



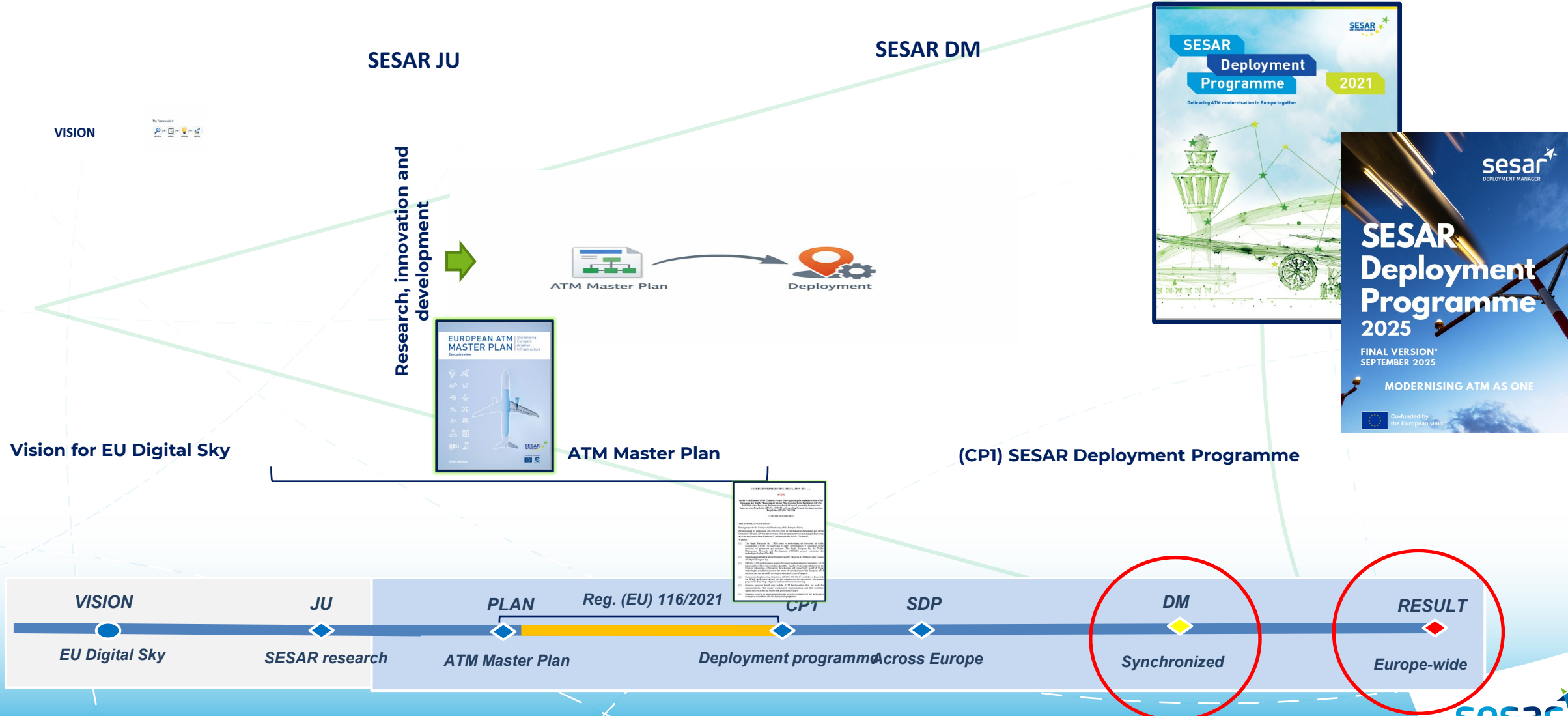
# Digitalisation as key element in SESAR ATM modernisation

Franck Montoya, SDM Implementation Programme Coordinator

26 May 2026, Airspace World

# SESAR framework: governance and roles

From innovation to deployment across the European ATM system



# Digitalisation in CP1

“**Digitalisation**” in Air Traffic Management is the progressive transition to the provision, exchange, and use of ATM-related information in structured digital form, using interoperable standards and electronic means, in order to enable efficient, safe and performance-driven operation of the European air traffic management network.

## *AF5 SWIM implementation:*

exchange of ATM-related information over IP-based networks (e.g. NewPENS, Internet) based on:

- standardised data models (AIXM, FIXM, IWXXM),
- service-oriented interfaces,
- common security, registry, and compliance rules

- Legacy / new information
- Extended use of information compared to legacy

**31/12/2025**

**CP1**

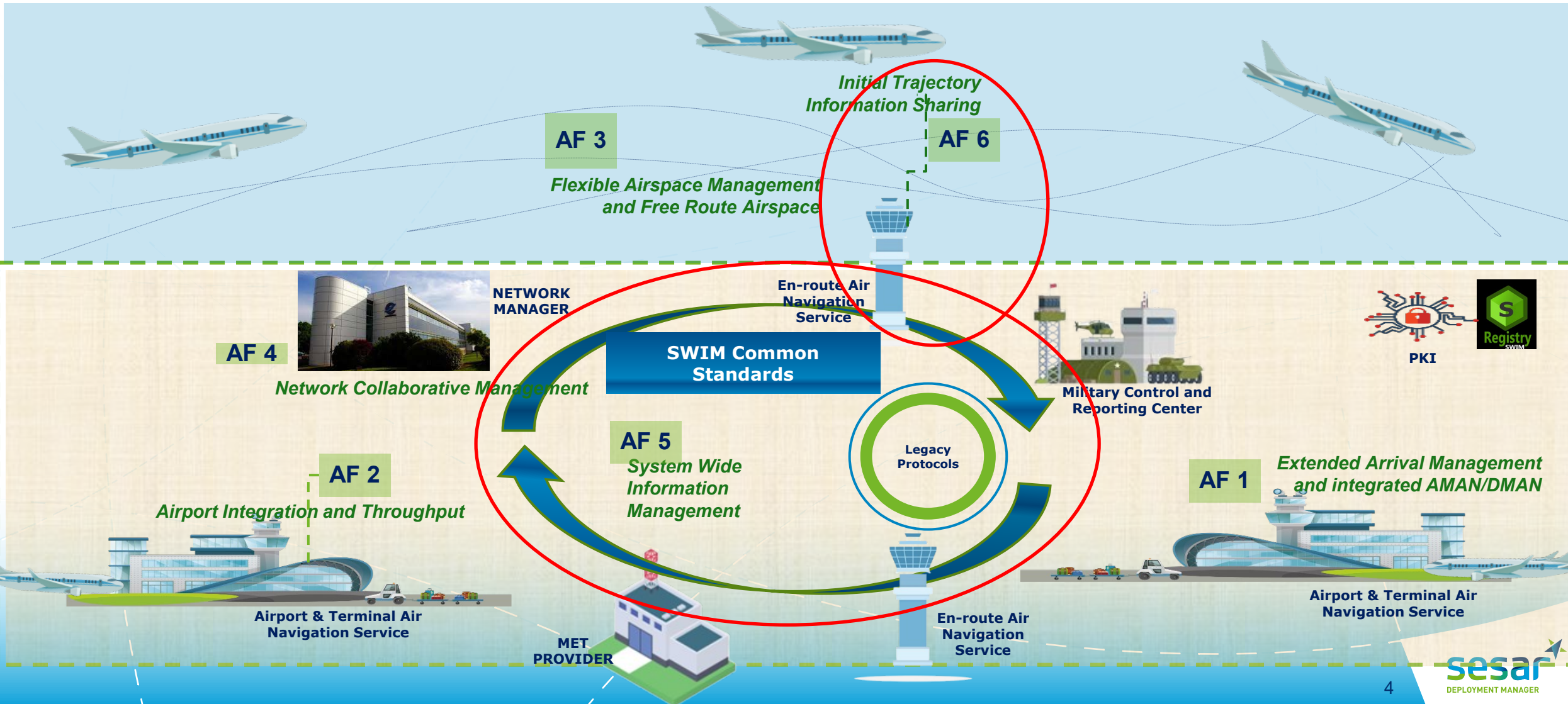
**31/12/2027**

## *AF6 Initial trajectory information sharing:*

downloading of aircraft 4D trajectory information (i.e. ADS-C EPP in compliance with ATS-B2 standards) through datalink and further distribution on the ground through SWIM for usage by ATC System (i.e. conformance monitoring)

