

Trajectory-Based Operations (TBO)

SWIM Needs

Presented to: ATIEC 2016

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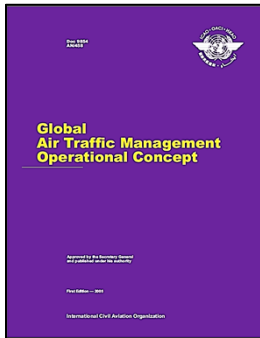
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Aviation Information World - Forecasting the Future

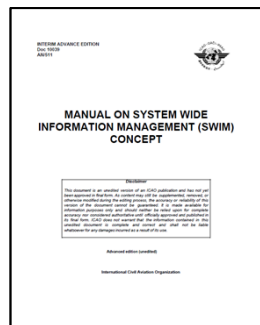
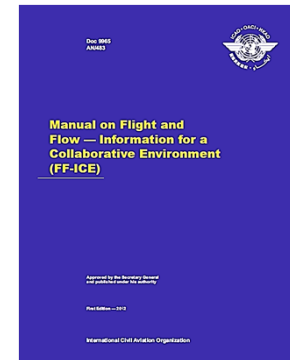


Global TBO Concept



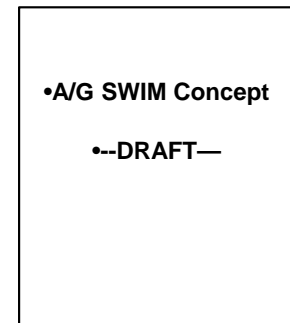
- ATMCP wrote the Global ATM Operational Concept (GATMOC, ICAO Doc. 9854)

- Significant changes were expected in use & exchange of Flight Information → FF-ICE Concept (Doc. 9965)

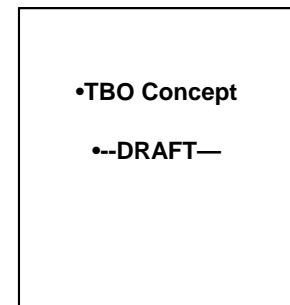


- Described need for SWIM and some notions of Global SWIM → ATMRPP developed SWIM Concept (Doc. 10039) → Further development through IMP

- Identified a need for aircraft connectivity to SWIM → A/G SWIM Concept being developed

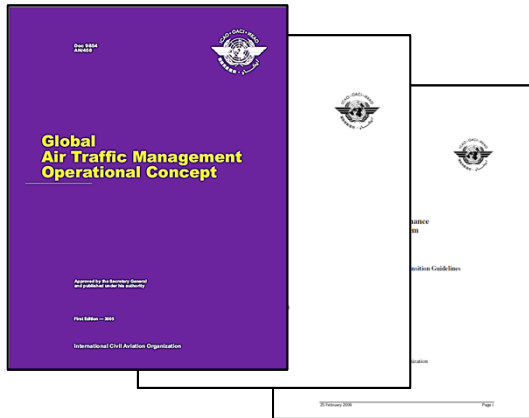


- GATMOC, FF-ICE described trajectory operations through the use and exchange of trajectories → ICAO/ATMRPP developing TBO Concept

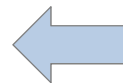
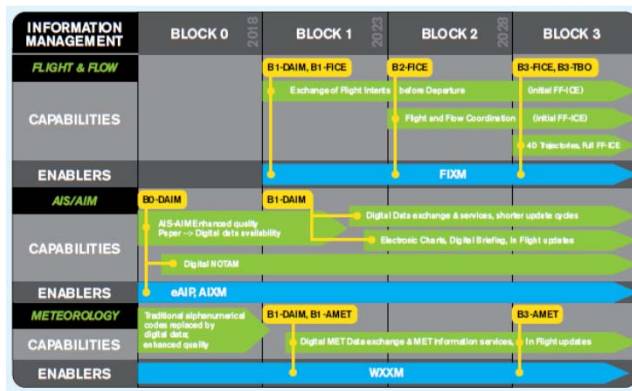


Global Air Navigation Plan

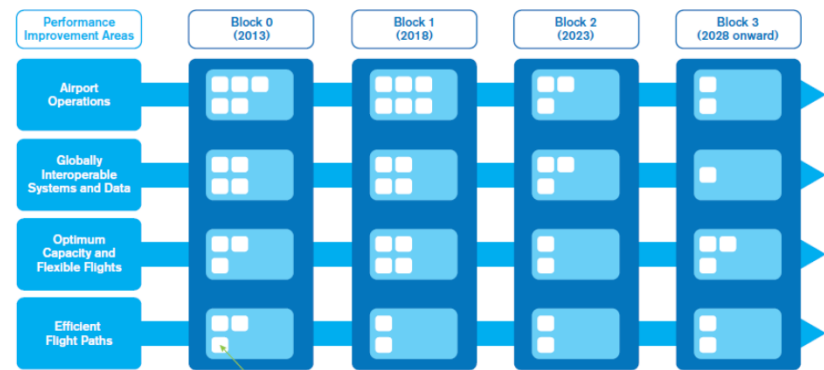
Global Air Navigation Plan (GANP)



