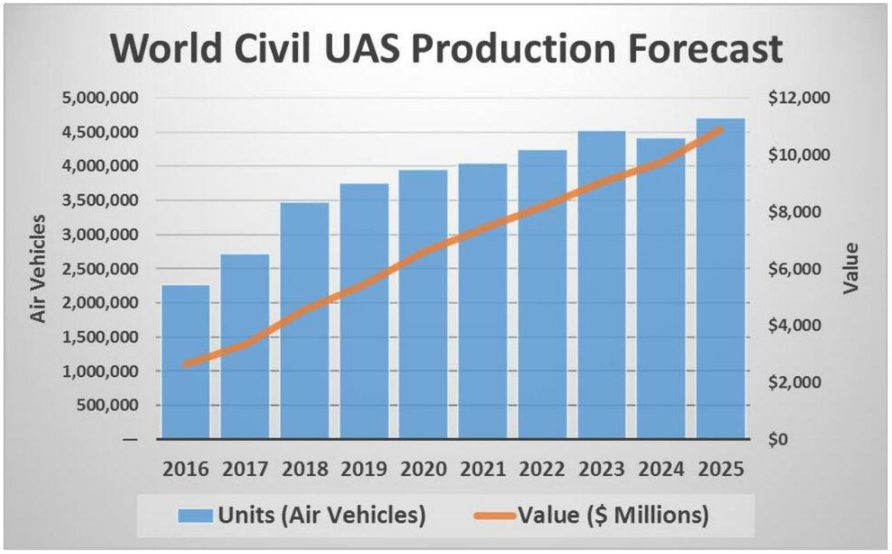


Aviation is safe
because it has the culture
to react
and take lessons out of
rare events

Trajectory Based Operations (TBO)