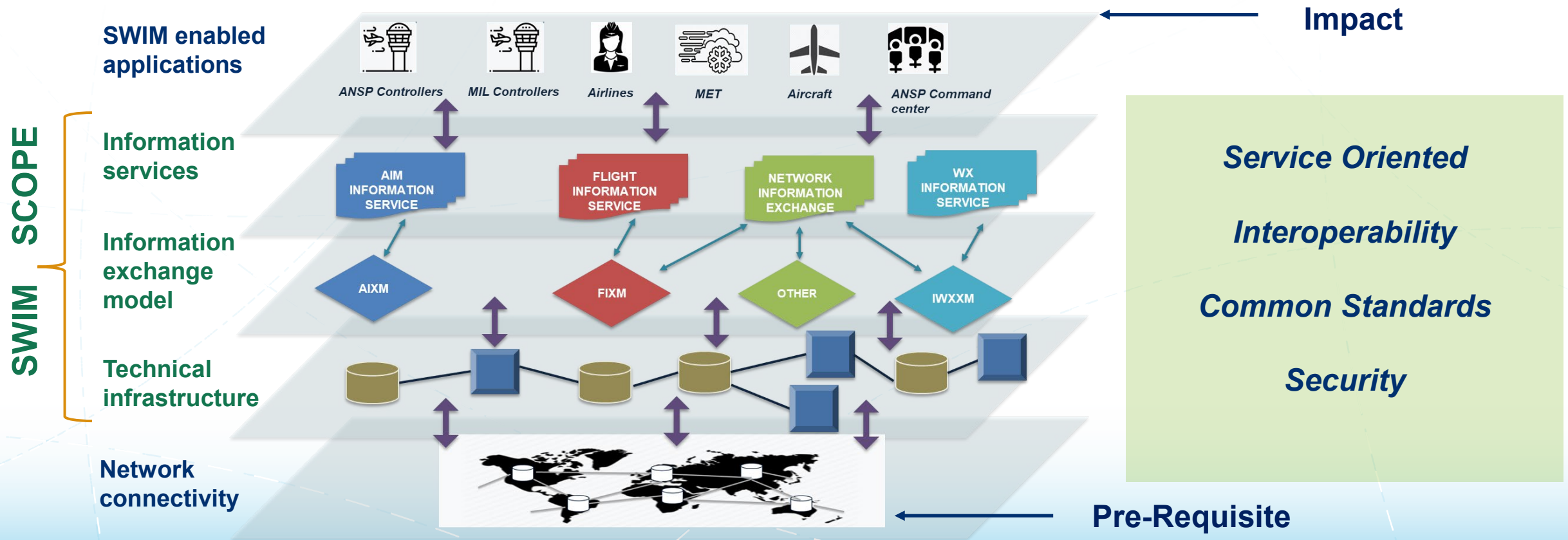
- Structured data-information for system use and network dissemination

# The 6 ATM functionalities of CP1



# What is SWIM?

**SWIM** is the current answer to **improving global interoperability** in air traffic management



# The evolution of information Exchanges in ATM

Feature / System	AFTN	AMHS	FMTP	SWIM
Era	1950s–2020s	2000s–present	Late 2000s–present	2010s–present
Purpose	Text-based aeronautical messaging	Modernized aeronautical messaging	Real-time flight plan data exchange	Full-service data exchange across all ATM domains
Data Type	Flight plans, NOTAMs, weather	Same as AFTN but structured	Flight data (FDPS-to-FDPS)	All ATM data
Technology	Telex, X.25	X.400-based (ISO/ITU) over IP	TCP/IP-based	Web Services, XML/JSON, AMQP, REST, MQTT, etc. (IP-based)
Communication Model	Store-and-forward	Store-and-forward	Real-time, point-to-point	Real-time, service-oriented (SOA), distributed
User Scope	All aviation Stakeholders	All aviation Stakeholders	Primarily European ACCs	All aviation stakeholders
Interoperability	Limited	High (but message-centric)	High between FDPSs	Very high, system-wide
Digitalisation level	Low	Medium	Medium	High

Mixed mode operations will exist for years to come...



Can and will SWIM cater for all ATM information exchange requirements?



# ICAO provisions and SWIM



Not binding but a Global baseline

ICAO states

EU states

## Adoption and incorporation into National regulations

Adopt into national regulatory frameworks

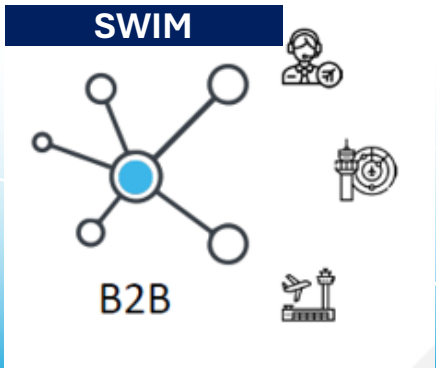
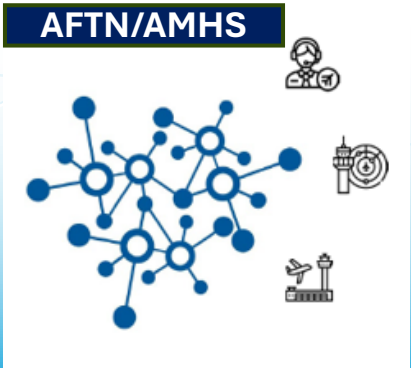
Amendments to national law

Potential exemptions

EU specific: EASA update of EU regulations (i.e. CP1)

## Impact on Aviation Operators and stakeholders

- Airports
- Airspace Users
- CAAs
- ANSPs
- Training req.
- Europe specific specifications



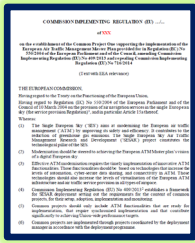
**AGREED**

- Met information Exchanges
- AIM information Exchanges
- FF-ICE

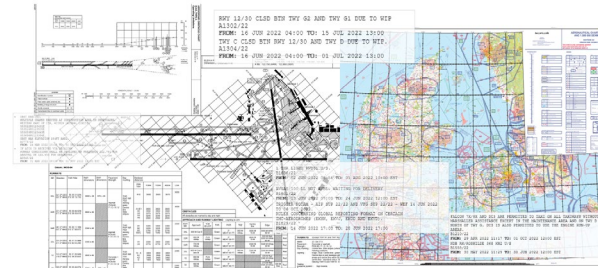
**EVALUATION**

- Flow Exchanges
- ATC-ATC Exchanges

# CP1 AIM SWIM Services and mandated changes



1. Aeronautical features service
2. Aerodrome mapping
3. Digital NOTAM



## Structured Data Formats

Instead of PDFs or paper charts, data is stored in XML-based models like AIXM, which are interoperable and suitable for modern systems.