Technology Roadmaps



Aviation System Block Upgrades (ASBU)



Modules (actual number of modules per Block/Performance Area may vary)

Images:ICAO

These layout the timeline of standards & guidance development activities



Key ASBUs

Timeline

2013

2018

2023

2028

Thread	Block 0	Block 1	Block 2	Flight Information
FICE – FF/ICE	Increased Interoperability, Efficiency and Capacity through Ground-Ground Integration	Increased Interoperability, Efficiency and Capacity through FF-ICE, Step 1 application before Departure.	Improved Coordination through multi-centre Ground-Ground Integration: (FF-ICE/1 and Flight Object, SWIM) including execution phase	Improved Operational Performance through the introduction of Full FF-ICE
DATM – Digital Aeronautical Information Management	Service Improvement through Digital Aeronautical Information Management	Service Improvement through Integration of all Digital ATM Information	Aeronautical Data / Constraints	
SWIM – System-Wide Information Management		Performance Improvement through the application of System-Wide Information Management (SWIM)	Enabling Airborne Participation in collaborative ATM through SWIM	Core Information Services
TBO – Trajectory-Based Operations	Improved Safety and Efficiency through the initial application of Data Link En-Route	Improved Traffic Synchronization and Initial Trajectory-Based Operation.		Full 4D Trajectory-Based Operations
				Operations