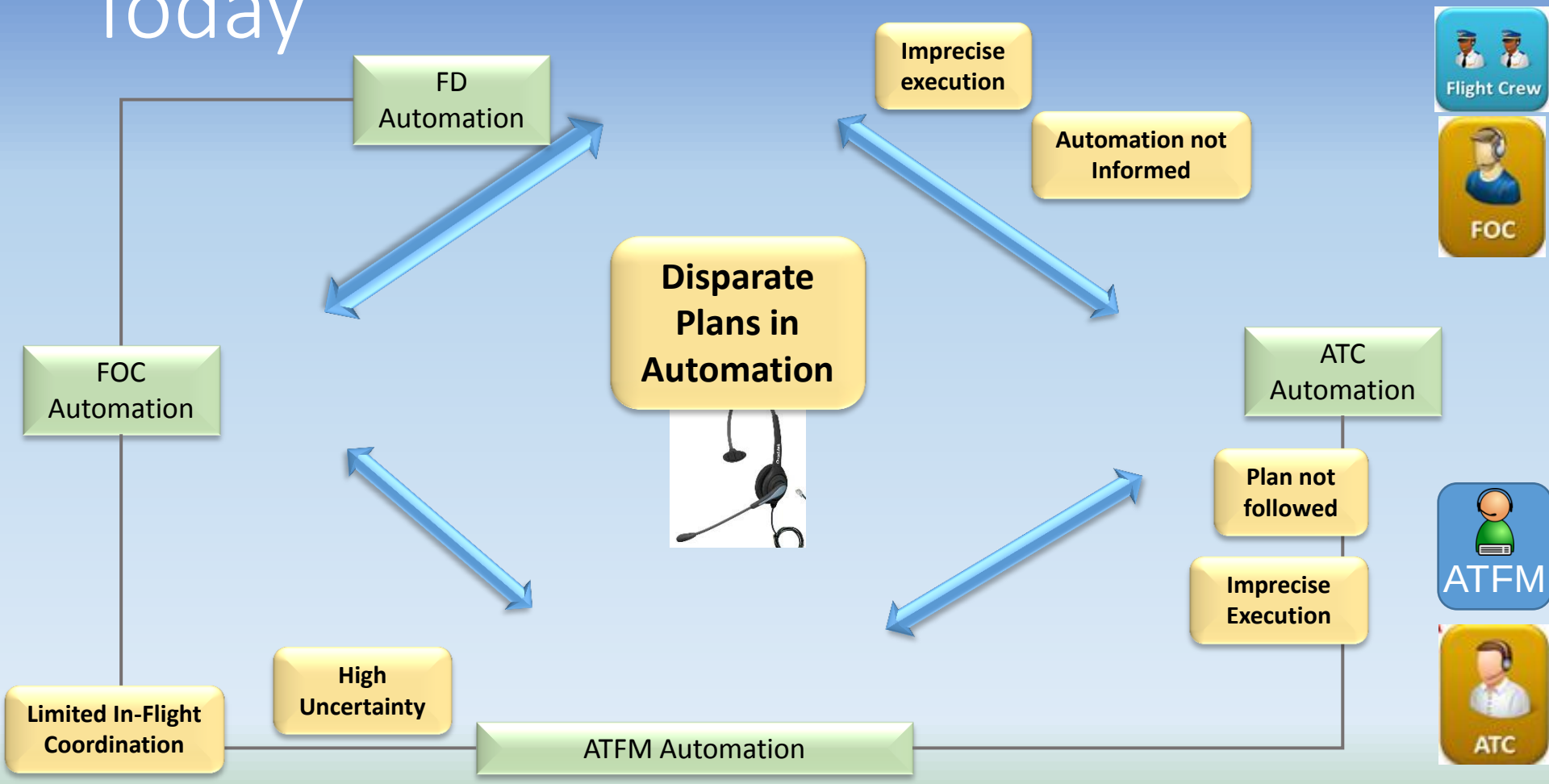
The paradigm change


GLOBAL AIR TRAFFIC (TRILLION REVENUE PASSENGER KILOMETRES)
Traffic is expected to double in the next 15 years
2014-2024
+5.2%
2024-2034
+4.0%
2014-2034
+4.6%
ICAO total traffic
Airbus forecast 2015
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1974
1979
1984
1989
1994
1999
2004
2009
2014
2019
2024
2029
2034
Source: International Civil Aviation Organization (ICAO)/Airbus 2015


World Civil UAS Production Forecast
Air Vehicles
5,000,000
4,500,000
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
—
Value
$12,000
$10,000
$8,000
$6,000
$4,000
$2,000
$0
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
Units (Air Vehicles)
Value ($ Millions)