## Automation and Real-Time Updates

Systems can automatically ingest and update aeronautical data.



## Data Quality

Regulatory frameworks define and enforce minimum quality requirements, which are the responsibility of the data originator.



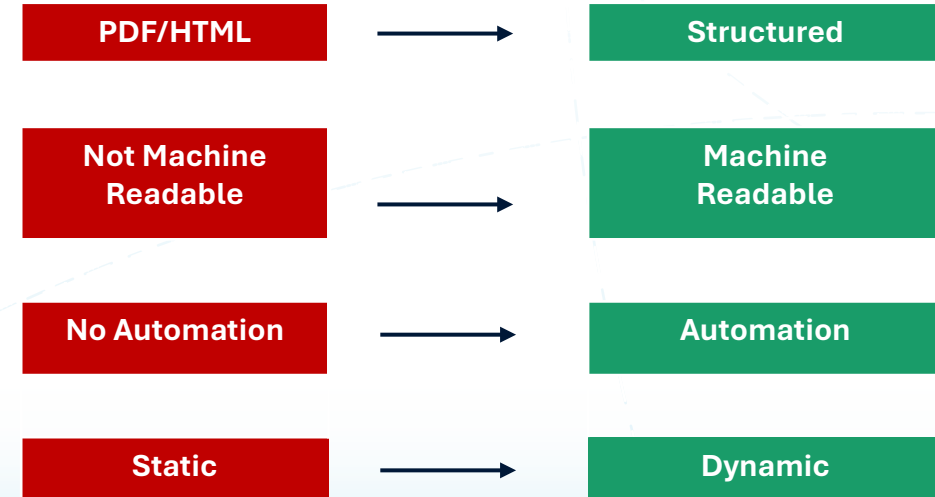
## Integration with Modern Systems

Digital AIM data can feed directly into flight planning tools, onboard avionics, air traffic control systems, and UTM



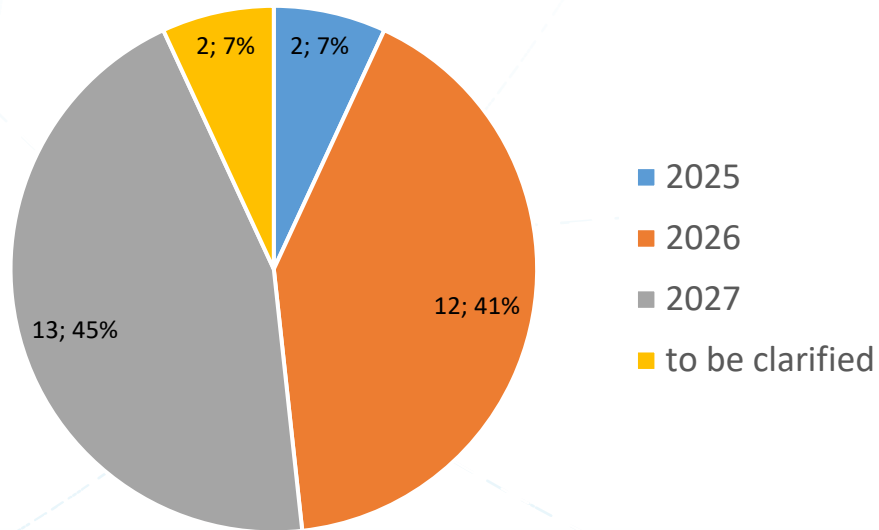
## Support for Trajectory-Based Operations (TBO)

Enables more efficient flight path planning by using high-quality, digital aeronautical and airspace data

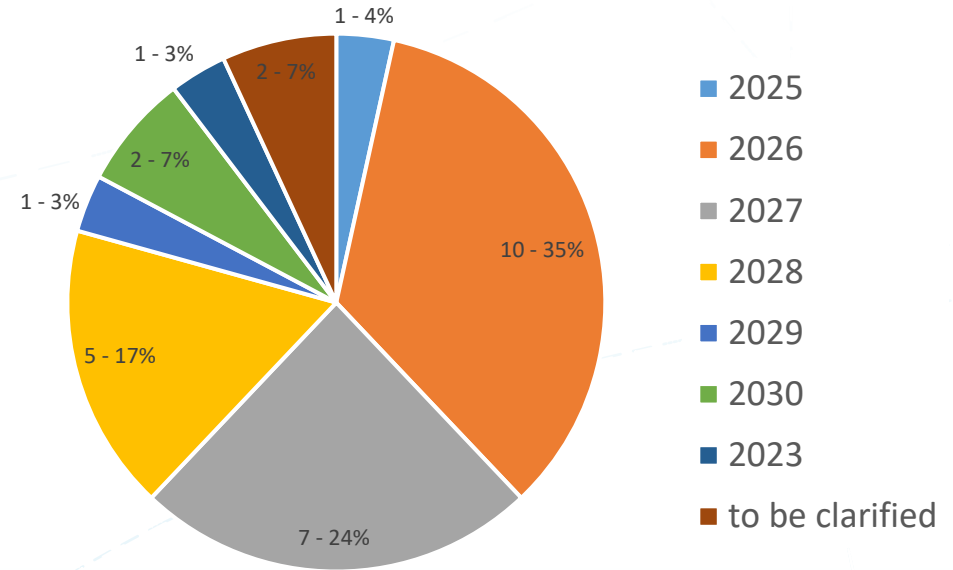


# CP1 AIM SWIM Implementation Status

## AIM SWIM Provision Implementation: countries/year



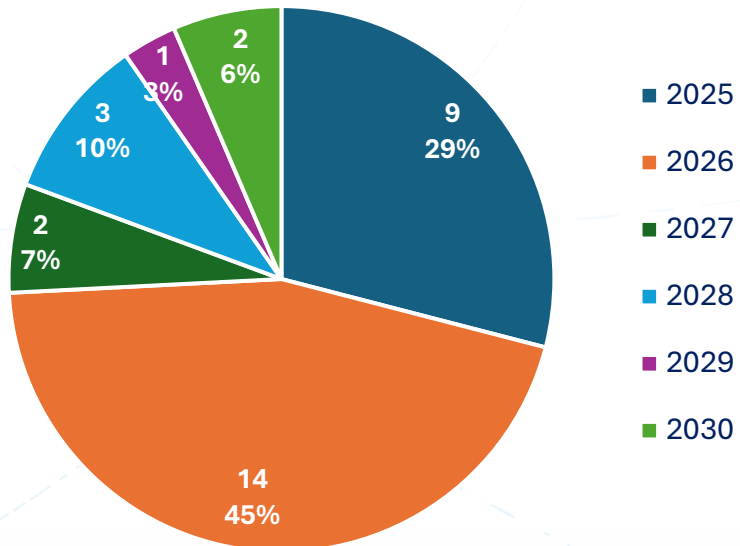
## AIM SWIM services consumption – Implementation: Countries/year



