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ICAO EMERGING SURVEILLANCE TECHNOLOGIES SYMPOSIUM

Surveillance Evolution in Europe

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Content

- Strategic view
- Progress
 - Airborne view
 - Ground view
 - Space view
- Future Developments
- Roadmap

SESAR ATM Master Plan Strategic View

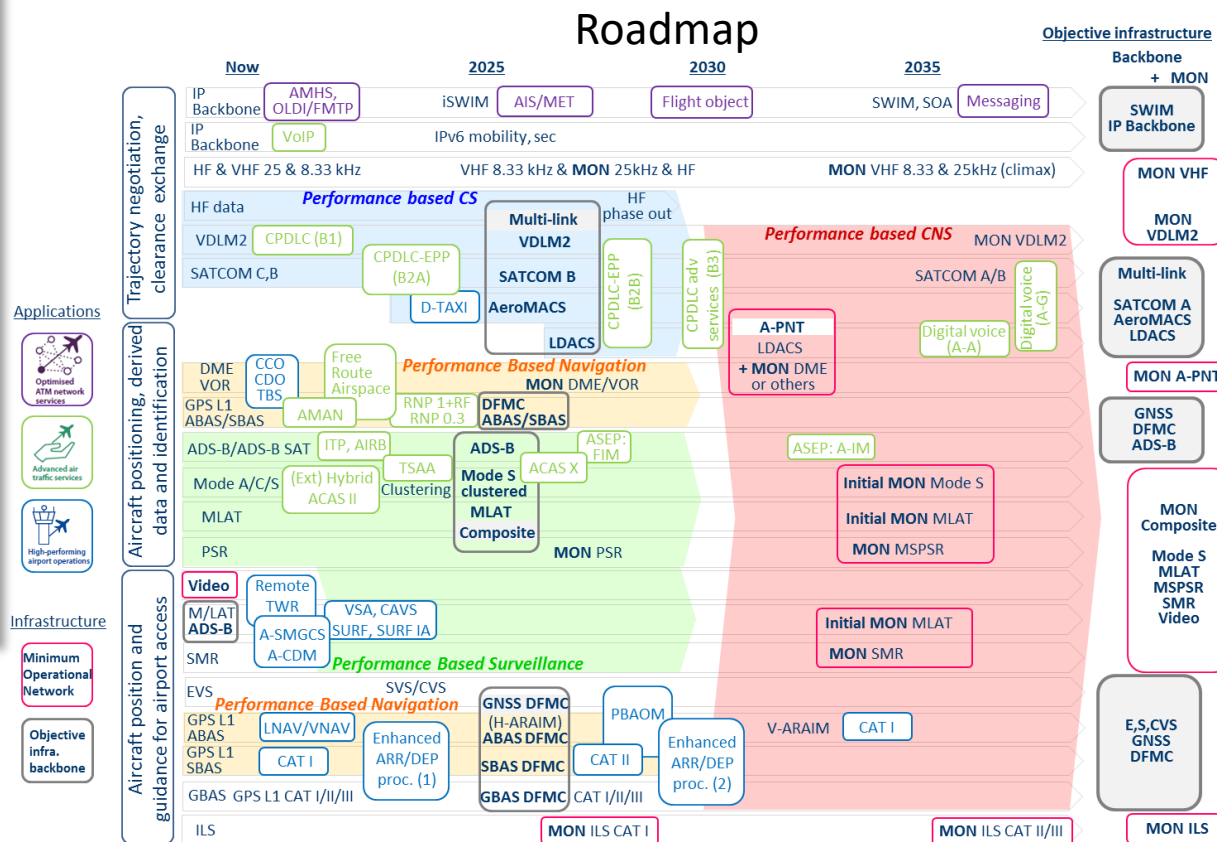


EUROPEAN ATM MASTER PLAN Digitalising Europe's Aviation Infrastructure
Executive view

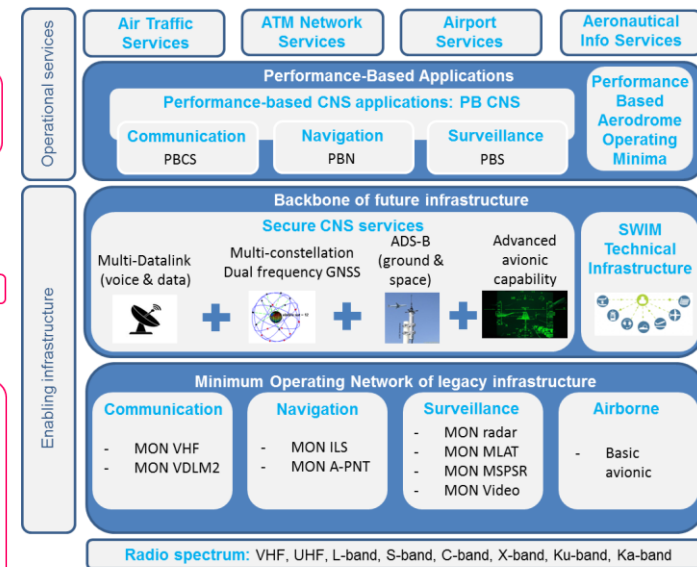
CNS evolution roadmap and strategy

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Consortium Coordinator: March 16, 2018
Edition date: 00.02.02
Edition: Template Edition: 02.00.01



Target Architecture



SUR MON currently being revisited

MON – Minimum Operational Network

SUR Avionics Requirements



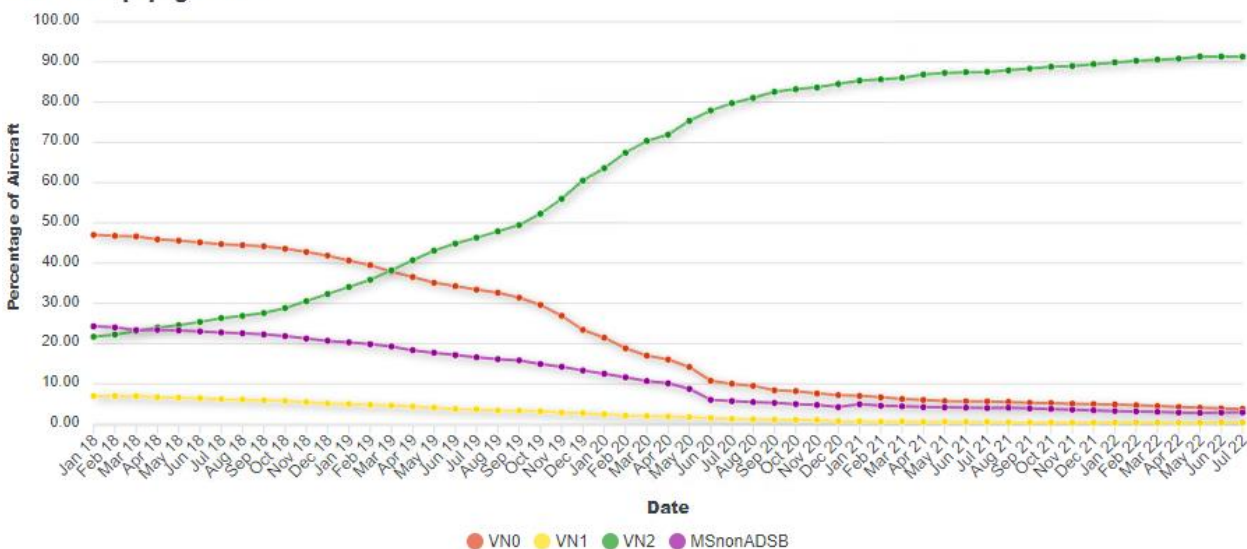
- EU Regulation 1207/2011 SPI IR (Amended)
 - ELS (IFR/GAT) + EHS & ADS-B (IFR/GAT >5.7t/250kts) from 7 December 2020
 - ADS-B version 2 required
 - EHS/ADS-B Transition until 7 June 2023
 - Provisions for: Aircraft with CoA before 7 June 1995, Maintenance, Export, End ops by 31 Oct 2025; State aircraft
- State AIPs
- Approval/Conformity
 - Airborne
 - EASA CS-ACNS (aircraft integration)
 - EASA CS-STAN (pre-approved installation on small aircraft)
 - EASA ETSO-C166b and ETSO-C112d (avionics component, in combination with GNSS ETSOs)
 - Ground
 - EASA AMC/GM
 - EUROCONTROL Specification for ATM Surveillance System Performance (ESASSP)
 - Sensors: EUROCAE ADS-B GS and WAM, EUROCONTROL Mode S