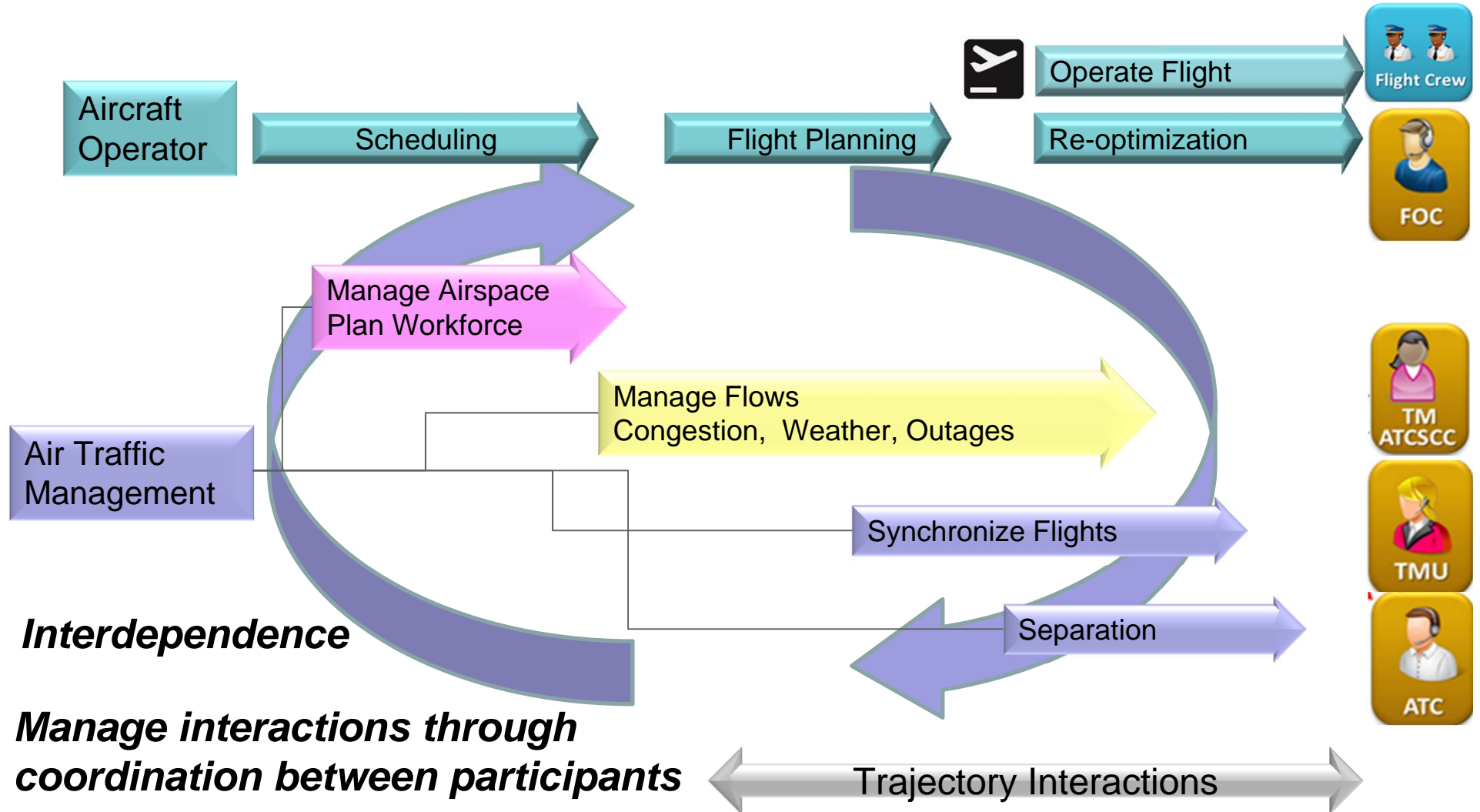


Key Characteristics of TBO

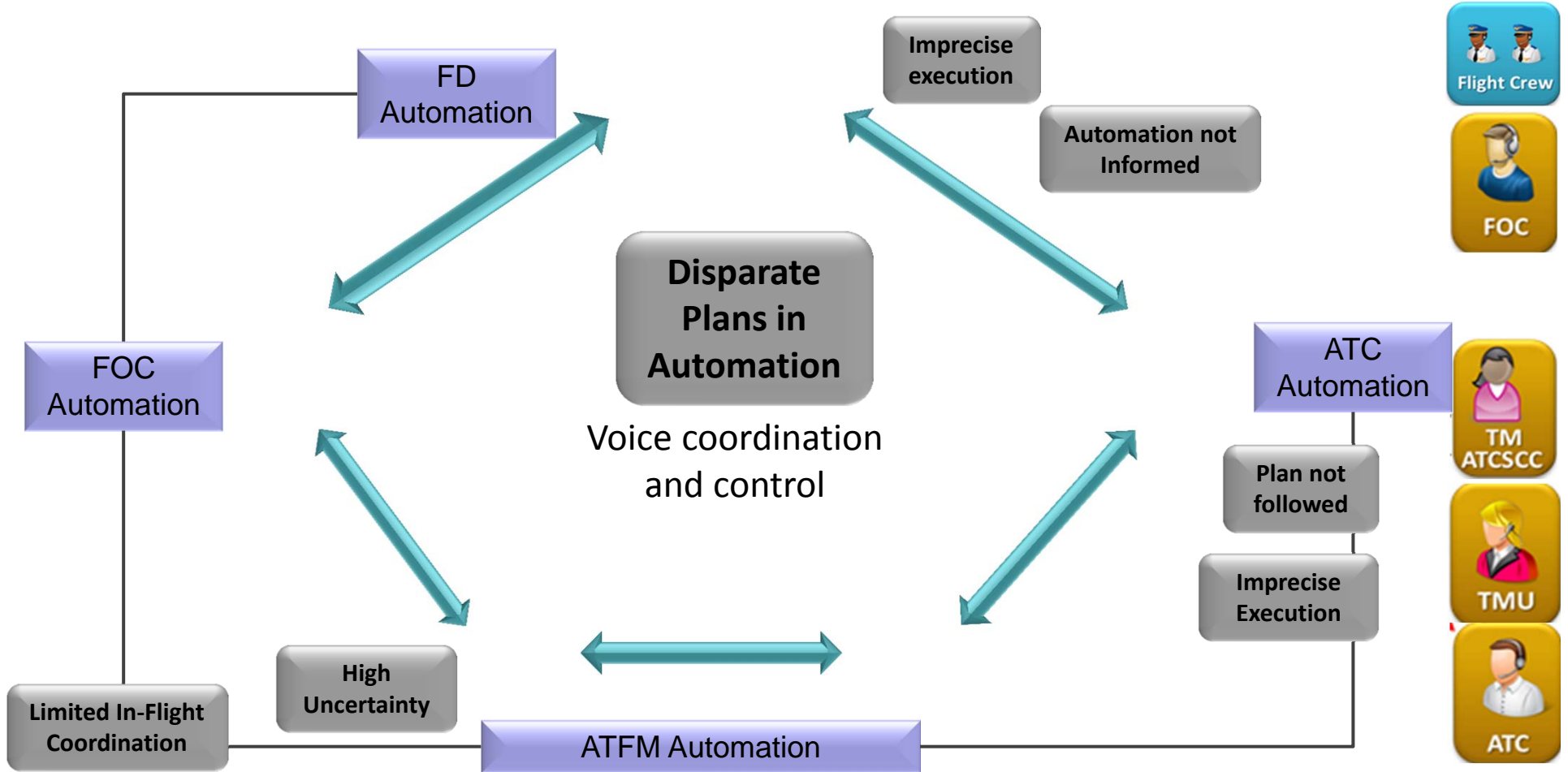
Image: Microsoft clip art



ATM Delivered via Collaboration



Coordination Today

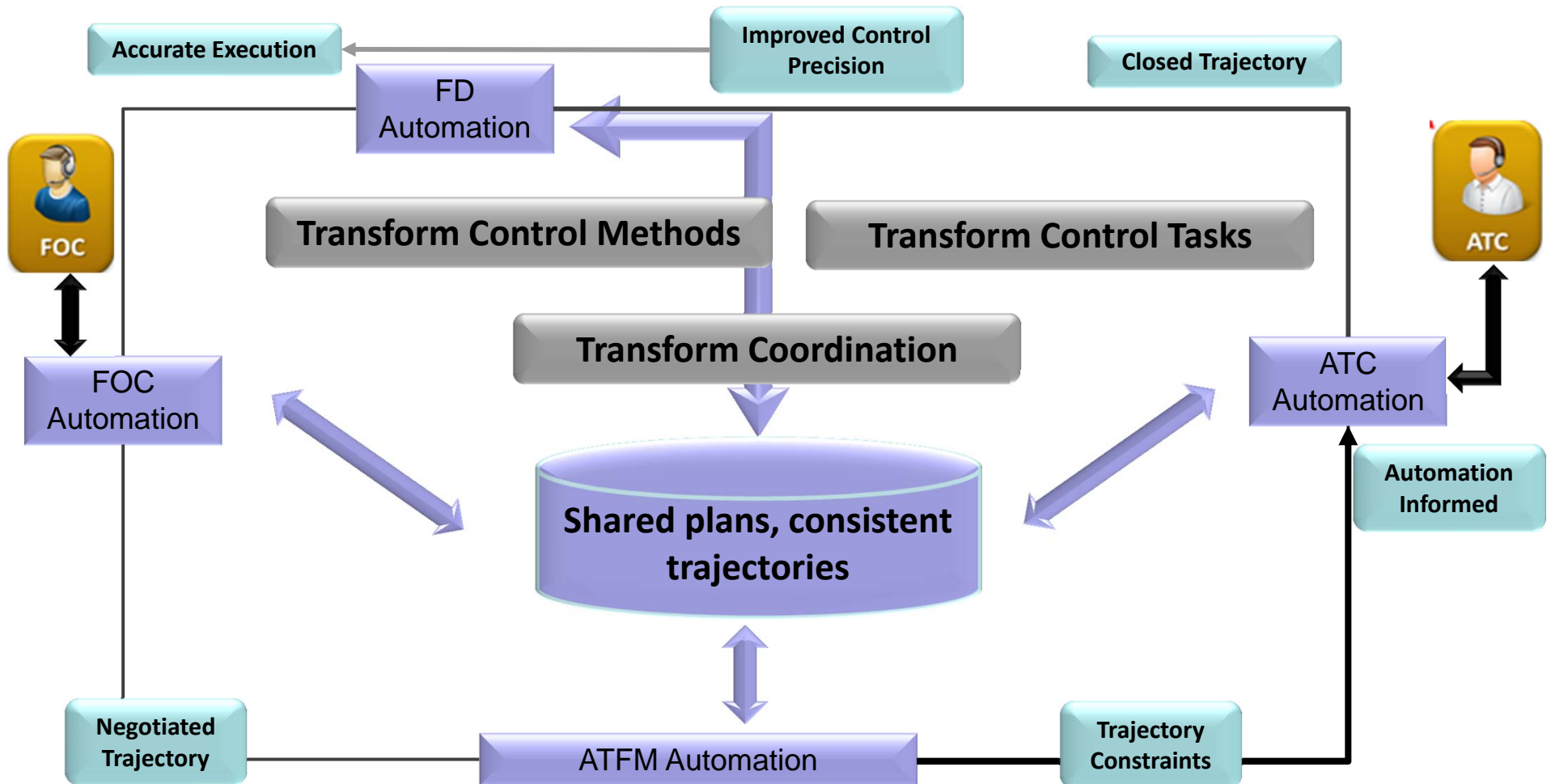


Multiple Participants Control a Flight
All Affect the Trajectory

Transform to Trajectory-Based:
Decision-Making, Control and
Coordination

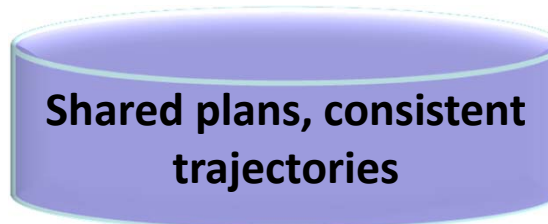


TBO Transformations



TBO - Three important attributes

- Sharing trajectory information
- Managing that information
- Using it as reference for the flight