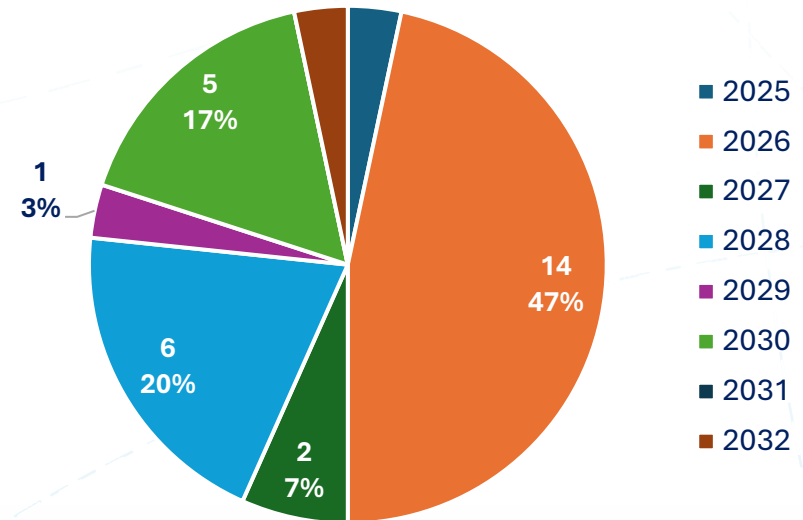


# CP1 ASM SWIM Implementation Status

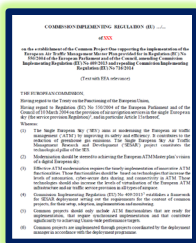
ASM SWIM services - Provision  
Implementation: Countries/year



ASM SWIM services - Consumption  
Implementation: Countries/year



# CP1 SWIM Met Services and mandated changes



1. Aerodrome Met Services
2. En-Route Met services
3. Network Met Services
4. Volcanic ash Services

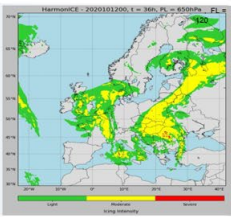
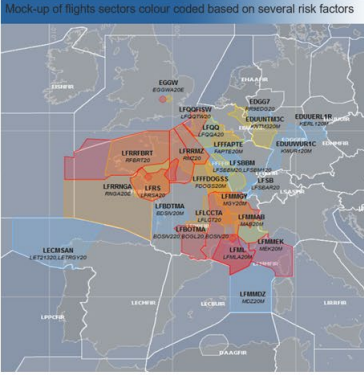
	Aerodrome	En route	Network	Volcanic ash
<b>Data</b>	Same/Enhanced	Same/Enhanced	Same	New
<b>Tech Impact</b>	SWIM	SWIM	SWIM	SWIM
<b>OPS Impact</b>	Potentially	Potentially	Potentially	Yes

	TAC / AMHS	IWXXM / SWIM
Nature	<b>Message-based (text)</b>	<b>Data/service-based (structured)</b>
Format	TAC (coded text)	<b>IWXXM (XML structured data)</b>
Exchange	Store & forward (AMHS)	<b>Service-based (SWIM)</b>
Usage	Human-readable	<b>Machine-processable</b>
Digitalisation level	Low-medium	<b>High (full digital)</b>

**METAR**  
KIAD 131052Z 0000KT 6SM MIFG CLR 09/08 A3006 RMK A02 SLP177 T00890078

**TAF**  
KIAD 130858Z 1309/1412 14003KT P6SM SKC  
FM131500 2000KT P6SM FEW250  
FM140600 17005KT P6SM SCT200  
FM141000 17007KT P6SM BKN110

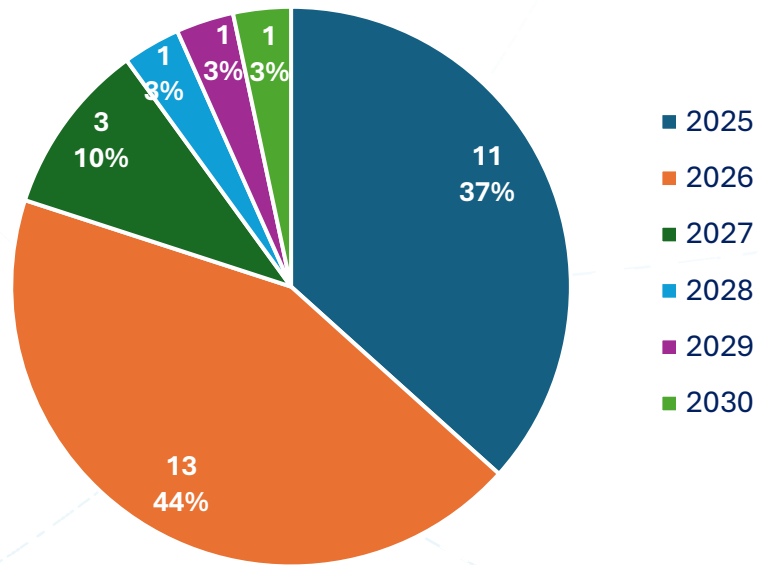
**AIRMET & SIGMET**  
WAUS41 KKCI 130845 BOST WA 130845 AIRMET TANGO UPDT 1 FOR TURB AND LLWS VALID UNTIL 131500 AIRMET TURB...NJ PA OH LE WV MD DC DE VA NC SC GA AND CSTL WTRS FROM 50WSW DXO TO 20SSE ETX TO 180ESE SIE TO 150SE SIE TO 190ESE ECG TO 130SSE ILM TO 30SW CLT TO 40S GQO TO GQO TO HMV TO HNN TO CVG TO FWA TO 50WSW DXO MOD TURB BTN FL240 AND FL410. CONDS CONTG BYD 15Z THRU 21Z. LLWS POTENTIAL...NY LO PA OH LE BOUNDED BY 50NNW SYR-50ENE SLT-40SSW ERI-40NNE CLE-20E YYZ-50NNW SYR LLWS EXP. CONDS DVLPG 09-12Z. CONDS CONTG BYD 15Z ENDG 15-18Z. OTLK VALID 1500-2100Z...TURB MA RI NY NJ PA OH LE WV MD DC DE VA NC SC GA AND CSTL WTRS BOUNDED BY 50ENE SLT-170SSE ACK-150SE SIE-190ESE ECG-150ESE ILM-30SSE GSO-30WNN ATL-GQO-HMV-HNN-CVG-40WSW ROD-50ENE SLT MOD TURB BTN FL280 AND FL390. CONDS CONTG THRU 21Z.

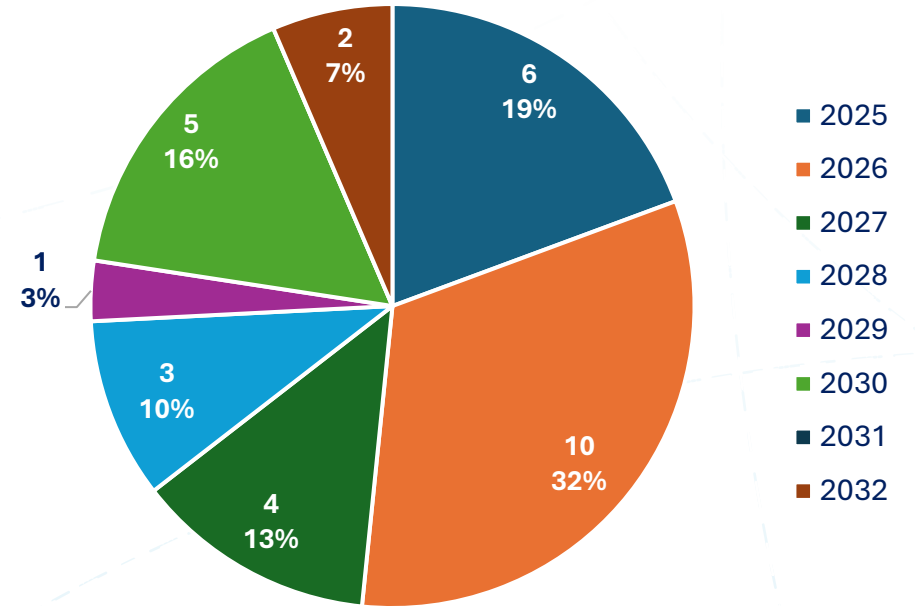
- SWIM enables instant sharing of weather data (e.g., METAR, TAF, SIGMET) between ATC, airlines, airports, and pilots for quick decision-making and operational coordination.
- Real-time weather alerts, including turbulence, cross border convection.
- Enhanced Weather data and SWIM Services
- Enhanced volcanic ash data through SWIM
- Enhanced gridded weather data