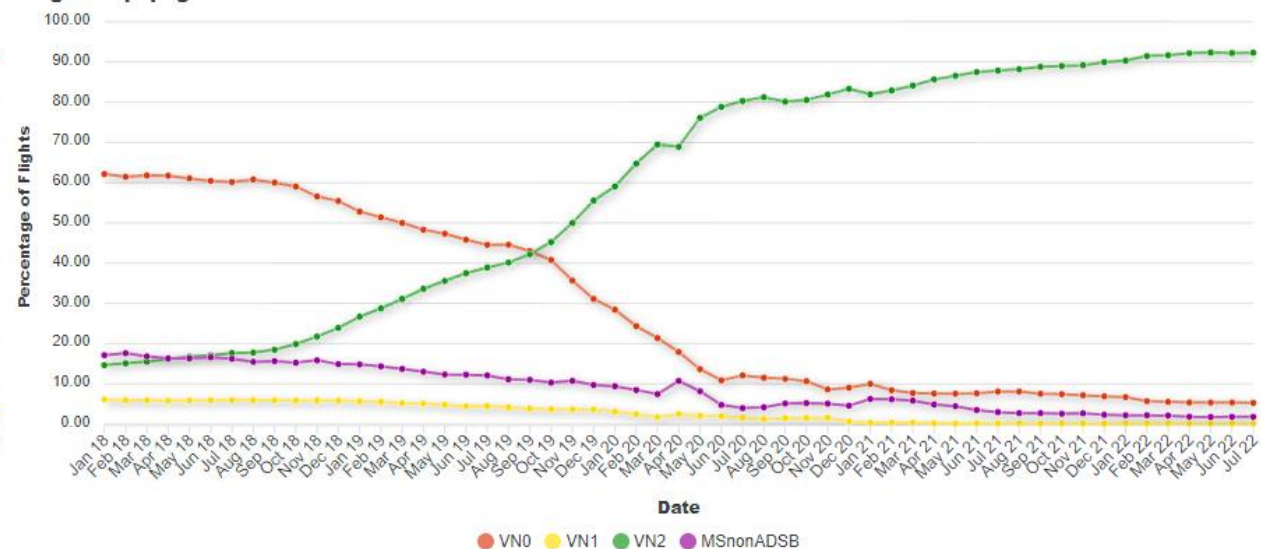
Airborne Equipage

- Mandated fleet under SPI IR
 - July 2022
 - ADS-B v2: ~92% Aircraft and NM Flights

Aircraft Equipage Stats

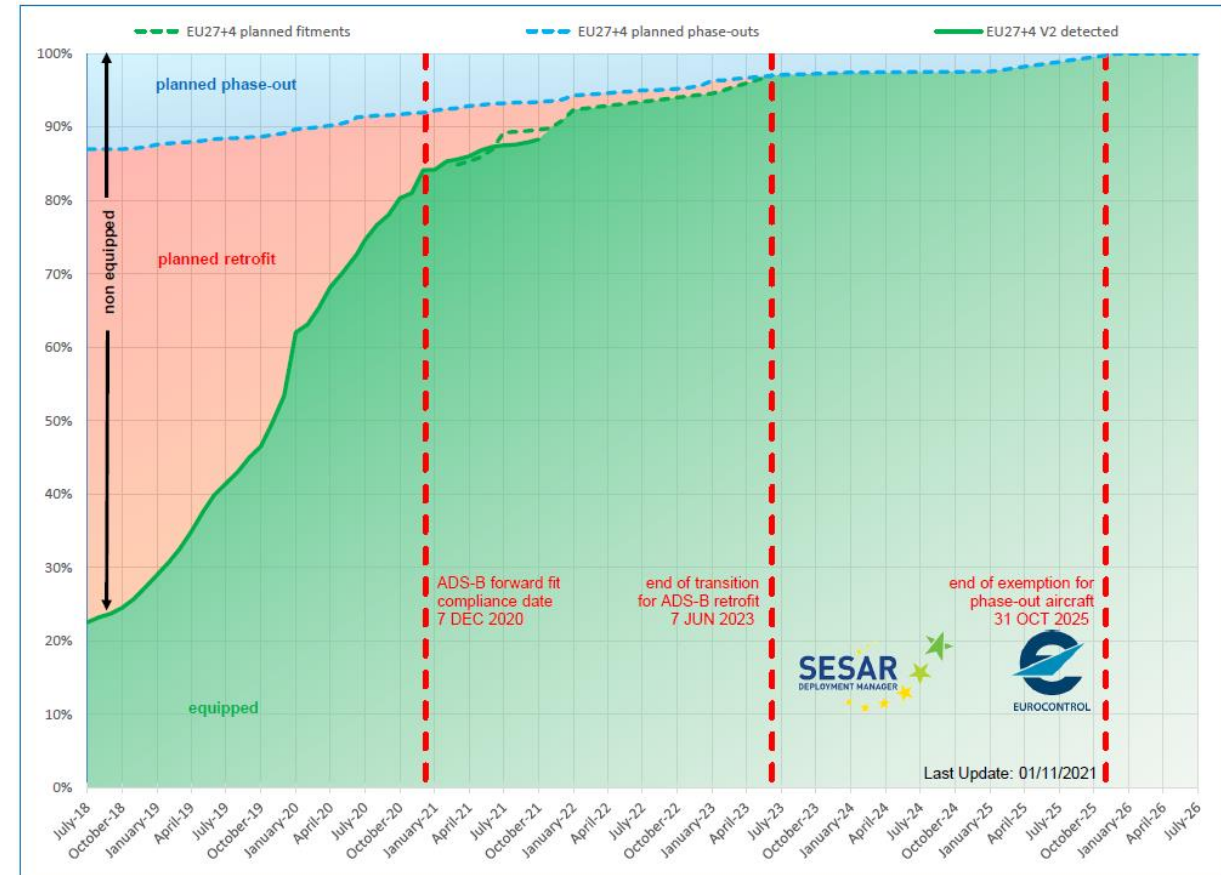


Flights Equipage Stats



Airborne Equipage monitoring

- Equipage vs plans and milestones
 - Airspace user plans: Based on surveys by SESAR Deployment Manager (SDM)
 - Actual equipage: Based on SUR monitoring by EUROCONTROL
- Status mid-2022
 - ~92% of mandated fleet and flights equipped with ADS-B v2
 - ~95% with all ADS-B versions
 - 80+ TMAs (of top-200 airports) with more than 90% of ADS-B v2 operations