The Role of SWIM - Sharing

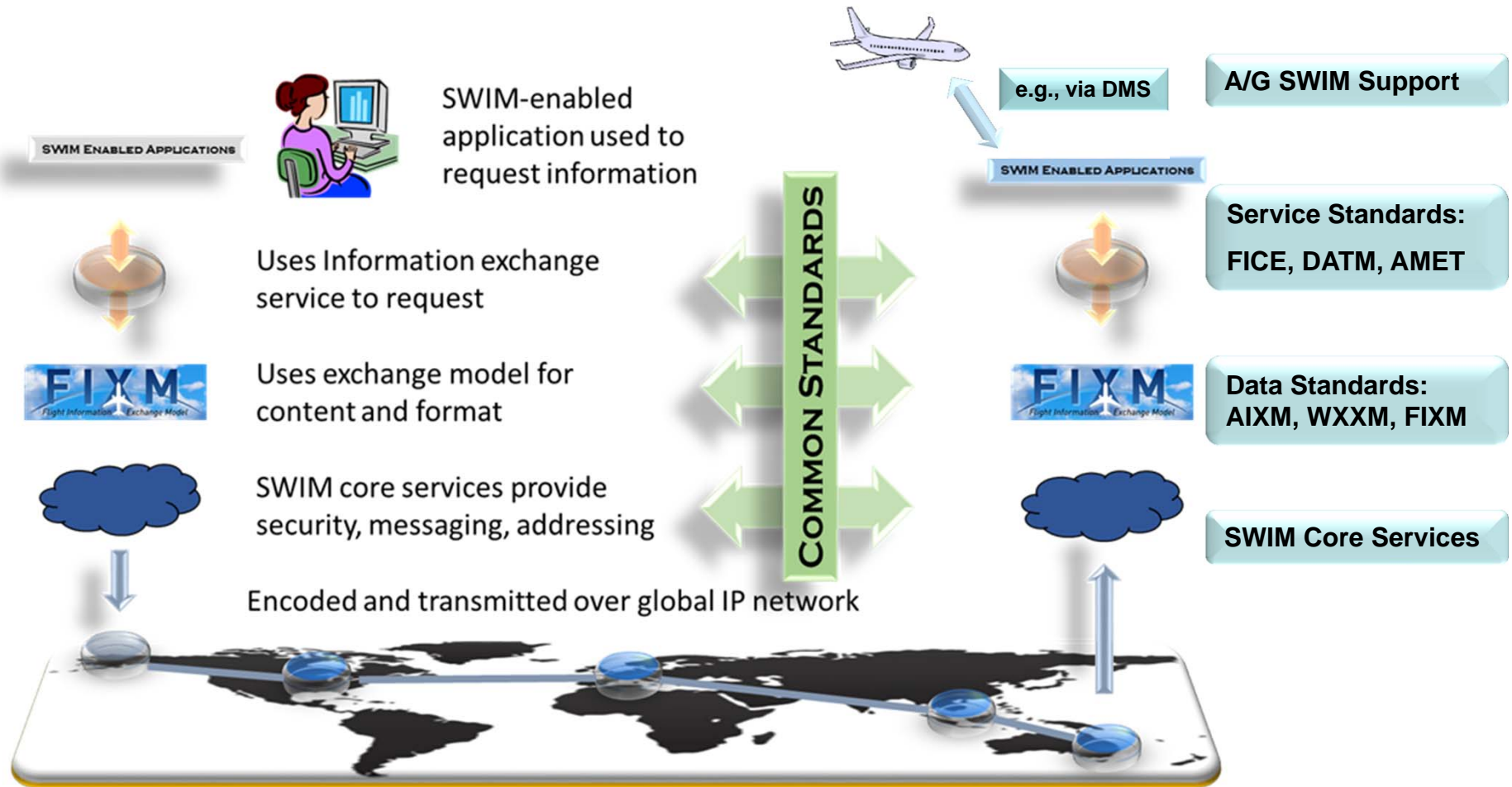
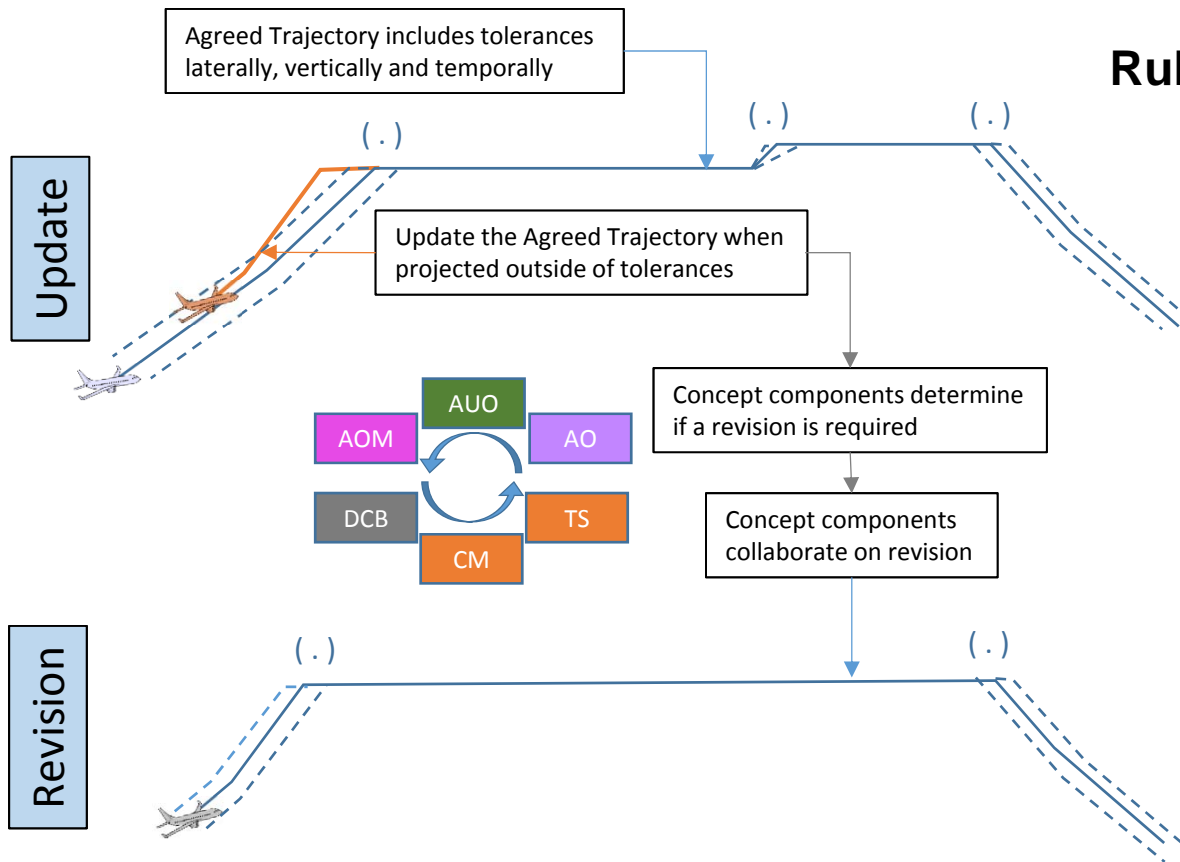