Google

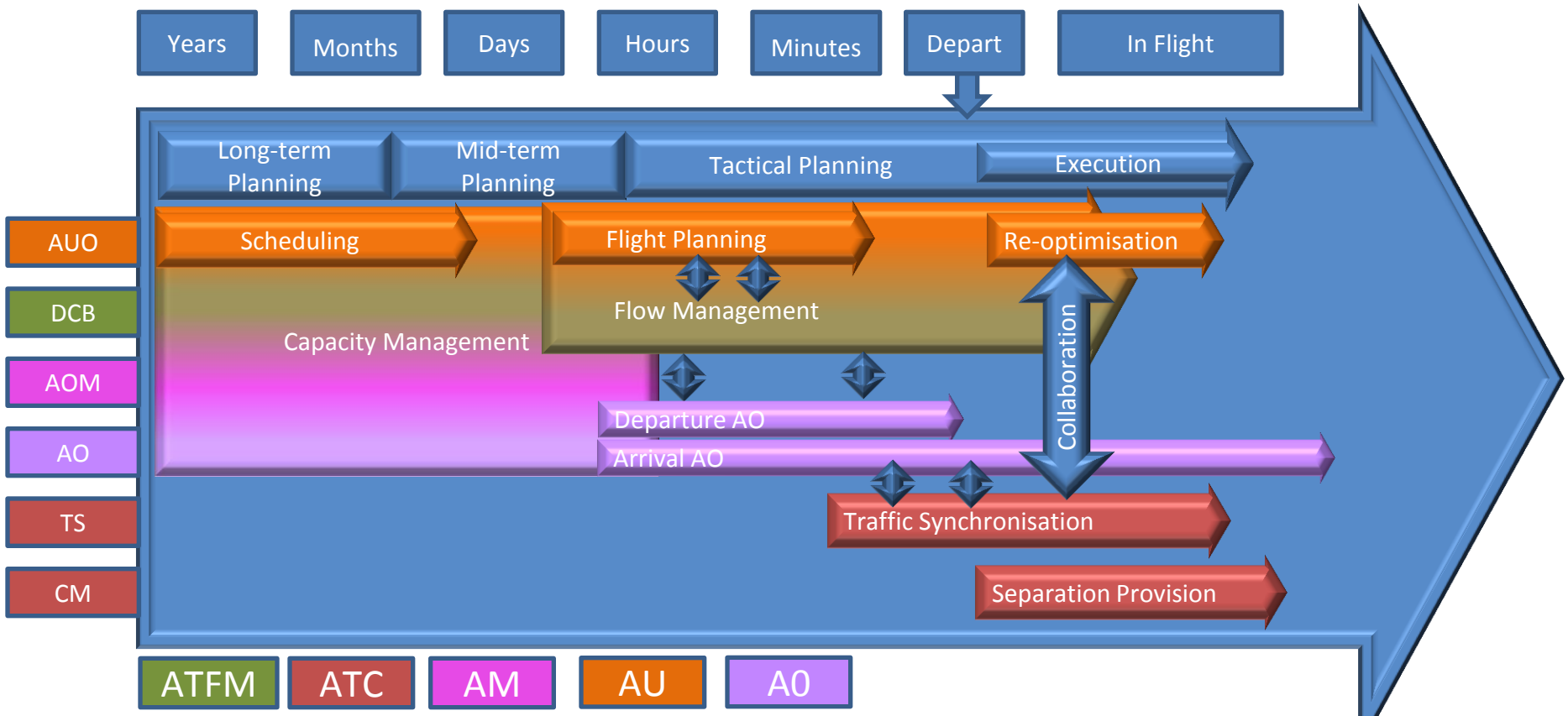
Air Transportation – Coordination Today



Multiples Participants Control a Flight All Affect the Trajectory

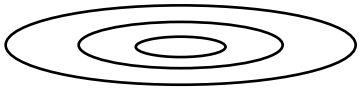
Transform to <u>Trajectory-Based</u>: Decision-Making, Control and Coordination

Trajectory Based Operations >>bringing it together



AM	Airspace Management
ATFM	Air Traffic Flow Management
AU	Airspace User
ATC	Air Traffic Control
AO	Aerodrome Operator

Trajectory Based Operation: Evolution



Open → Closed
Deliver Agreed
Piecewise → End-to-end
Precision where needed

Use Trajectory
Create Clearances
Trajectory Revisions
TM Rules

Airspace User	Trajectory Accuracy	Clearances	ATM Components
FPL	Adapted Values	Voice	TBO Components
Pre-departure Negotiation	Shared Parameters	Initial CPDLC	Ground Synchronization
Post-departure Negotiation	Aircraft-Derived	Precise Clearances	Full TBO Integration
	Aircraft 4DT (EPP)		

FF-ICE/Planning

FOC

FOC

FD

EFB

ADS-C

Significant interactions between columns

FF-ICE/Planning

(**F**light and **F**low **I**nformation for a **C**ollaborative **E**nvironment)