Equipage Evolution – Ratio of “NM flights”

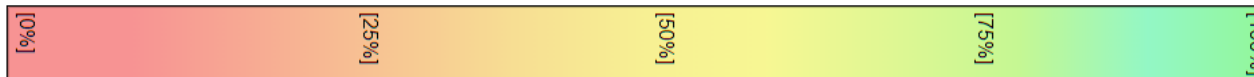
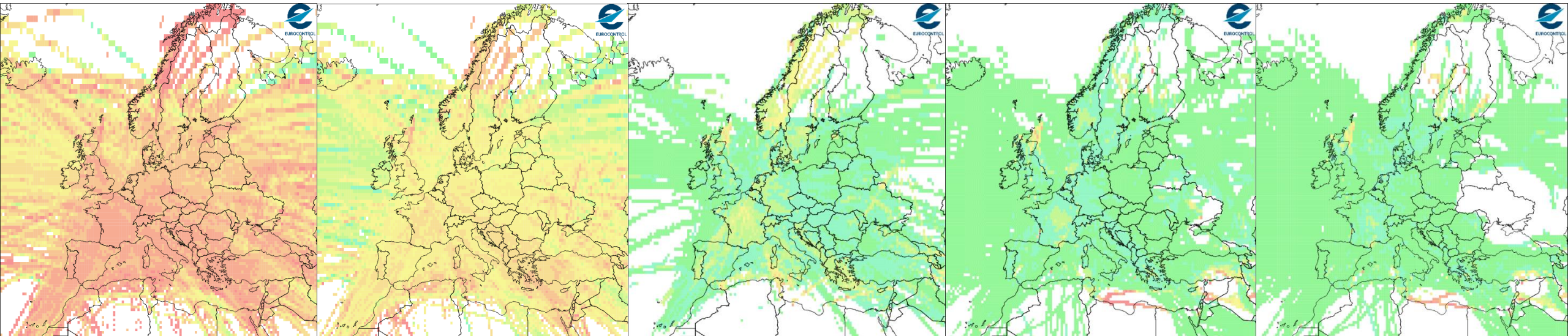
01.07.2018

01.07.2019

01.07.2020

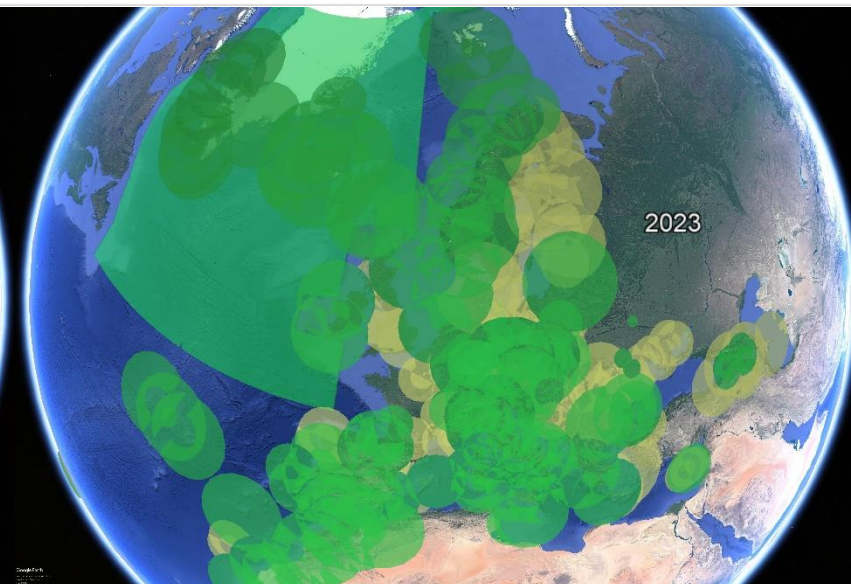
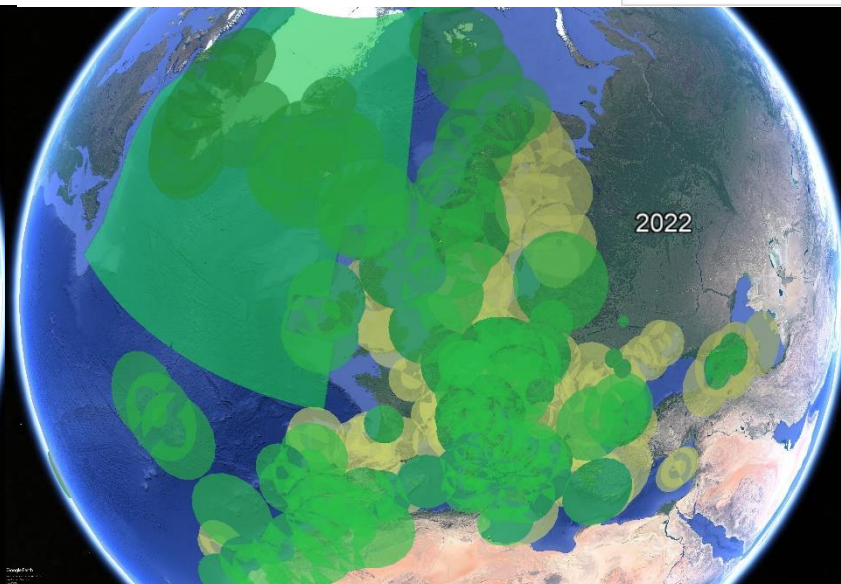
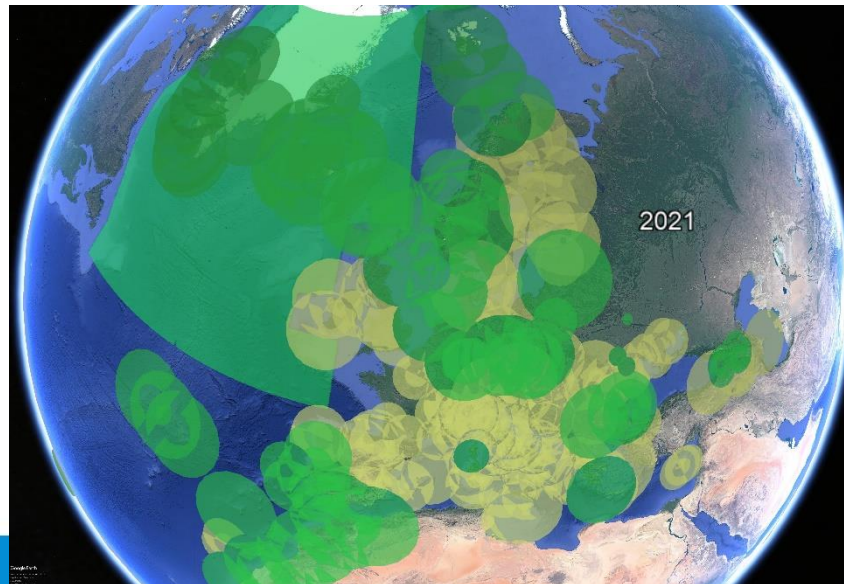
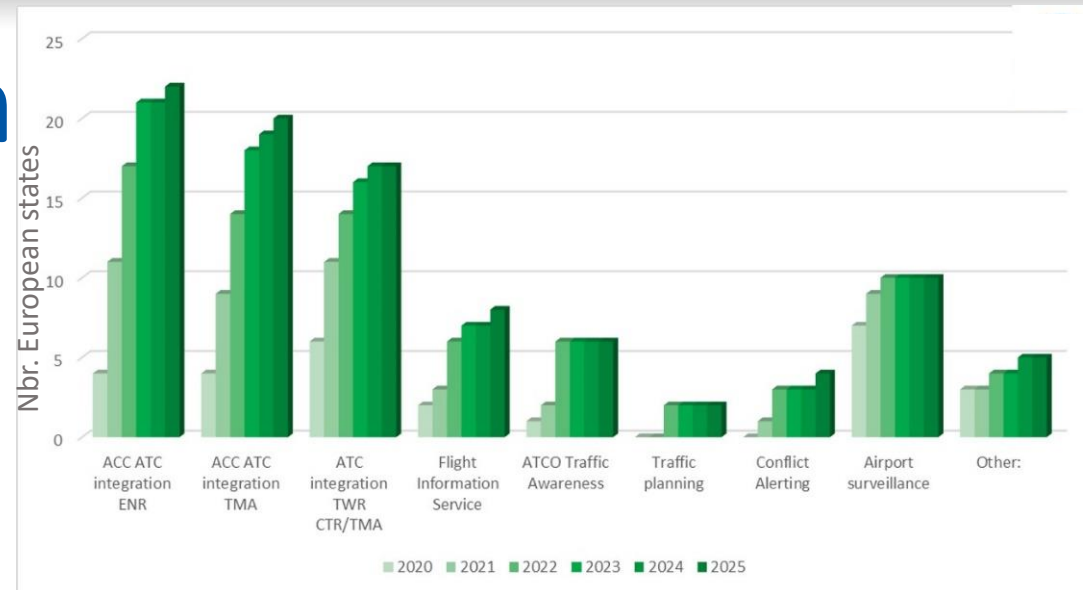
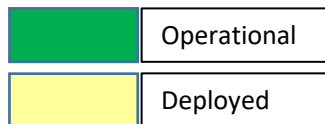
01.07.2021