Image: ICAO SWIM Concept

SWIM & Managing the Trajectory



Rules for Trajectory Management

- Permissions
- Criteria & responsibility for update & revision
- Timing / Frequency
- Prioritization
- Services & transactional behavior

Not static, vary as flight operates



Standards

Managing the Trajectory - Example

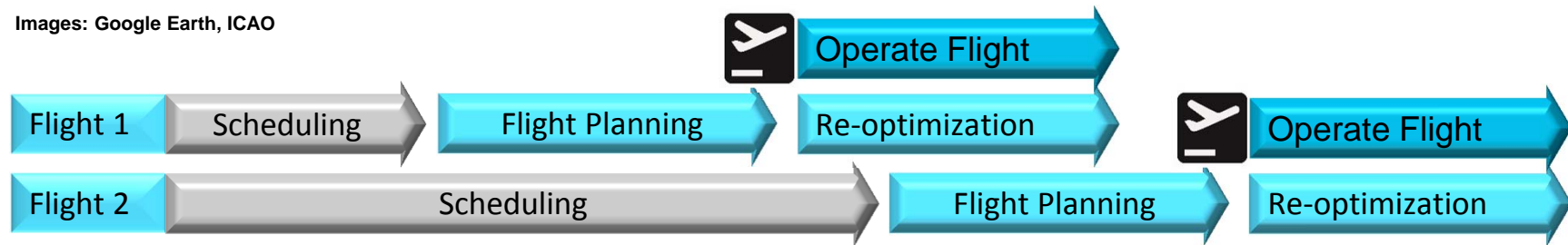
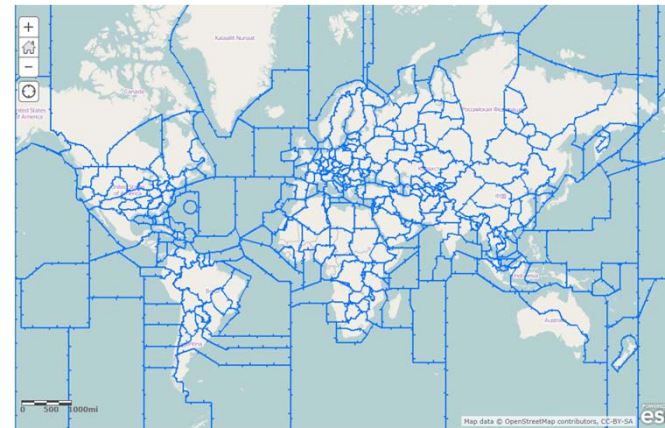
Ten days, One Airframe