# CP1 MET SWIM Implementation Status

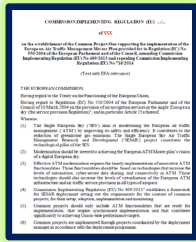
MET SWIM services - Provision  
Implementation: Countries/year



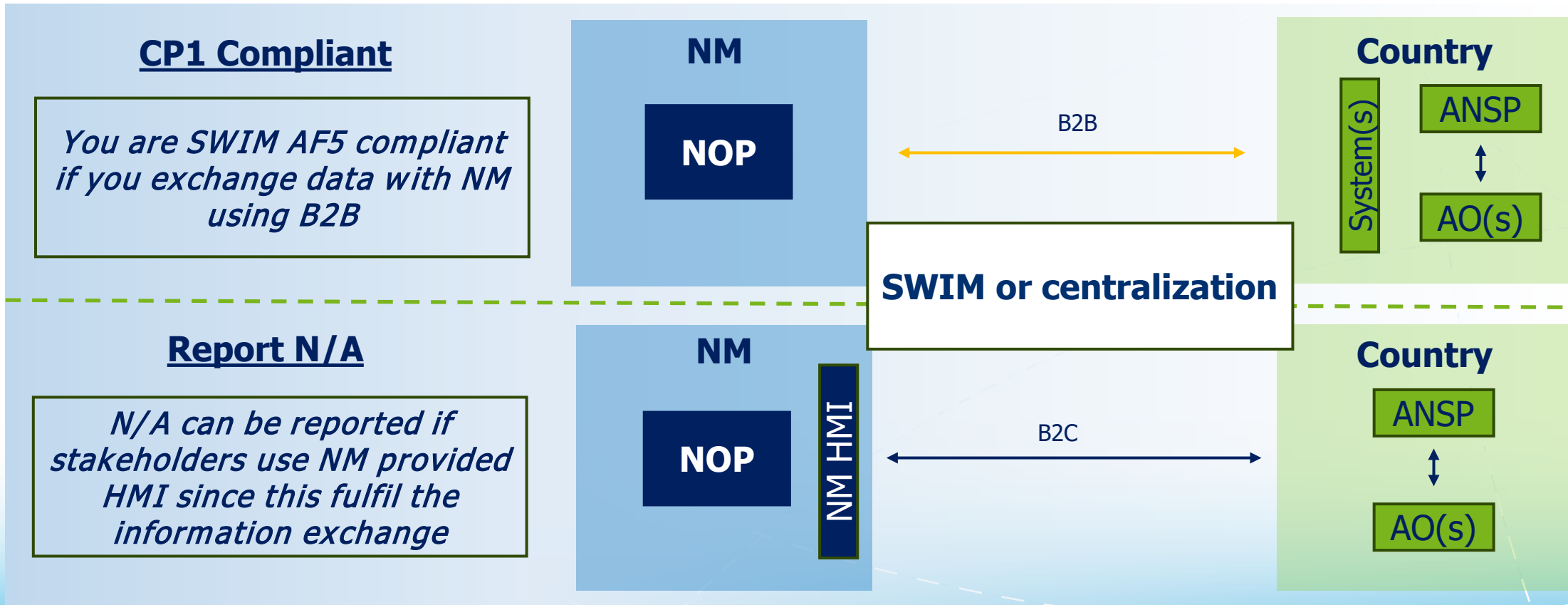
MET SWIM services - Consumption  
Implementation: Countries/year



# CP1 SWIM Services and mandated changes Flow Services – NM B2B



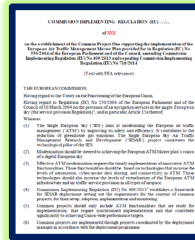
1. ATFCM tactical updates service
2. Flight management service
3. Measures service
4. Short term ATFCM measure service
5. Counts service



# CP1 SWIM Services and mandated changes FF-ICE/R1



**Global fpl2012  
Sunset Date 2034!**



1. Filing service
2. Publication Service
3. Flight data request service
4. Notification service
5. Trial Service

## Why? FPL 2012

```
(FPL-DLH9LCZ-IS
-A320/M-SDEZE3FGIULORWXYZ/HB1
-EDDM0940
-N0445F370 ROTAX3S ROTAX L603 LATLO DCT OBEDI DCT NEMEK DCT VRANA
DCT PETAK/N0445F390 DCT PINDO UL607 XORKI
-LGAV0208 LGSA
-PBN/A1B1C1D101S1S2 COM/ULD DAT/VM DOF/230122 REG/DRAWKZ
EET/EDUU011 LOVV014 LJLA0026 LDZO0035 LQSB0039 LYBA0107 LAAA0116
LGGG0130 CODE/3C66EB RVR/75 OFR/DLH ORGN/EDDFDLHD DLH PER/C RMK/TCAS
AO4DT)
```

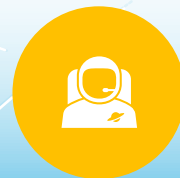
**ICAO:**  
The FF-ICE concept is intended to address **limitations and constraints of the current flight planning mechanism** and enable the transition to a **fully collaborative environment** where a flight trajectory is shared and optimized during all phases of a flight (i.e. Trajectory-Based Operations (TBO) environment).



UNDERSTAND  
REQUIREMENTS



COLLABORATION



SCALABLE &  
FLEXIBLE



MACHINE  
READABLE



TBO ENABLER

# FPL2012 vs FF-ICE — From Messages to Digital Trajectory

## FPL2012 (Message-based)

- ICAO fixed message format
- Static flight description
- Fragmented updates (FPL/CHG/CNL/DLA)
- Point-to-point (AFTN/AMHS)
- Limited trajectory detail
- No shared global view

## FF-ICE (Data-centric)

- Structured data model (FIXM)
- Full 4D trajectory
- Continuous lifecycle (single object)
- Service-based (SWIM/B2B)
- Rich performance data
- Shared network-wide view

## Lifecycle evolution

FPL2012: Airspace User → FPL → CHG/DLA/CNL → fragmented updates → local views

FF-ICE: Airspace User → eFPL → shared flight object → continuous updates → network-wide trajectory