01.07.2022



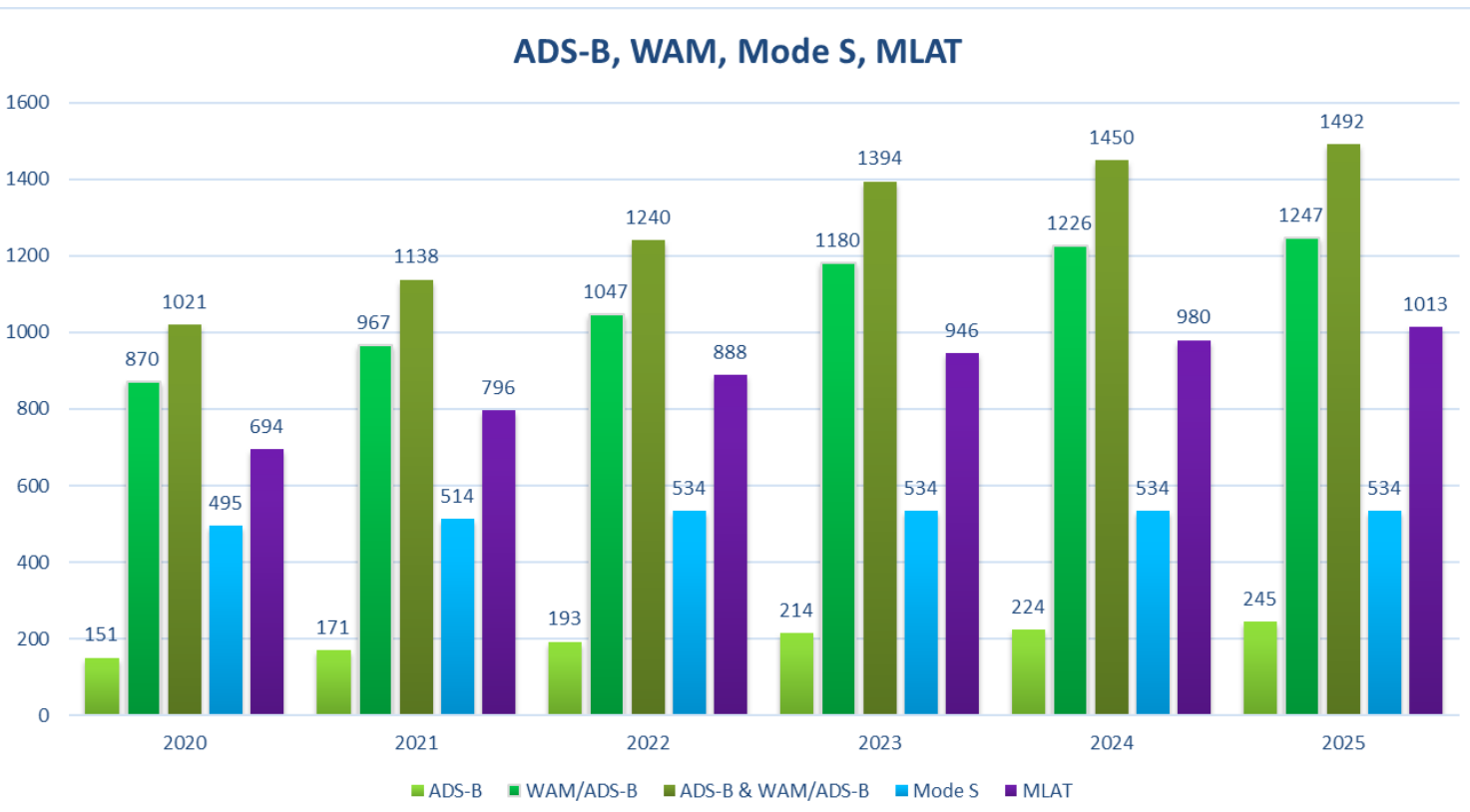
Ground ADS-B Implementation

- Updates from Local Single Sky Implementation+ (LSSIP+) monitoring

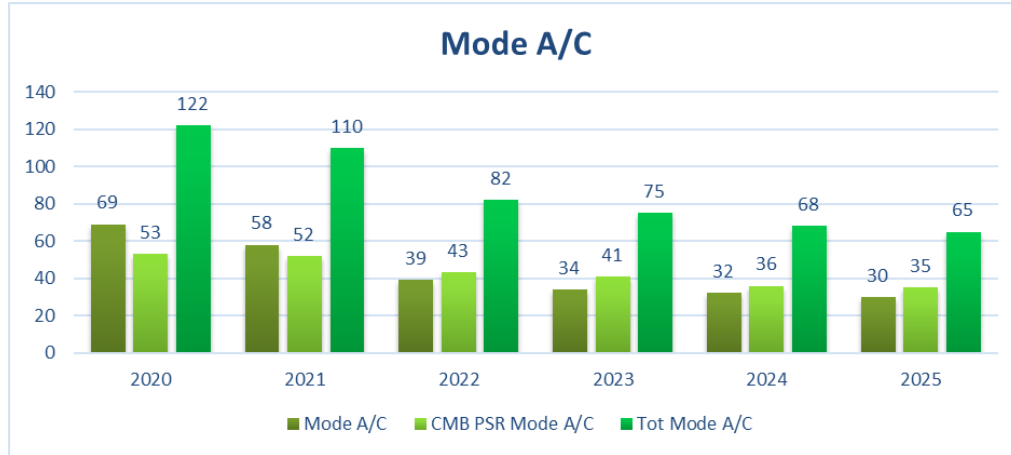


SUR Sensor Evolution

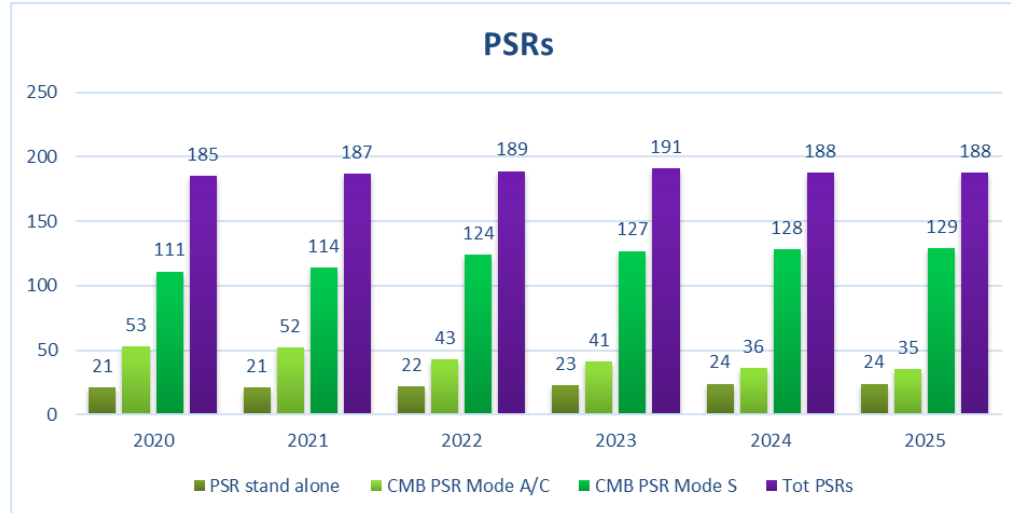
ADS-B, WAM, Mode S, MLAT



Mode A/C

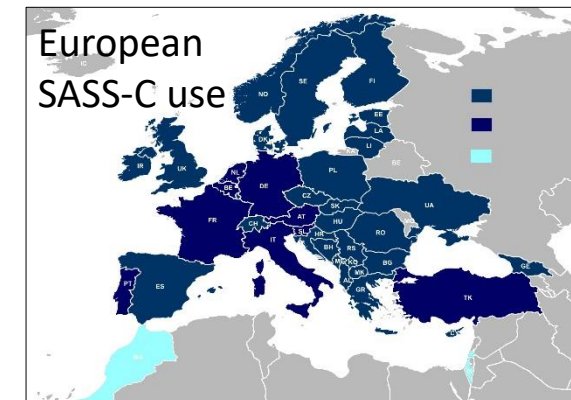
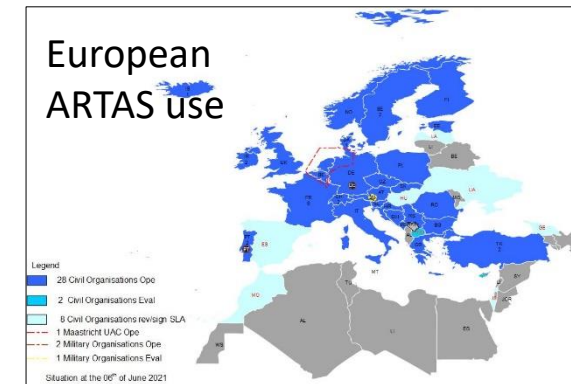
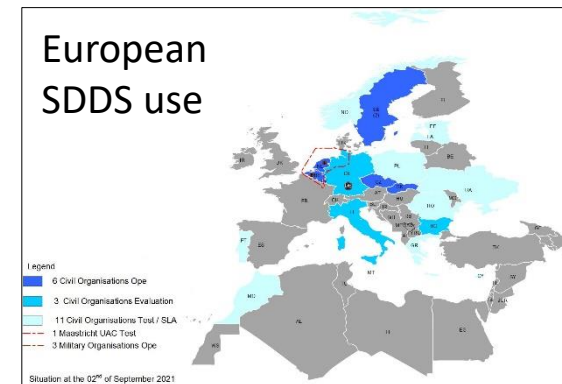


PSRs



Surveillance chain

- Surveillance Data Processing (SDP)
 - ARTAS system used by most European states and some non-European
 - Operations since 1999
 - Operational in almost all European countries
 - Various other SDPs are used as main and/or fallback
- Surveillance Data Distribution (SDD)
 - SDDS used by several ANSPs in Europe
 - ADS-B Server functionality
- Surveillance Analysis Support System for ATC Centres (SASS-C)
 - SUR evaluation system used by most European states
- ASTERIX incl.:
 - SSR Mode S: CAT048
 - ADS-B: CAT021 (CAT053 - new ADS-B Category under development)
 - WAM: CAT020



ADS-B Applications

ADS-B OUT Applications (EUROCAE/RTCA)

- In Radar Airspace (ADS-B RAD, ED-161/DO-318)