Images: Google Earth, ICAO

SYD-LAX-PVG-NRT-ATL-JNB-ATL-JNB-ATL-NRT-ATL-JNB-ATL-DXB

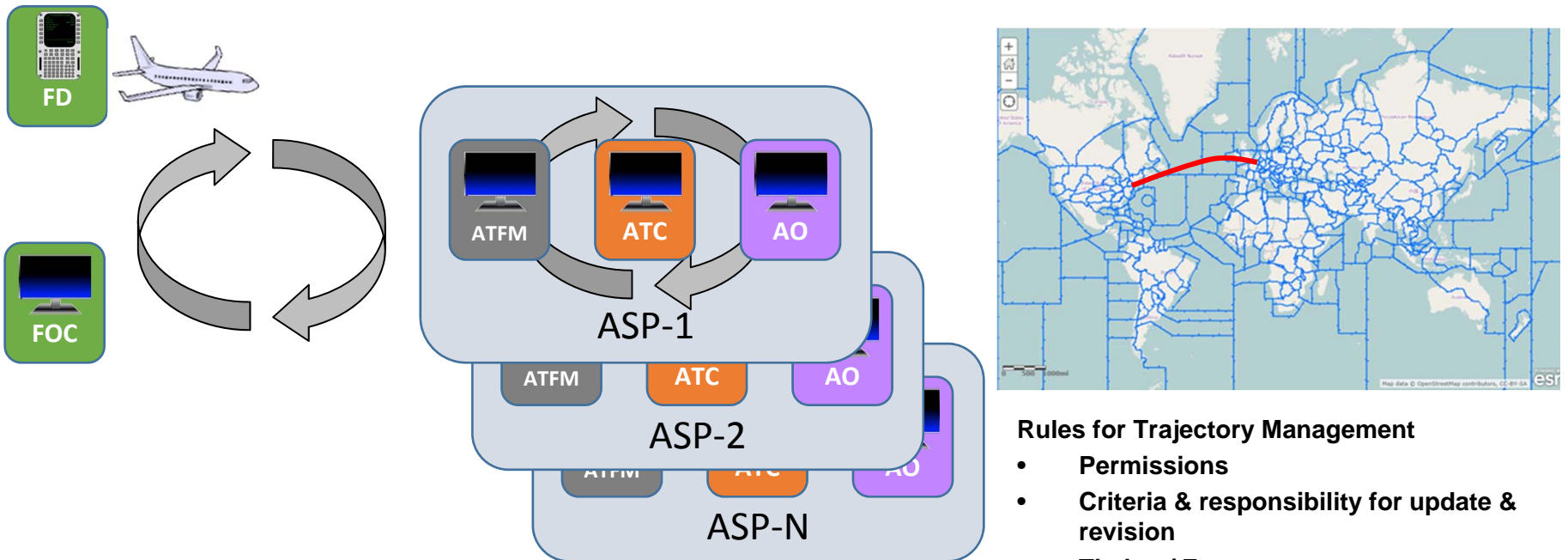
Operates through >25 ANSPs



Keeps going...

Managing the Trajectory (2)

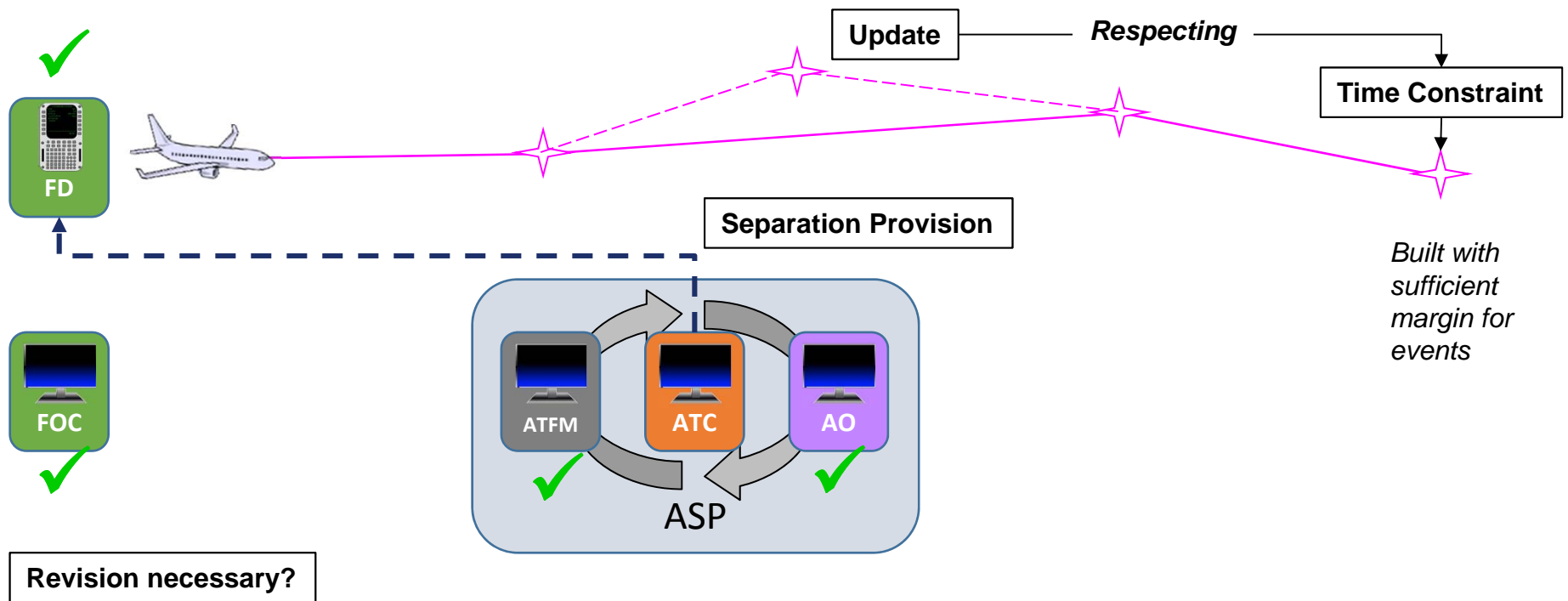
- Consider planning & re-planning w/ Automation-to-automation coordination