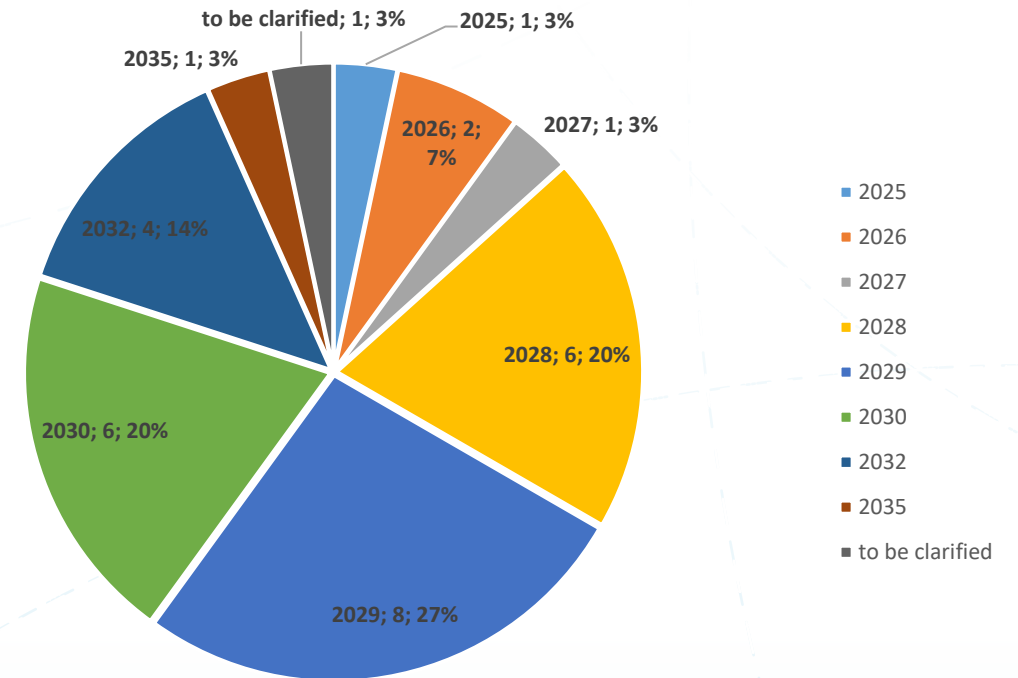
# CP1 FF-ICE SWIM Implementation Status

Airspace Users (~850 in ECAC)

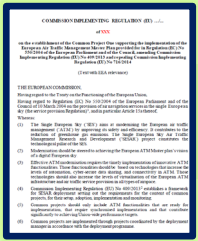
~ 20% of FF-ICE flight plans, 80% FPL2012 in May 2026

Mixed mode operation to continue (until FPL2012 sunset date - 2034) - ?

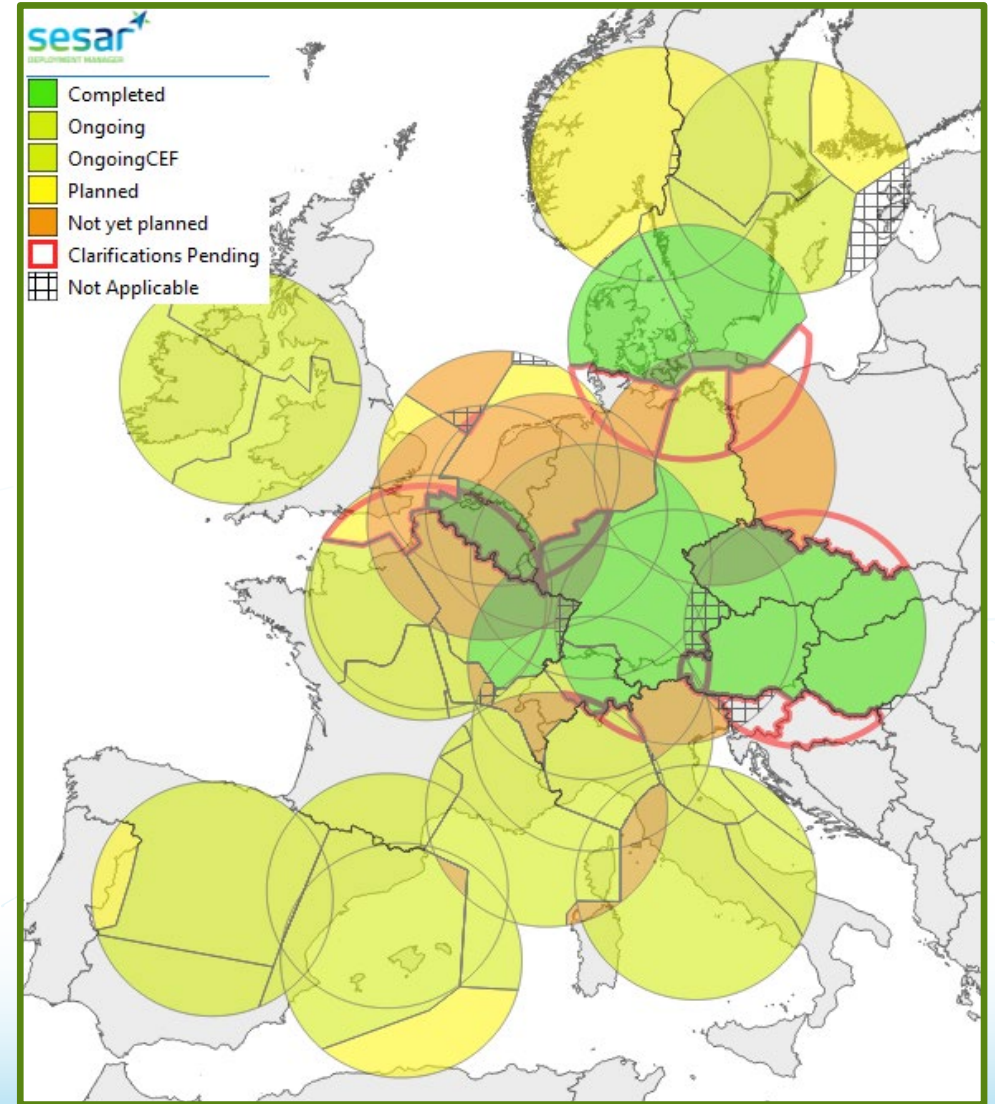
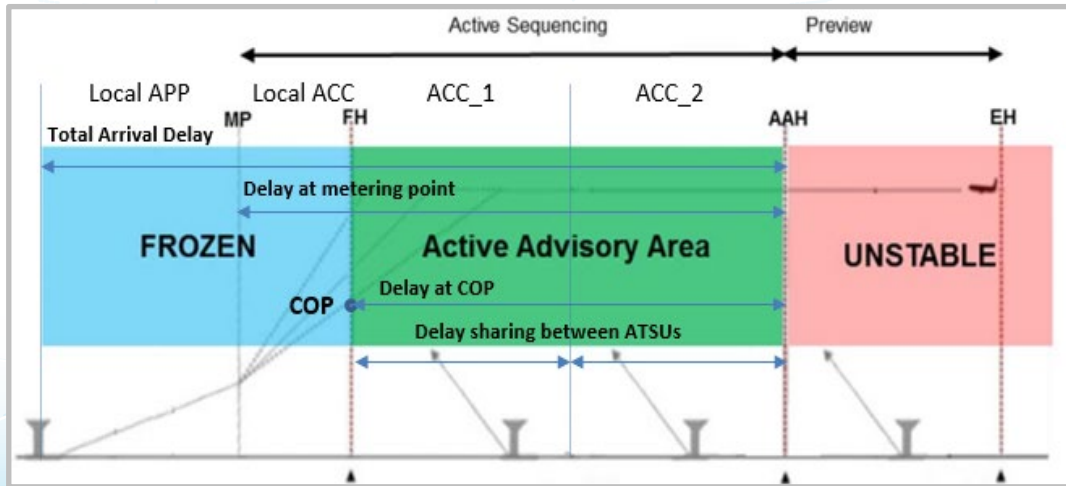
## FF-ICE Implementation: ANSPs by year