- In Non-Radar Airspace (ADS-B NRA, ED-126/DO-303)
- Airport Surveillance (ADS-B APT, ED-163/DO-321)

⇒ ICAO PANS-ATM

⇒ ICAO Annex 10

⇒ (ICAO Circular 326)

⇒ (“ICAO PBS SG RSUR”)

ADS-B IN Applications (EUROCAE/RTCA)

- Aircraft Surveillance Applications MOPS (ED-194/DO-317)
- Interval Management MOPS (ED-236/DO-361)
- Enhanced Traffic awareness for Flight ops (AIRB, ED-164/DO-319)
- Enhanced Traffic awareness for Surface ops (ED-165/DO-322+323)
- In Trail Procedure (ITP, ED-159/DO-312)
- Visual separation on Approach (VSA & CAVS, ED-233/DO-354)
- Traffic Situation Awareness with Alerts (TSAA/ATAS, ED-232/DO-348)
- Interval Management (IM, ED-195/DO-328)

⇒ ICAO DOC 9994 Manual on Airborne Surveillance Applications

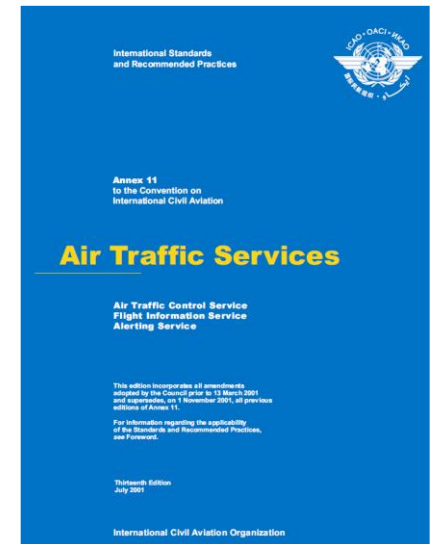
⇒ ICAO PANS-ATM, PANS-OPS

⇒ ICAO Annex 10

ADS-B Implementation aspects



- Generally fused with other sensors e.g. Radar/MLAT
- Stand alone in specific environments (low density)
- All ANSPs use ADS-B v2, some are using all ADS-B versions
- For all types of Air Traffic Services: ATC, FIS, Alerting

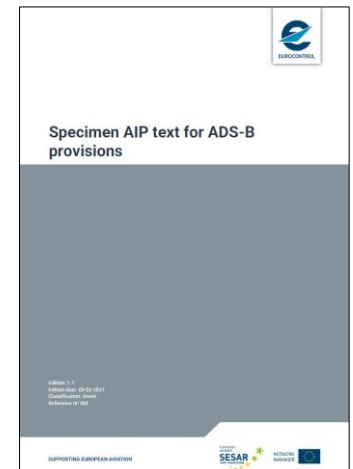


ADS-B Implementation aspects cont.