Replaces current Flight Plan →

- More flexibility
- Scalable
- SWIM
- Foundation for TBO

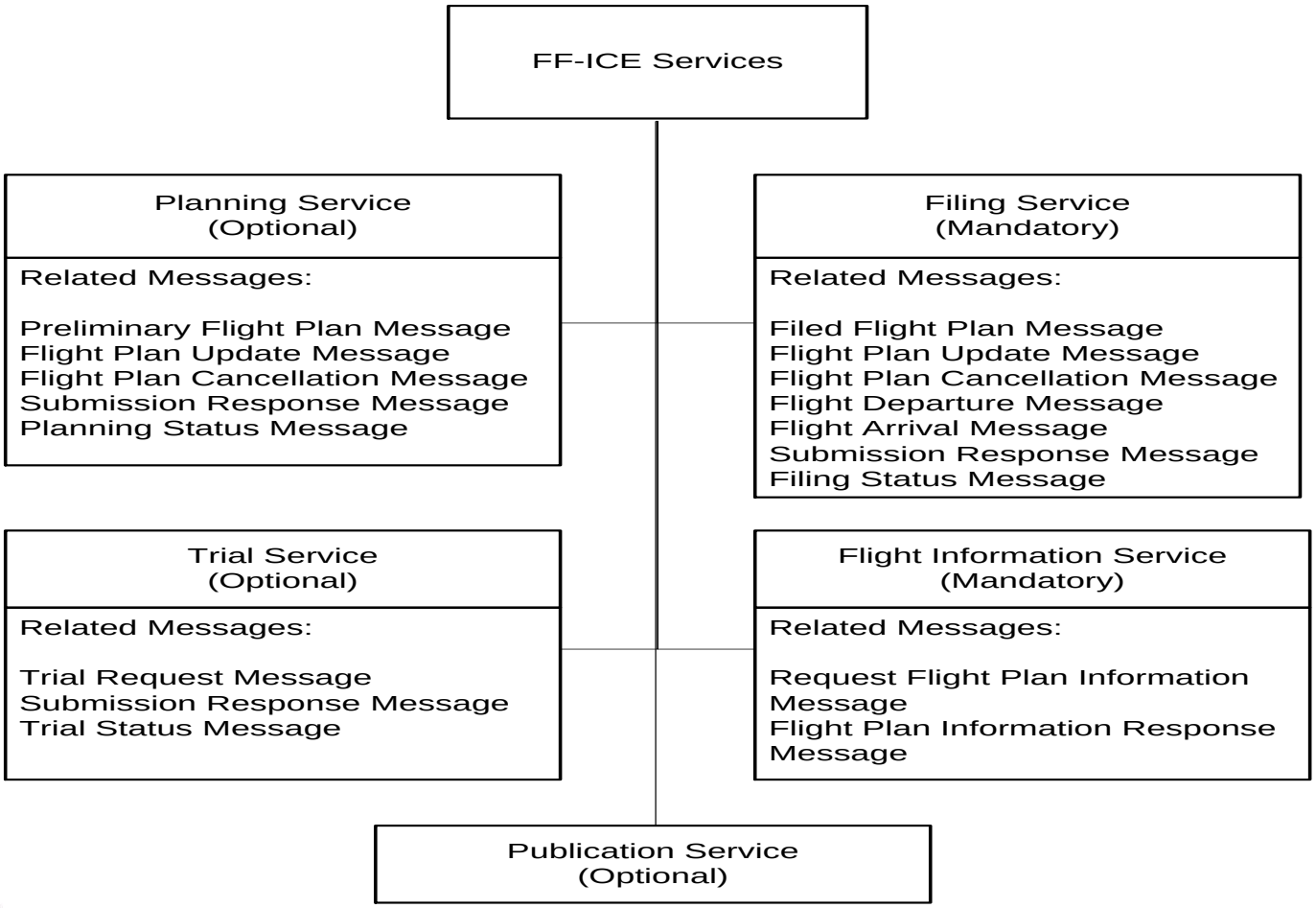
New Services →

- Planning Service
  - Supporting collaboration
- Trial Service

Performance Based Deployment →

- No Big Bang transition
- Europe/US: +/- 2020
- Sunset date FPL TBD

New Services



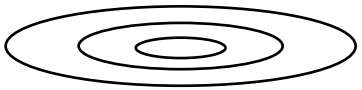
FF-ICE/Planning progress

- ICAO Provisions
  - Ready
  - High Level
- Implementation guidance
  - In progress
- Development FIXM (Flight Information eXchange Model)
  - In progress
  - Version 4 available and being tested
- Implementations
  - US/Europe in progress
  - Involvement of CFSP

FF-ICE/Execution Scope

- Extend pre-departure negotiation to post-departure
- Ground synchronization
  - Extend present-day Notification & Coordination processes
  - Improve prediction accuracy by sharing consistent trajectory information