# CP1 SWIM Services and mandated changes EAMAN Service— NM B2B

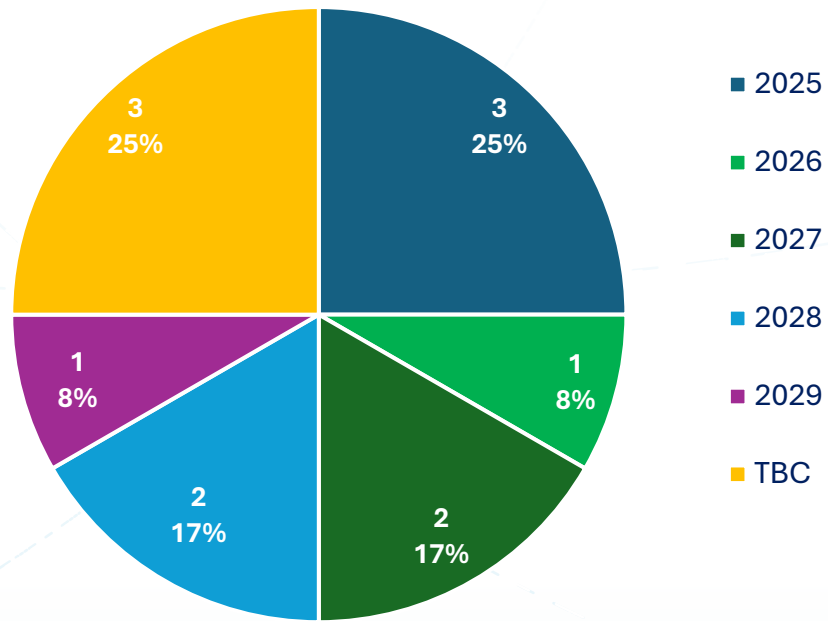


## 1. Extended AMAN SWIM Service (ED254A)

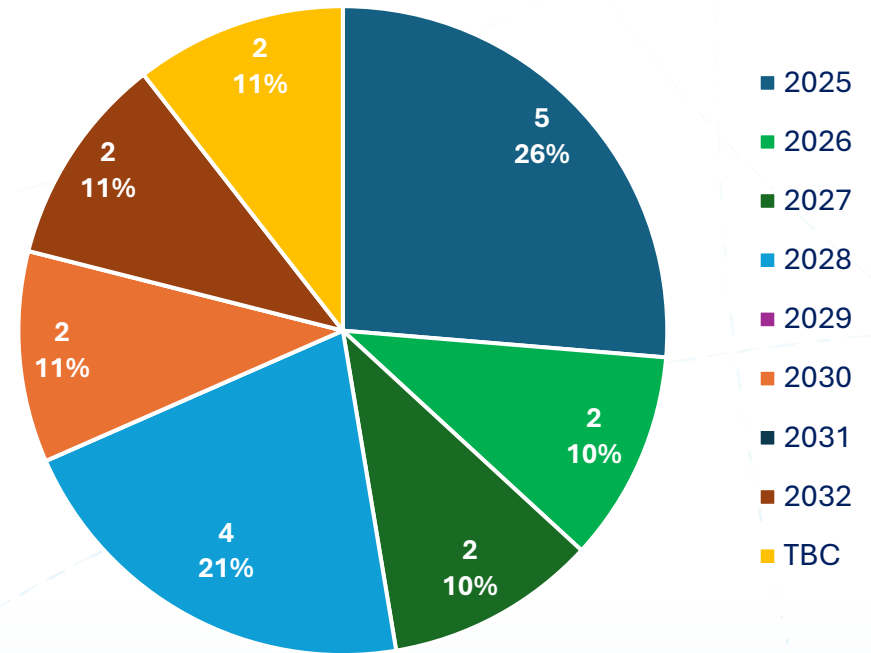


# CP1 Extended AMAN SWIM Implementation Status

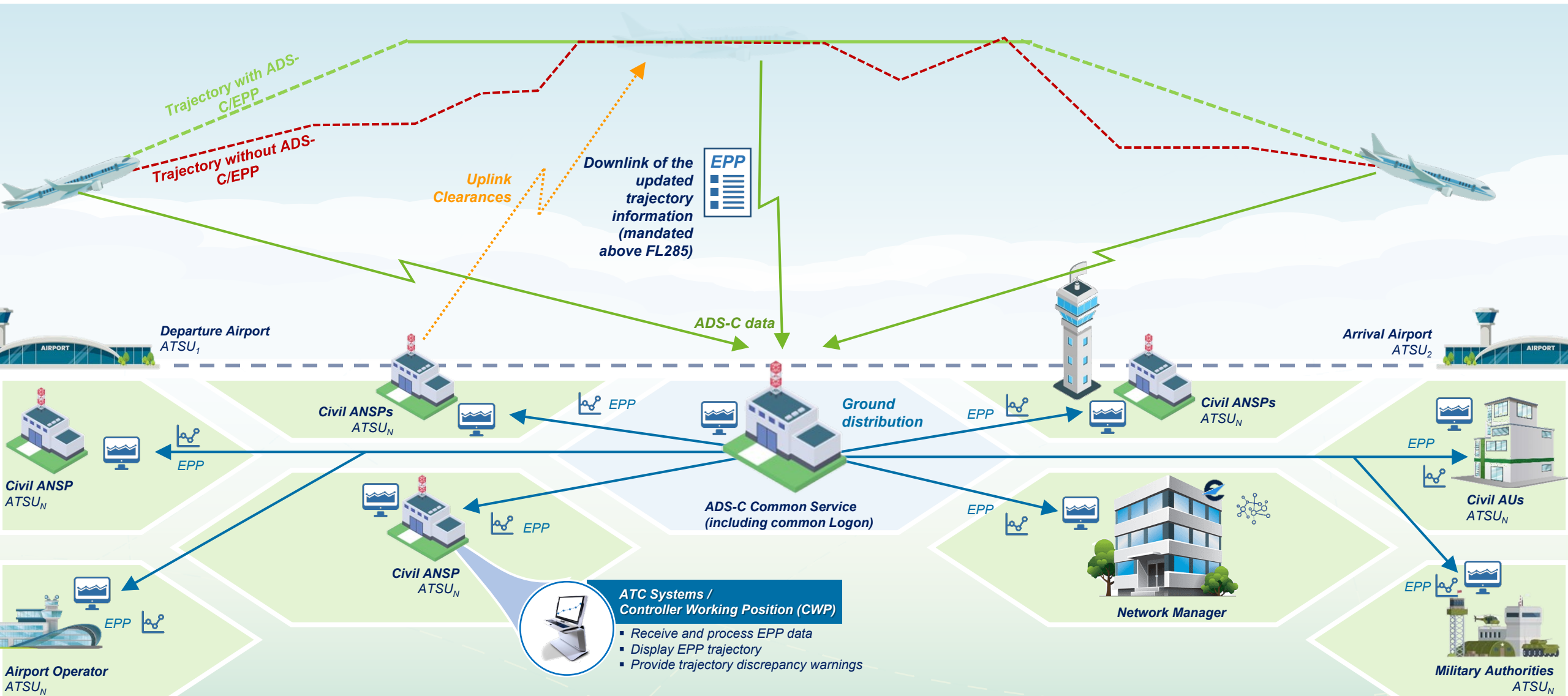
## Extended Arrival Sequence SWIM Service - Provision Implementation: Countries/year