- ADS-B Flight plan indications
 - Improved provisions for ADS-B Out and ADS-B IN indications using item 18 SUR/
 - Under implementation
- Specimen AIP available
 - Prevent provision of misleading data and
 - Provide guidance for equipage for non-mandated
- Privacy
 - Concerns raised by some Airspace Users (AU)
 - Mitigation options explored incl.:
 - Safeguarding Flight data, Improve AU control of data, Anonymize SUR data
 - Privacy discussion paper available
 - Implementation guidelines under development
- Mixed SUR equipage
 - Limiting benefits, trade-off between AU impact (cost vs direct benefit) and enabling full ATM ADS-B benefits
 - Mitigating constraints, making it “easy” to equip

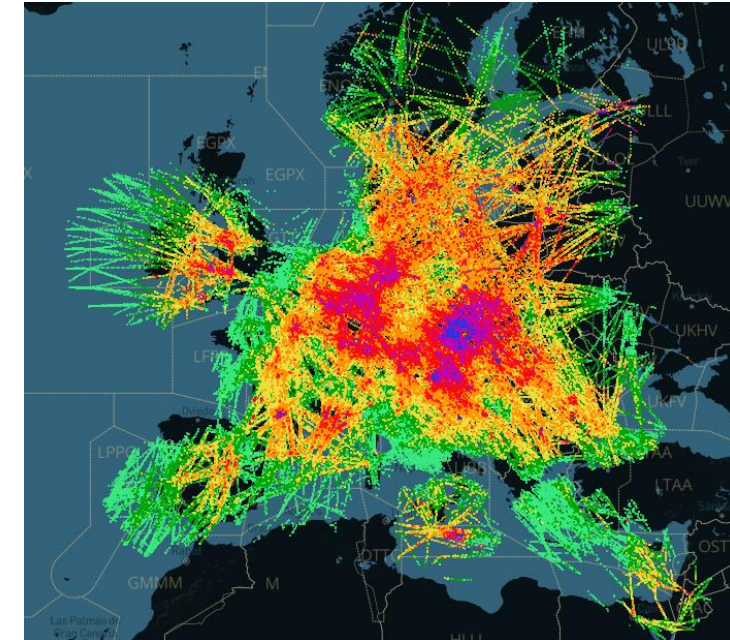
The image shows a screenshot of an 'International Flight Plan' form. It contains several sections with fields for flight information. Key sections include:

- FLIGHT PLAN:** Fields for origin, destination, and flight route.
- OPERATOR:** Fields for aircraft type, registration, and model.
- EQUIPMENT:** A section for specifying the aircraft's capabilities, including ADS-B Out and ADS-B In status.
- PILOTS:** Fields for pilot names and ratings.
- OPERATIONAL INFORMATION:** Fields for flight level, altitude, and other operational details.



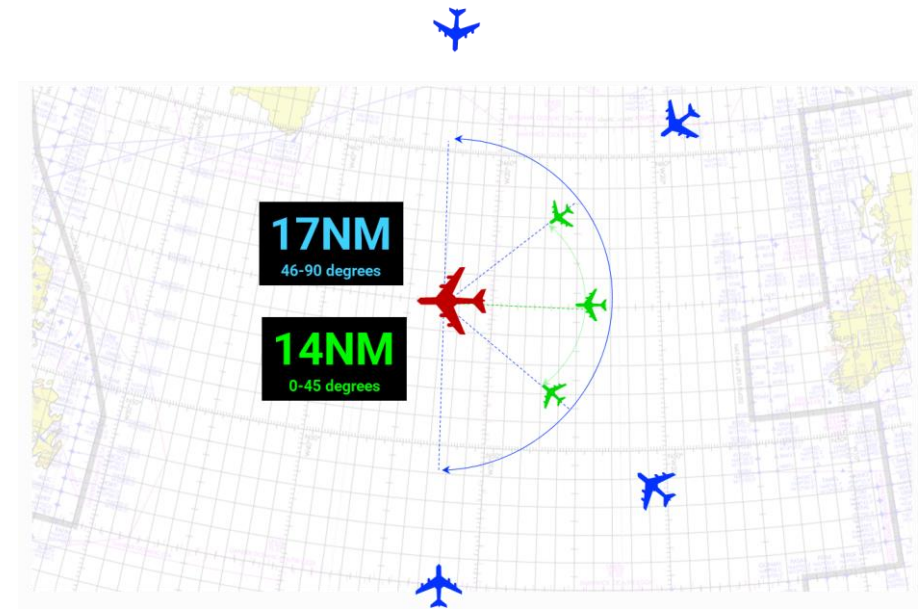
Developments

- Moving towards making all sensors using ADS-B
 - Mode S SSR, MLAT/WAM/LAM and ADS-B GS
- ADS-B version 3 considerations
 - Avionics MOPS ED-102B/DO-260C [chg. 1]
 - Ground System ED-129C: Basic 2022, ED-129D: full tbd
 - ASTERIX: CAT021 ed. 2.6, CAT053 (2022+)
 - Related Regulatory/Approval updates - initial drafting