Rules for Trajectory Management

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- Timing / Frequency
- Prioritization
- Services & transactional behavior

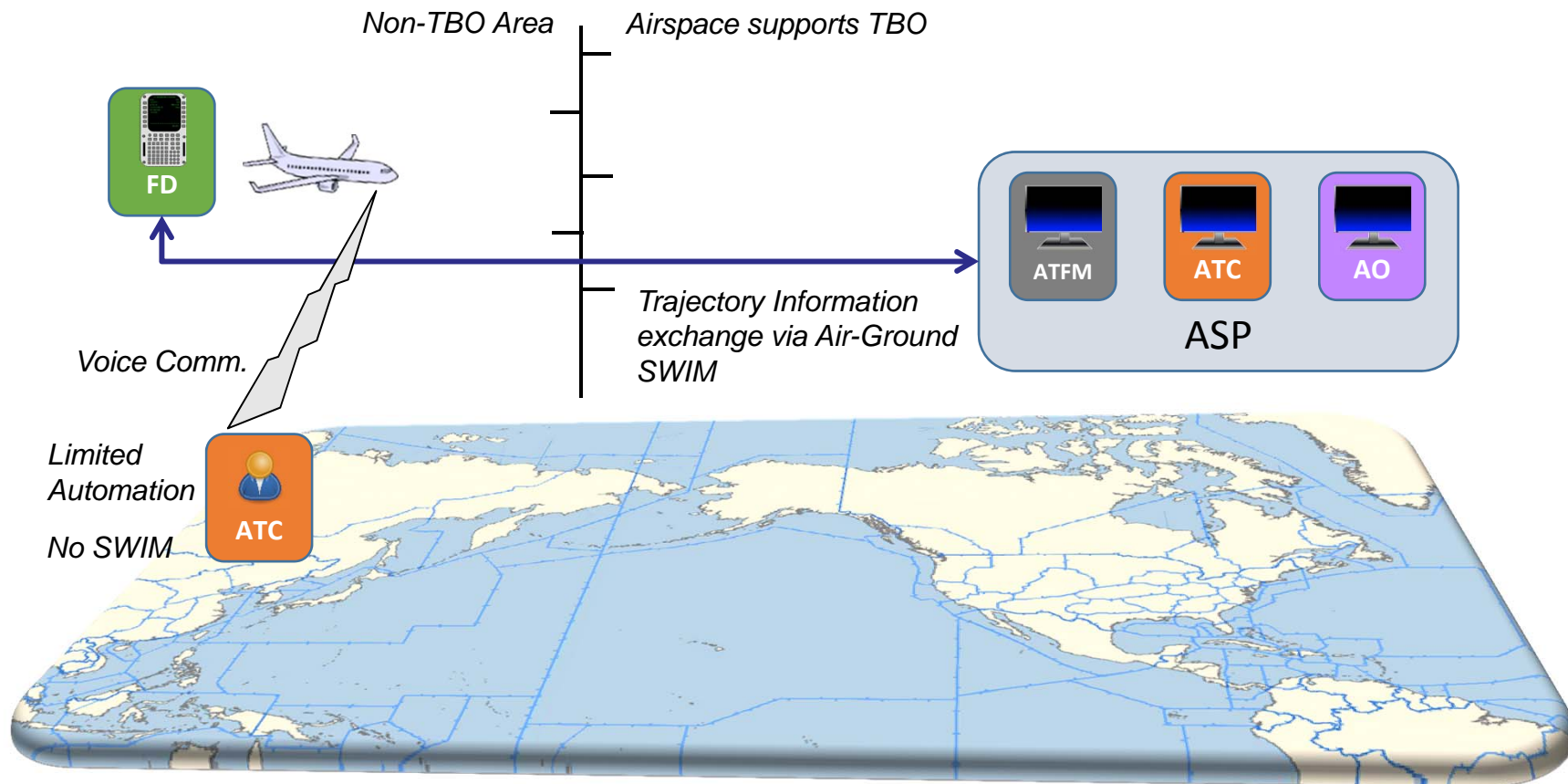
Using the Trajectory



- Fit-for-purpose Information Services support operational use

Transition & Mixed-Mode

- Important SWIM role for transition



Looking Forward

2016
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2018

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2028

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SWIM – System-Wide Information Management		Performance Improvement through application of System Management	Enabling Airborne Participation in ATM through	
TBO – Trajectory-Based Operations	Improved Safety and Efficiency through the initial application of Data Link En-Route	Improved Traffic Synchronization and Initial Trajectory-Based Operation.		Full 4D Trajectory-Based Operations

SWIM Needs for TBO



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