Trajectory Based Operation: Evolution



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FOC

FD

FOC

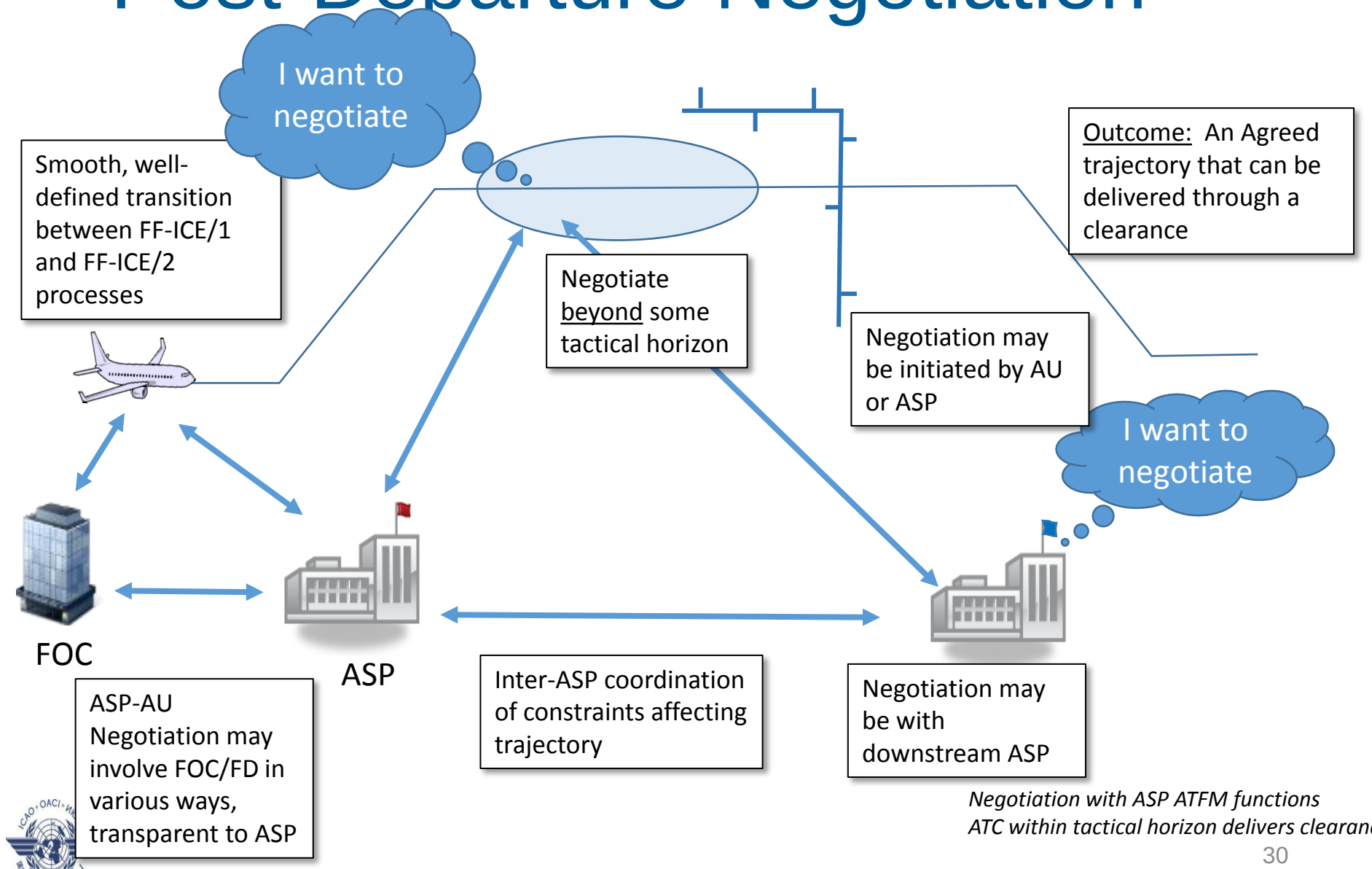
EFB

ADS-C

TF-ICE/Execution

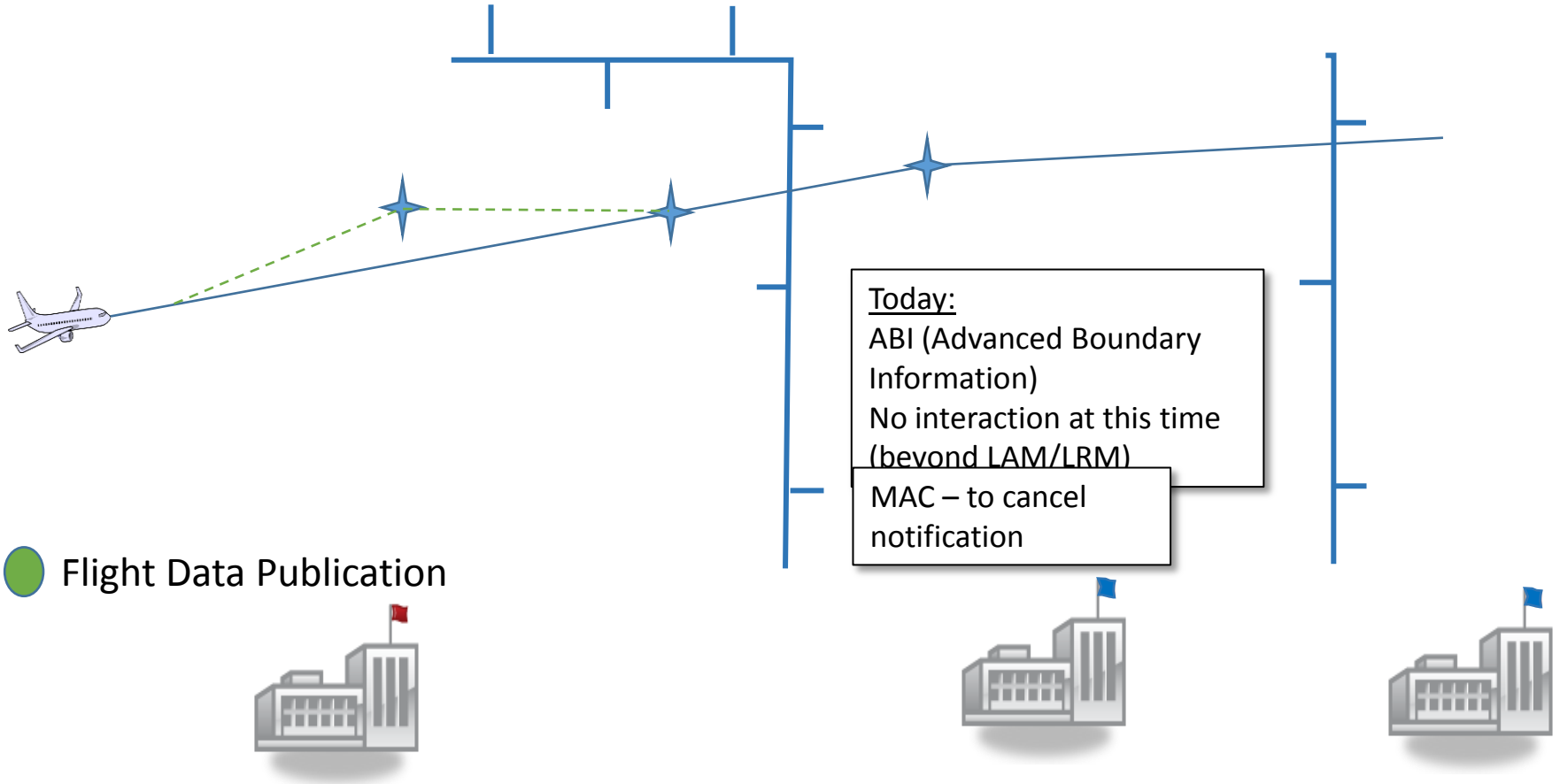
Significant interactions between columns

Post-Departure Negotiation



Negotiation with ASP ATFM functions
ATC within tactical horizon delivers clearances

Continuous Notification



Note: Continuous Notification provides more content than exists in ABI. Content might also include cancellation of notification.

"FLT123 delayed. New EOBT is +45 minutes"

FOC

ASP

AERODROME

Taxi Queue Adjusted

FLIGHT #	TAXI TIME
123	1135
54	1138
987	1141
753	1144
2159	1147
681	1150
555	1153
707	1156
1869	1159

FLIGHT #	TAXI TIME
54	1135
987	1138
753	1141
2159	1144
681	1147
555	1150
707	1153
1869	1156
123	1220

20 Min Delay Assigned

FLIGHT #	WHEELS UP
65	1209
776	1211
846	1215
792	1219
2061	1224
432	1229
896	1232
1225	1237
123	1240

AU Swaps Flights

FLIGHT #	WHEELS UP
65	1209
776	1211
846	1215
792	1219
2061	1225
432	1229
896	1232
1225	1237
123	1240

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65	1209
776	1211
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792	1219
123	1225
432	1229
896	1232
1225	1237
2061	1240