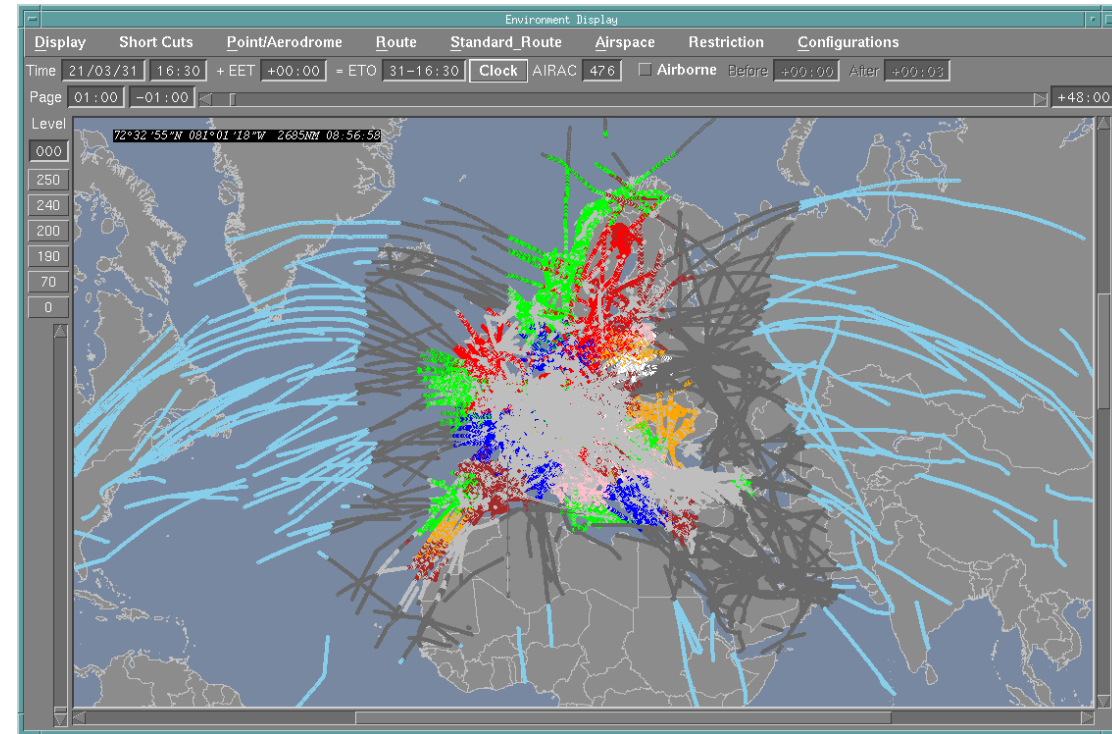
Space-Based ADS-B - ATS

- NAT region - Separation minima using ATS surveillance systems where VHF voice communications are not available [ASEPS]
 - Shanwick (& Gander)
 - Santa Maria (currently Gnd, SBA under evaluation)
- NAT region
 - Reykjavik
 - Bodo (FIS, Alerting <FL100, higher alt. tbd)
- Other specific use cases under evaluation



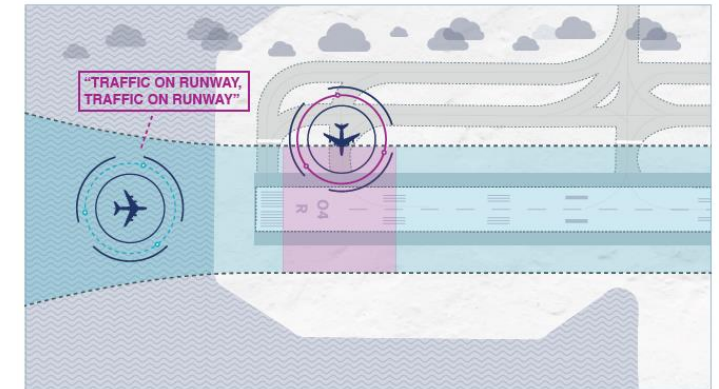
Space-Based ADS-B - ATFM

- Integration of Space-based ADS-B data into ETFMS - Spring 2021
 - ADS-B complements CPR data in NM area
 - ADS-B provides a major predictability improvement of 20% in time
 - A significant part from better estimates for flights inbound to Europe

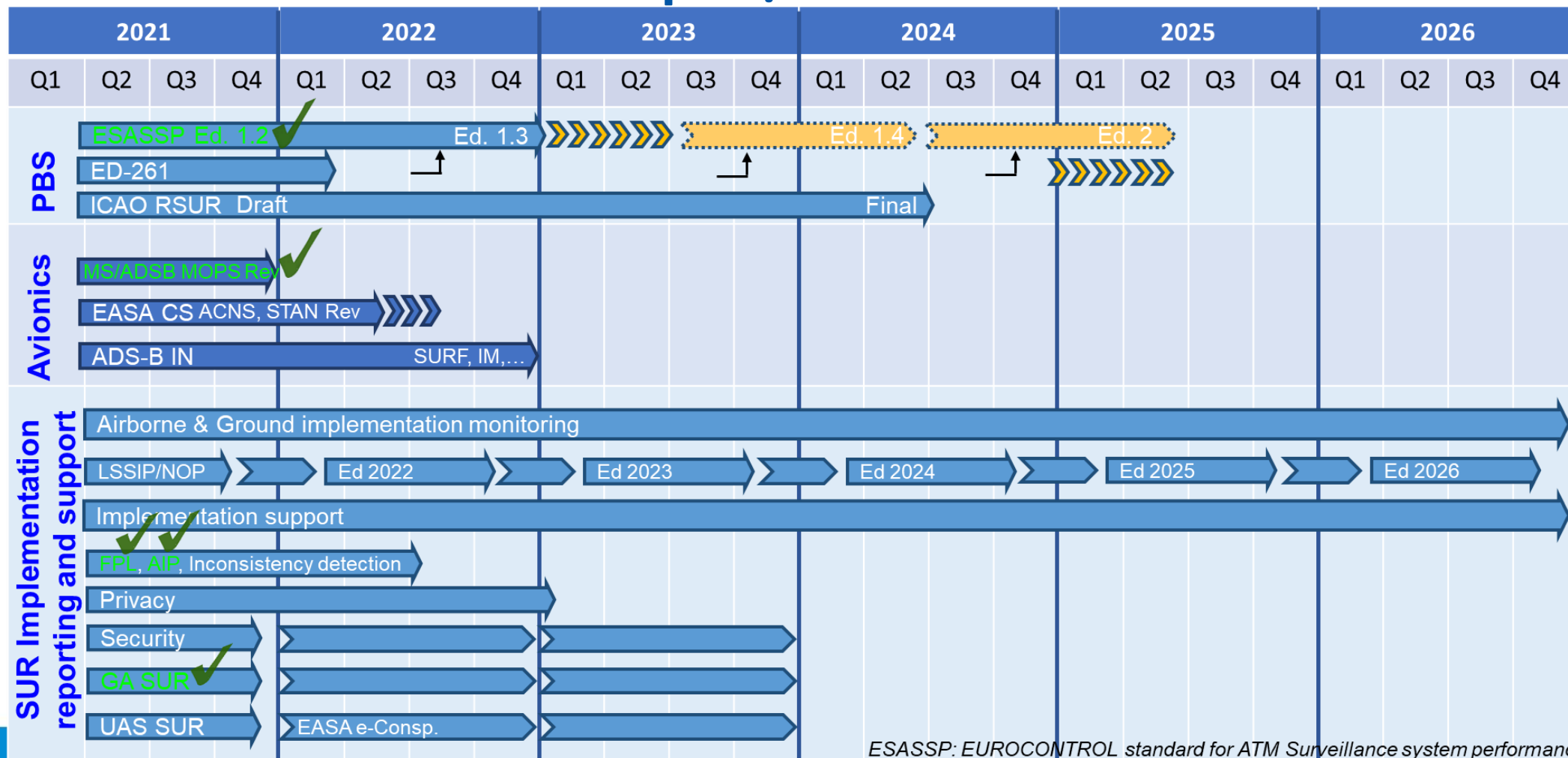


ADS-B IN

- ADS-B IN Airborne Awareness applications are Operational since 2012
- Other ADS-B IN applications under development
 - Airport Surface applications
 - Focus on Runway Alerting
 - Interval Management (IM), etc.