## Extended Arrival Sequence SWIM Service - Consumption Implementation: Countries/year



# CP1 - AF6 – Initial Trajectory Information Sharing



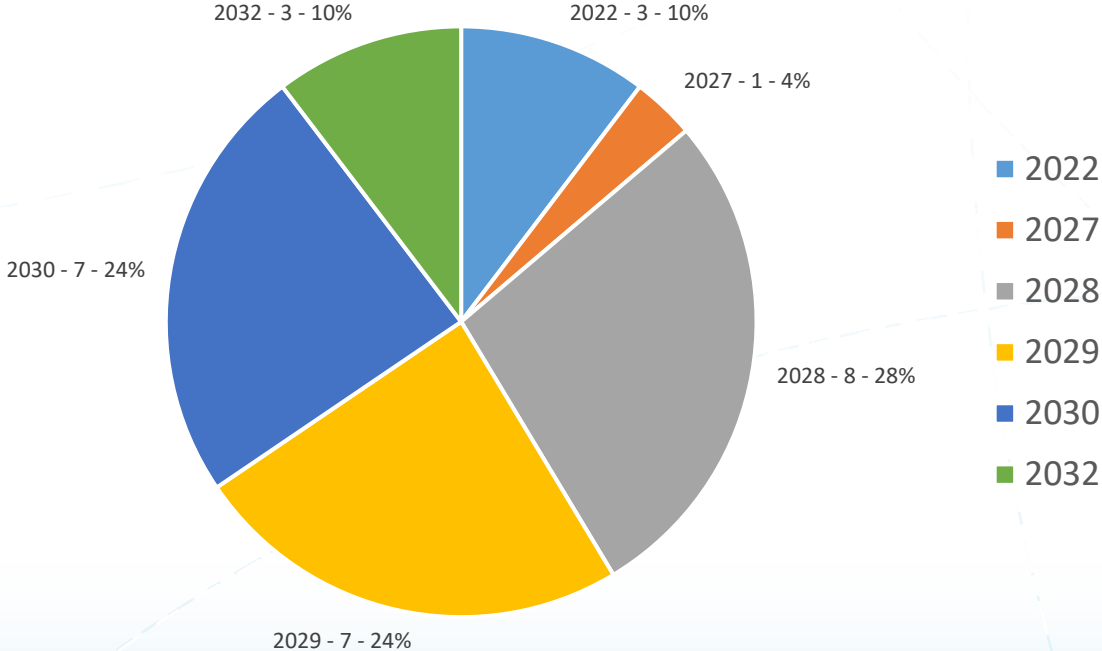


# Initial Air-Ground Trajectory Information Sharing: implementation status

## Aircraft with ADS-C/EPP capability: SDM forecast

	04/ 2026*	2028	2030	2035	2040
Cumulative aircraft equipped	630	900	1500	3500	6000
Cumulative aircraft equipped (retrofit)	20	250**	350	500	1000
Cumulative aircraft equipped ECAC based	480	680	1200	2500	4000
Share of total jet fleet equipped operating in ECAC (%)	5,6	7,6	14	28	45

Initial Air-Ground Trajectory Information Sharing- ANSPs implementation per year



(\*) Extract form LL  
 (\*\*) Incl aircraft in CLEAN ATM3 project

# ATM Masterplan – TBO & ODA links with CP1 SWIM and initial trajectory information sharing



## Strategic Deployment Objectives

### SDO 5 – Transformation to trajectory-based operations (TBO)

- Initial TBO elements being implemented through CP1
- Next steps in SESAR R&D building on CP1 SWIM services and initial trajectory sharing

### SDO 8 – Service-oriented delivery model (data-driven and cloud-based)

CP1 SWIM implementation is baseline upon which SOA in ATM may build on

**SWIM (AF5) and Initial Trajectory Sharing (AF6) are prerequisites for later deployment of SDO 5 and SDO 8**

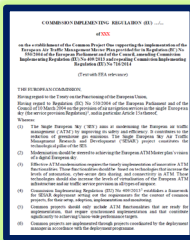
# CP1 Deployment: pre-requisite for Trajectory Based Operations

A concept enabling globally consistent performance-based 4D trajectory management **by sharing and managing trajectory information**. TBO will enhance planning and execution of efficient flights, reducing potential conflicts and resolving upcoming network and system demand/capacity imbalances early

## Trajectory-Based Operations

AIM  
ASM  
FF-ICE/R1  
MET  
Flow  
ADS-C EPP  
EAMAN

SWIM

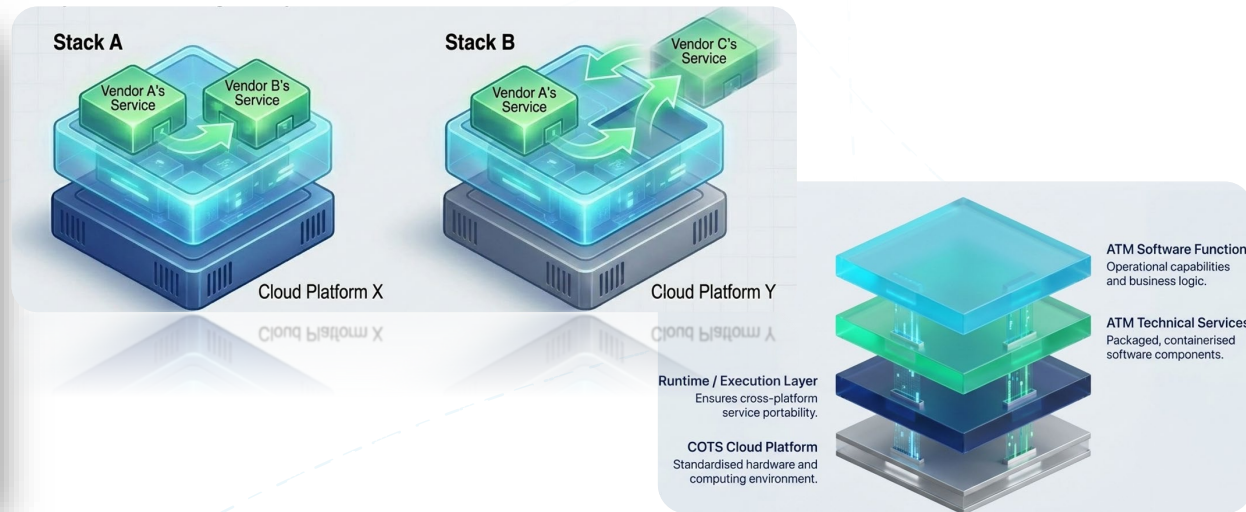


# Relationship SDO#8 with CP1 SWIM and AF5

SDO#8 does not replace SWIM: it builds on it and extends the digitalisation scope from information exchange based upon services to service delivery.



	CP1 / SWIM AF5	DraftCP2 / SDO#8
Primary Focus	Standardized Data Exchange	Standardized Service Execution
Architecture	SWIM Profiles & Messaging	COTS Cloud & Platform-Agnostic APIs
Provider Model	Traditional ANSP sharing data	Decoupled ATSP & ADSP roles



## SWIM contributes

- Harmonised information services
- Data models such as AIXM, FIXM, WXXM
- SWIM technical infrastructure baseline

## SDO#8 adds

- Service contracts and APIs
- Runtime/execution layer
- COTS cloud platform profile
- Portability and interchangeability

## Draft CP2 proposes

- Industrialisation focus
- Forward-fit for new baselines
- Transition planning from RP5
- Cross-SDO coherence

**ATM Digitalisation is progressing through SESAR CP1, yet at a lower pace than anticipated**



**Need of further digitalisation in support of Business transformation**

**or**

**business transformation in support of further digitalisation**



# Thank you

## Any questions?



SESAR Deployment Manager 



@SESAR\_DM 



@SESARDeploymentManager 



sesar\_deployment 



SESAR Deployment Manager 



Co-funded by  
the European Union