AU Negotiates with ASPs

New AU Trajectory

↓

ASP Review and Negotiates

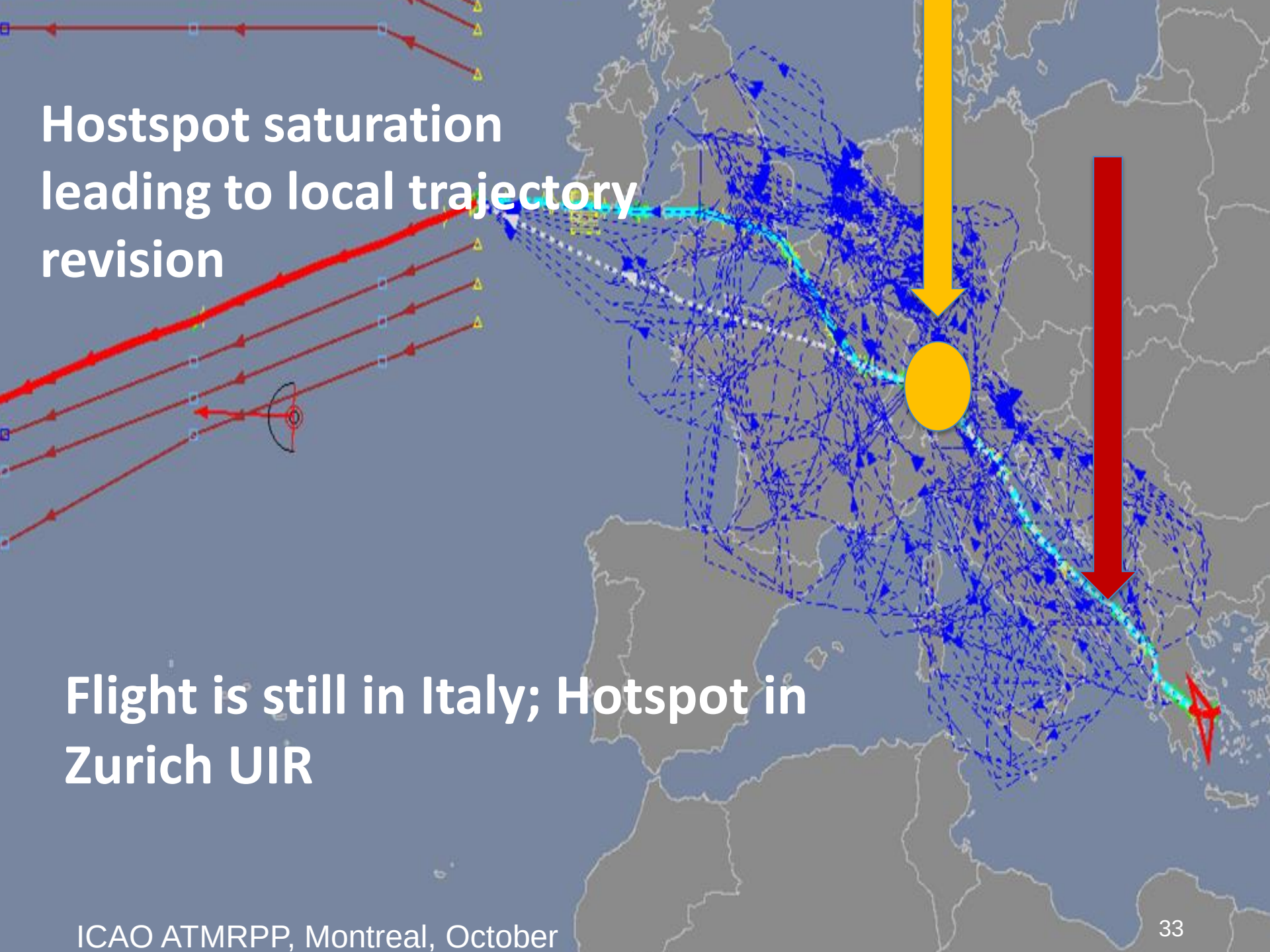
↓

ASPs Approve

↓

FAA

NextGEN


Hostspot saturation leading to local trajectory revision
Flight is still in Italy; Hotspot in Zurich UIR

TBO and FF-ICE

- Trajectory Based Operation: Paradigm change for ATM
  - Collaboration
  - Performance
  - All airspace users

- Gradual implementation through FF-ICE
  - FF-ICE/planning: pre-departure >> replaces current FPL
  - FF-ICE/execution: post-departure >> supports in flight negotiation/ground synchronisation
  - Full TBO : integration of the aircraft

- ICAO
  - FF-ICE planning provisions ready by 2020
  - TBO Concept presented to Air Navigation Conference 2018
  - TBO fully integration in Global Air Navigation Plan 2019

TBO >>transformation of ATM