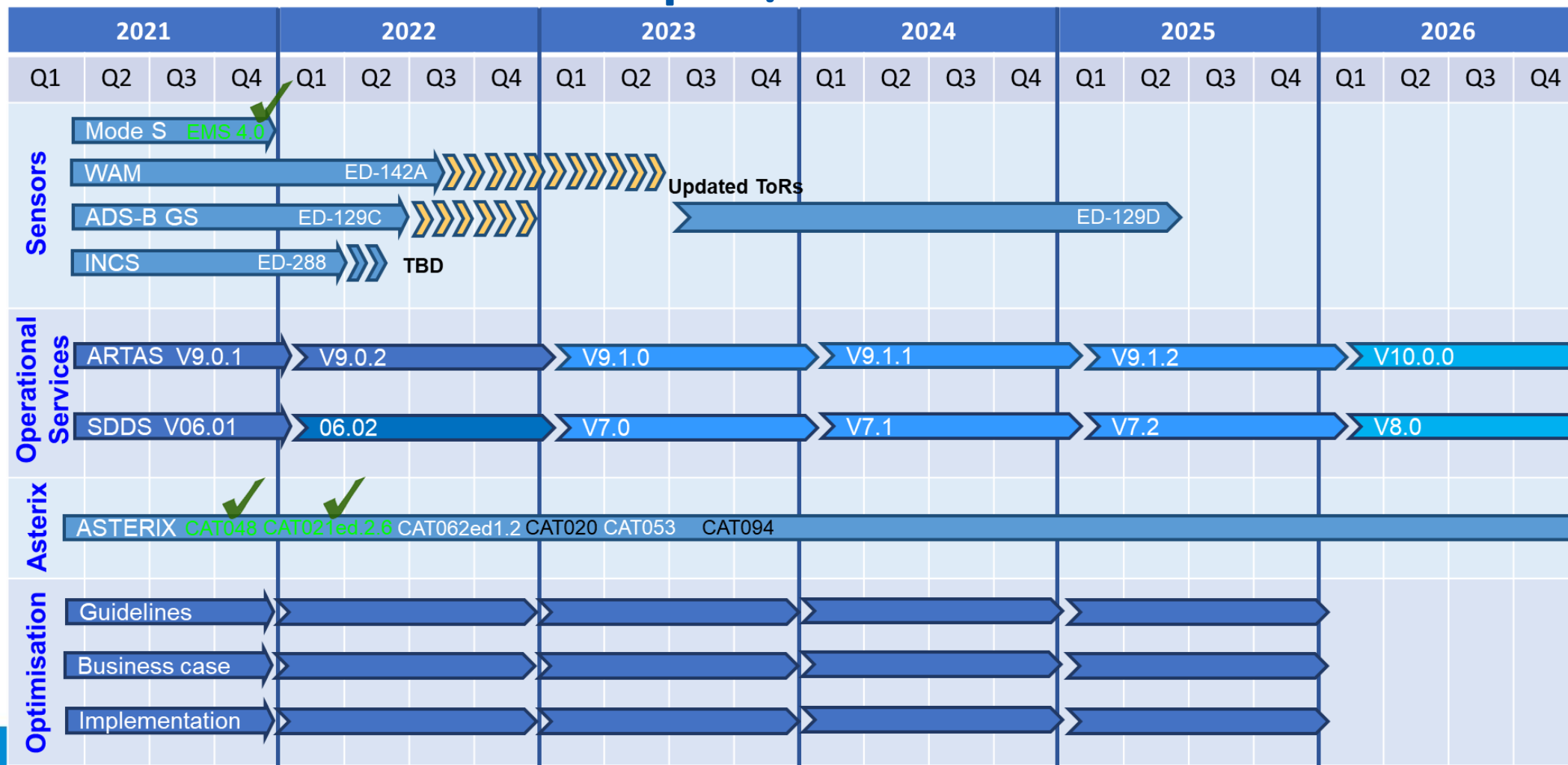


Surveillance Roadmap 1/3

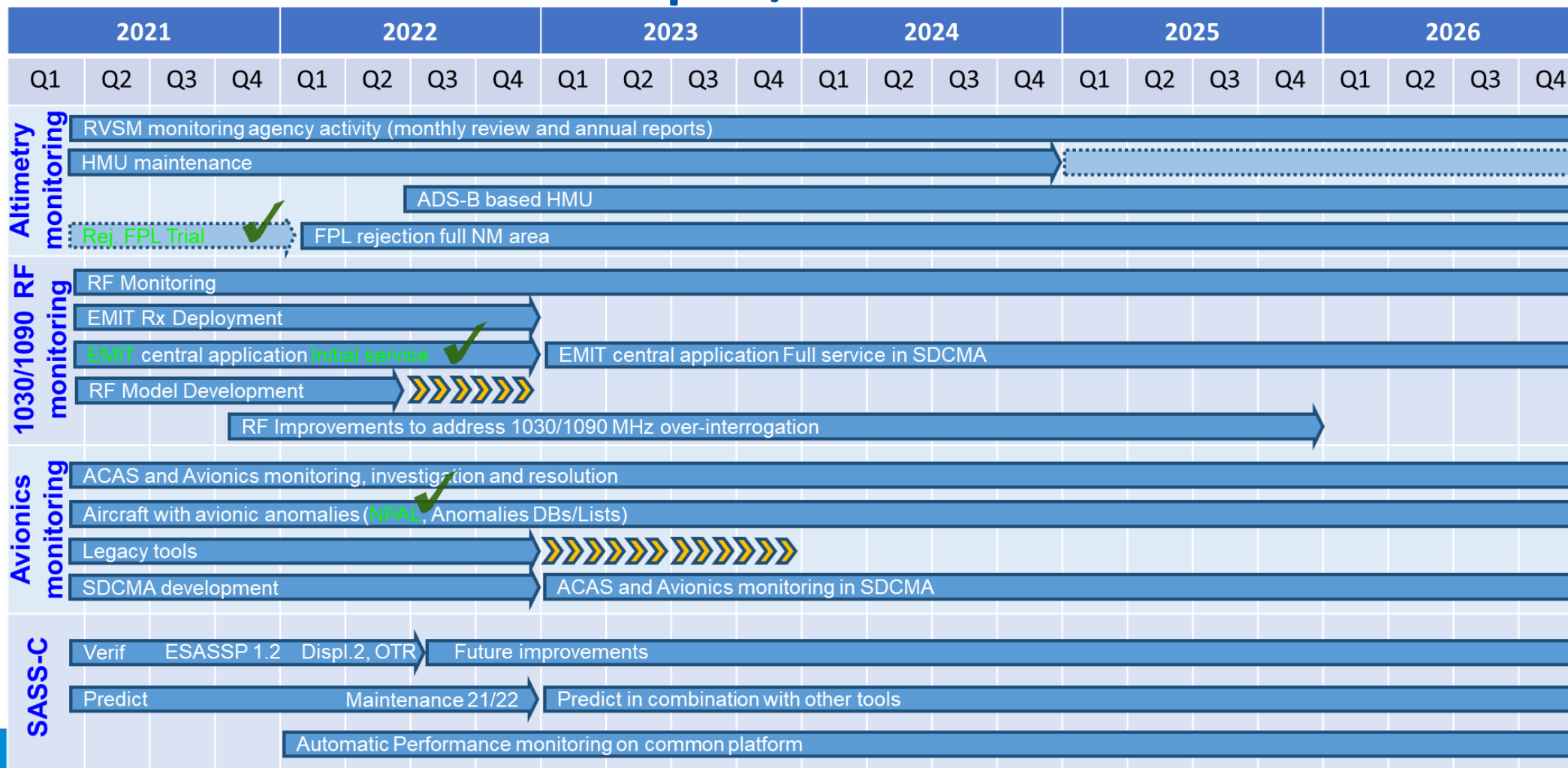


ESASSP: EUROCONTROL standard for ATM Surveillance system performance
 CS-ACNS, CS-STAN: EASA certification specifications

Surveillance Roadmap 2/3



Surveillance Roadmap 3/3



Collaborative progress

- European and International Stakeholders
- Global Interoperability
- Civ-Mil coordination



THANK YOU



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