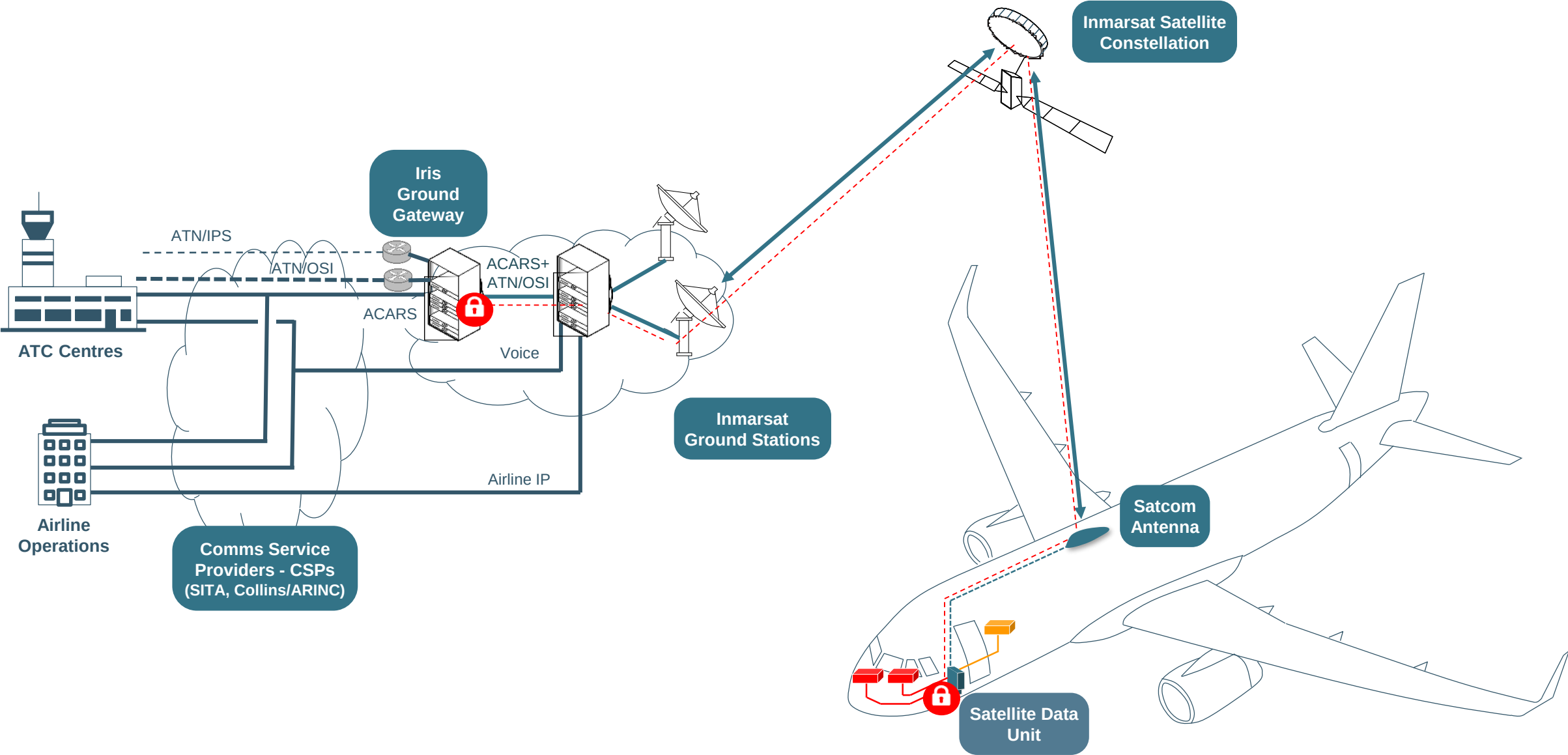


IRIS WEBINAR 3

BUILT TO FLY

inmarsat
AVIATION

IRIS infrastructure



BUILT TO FLY

IRIS Development steps & maturity

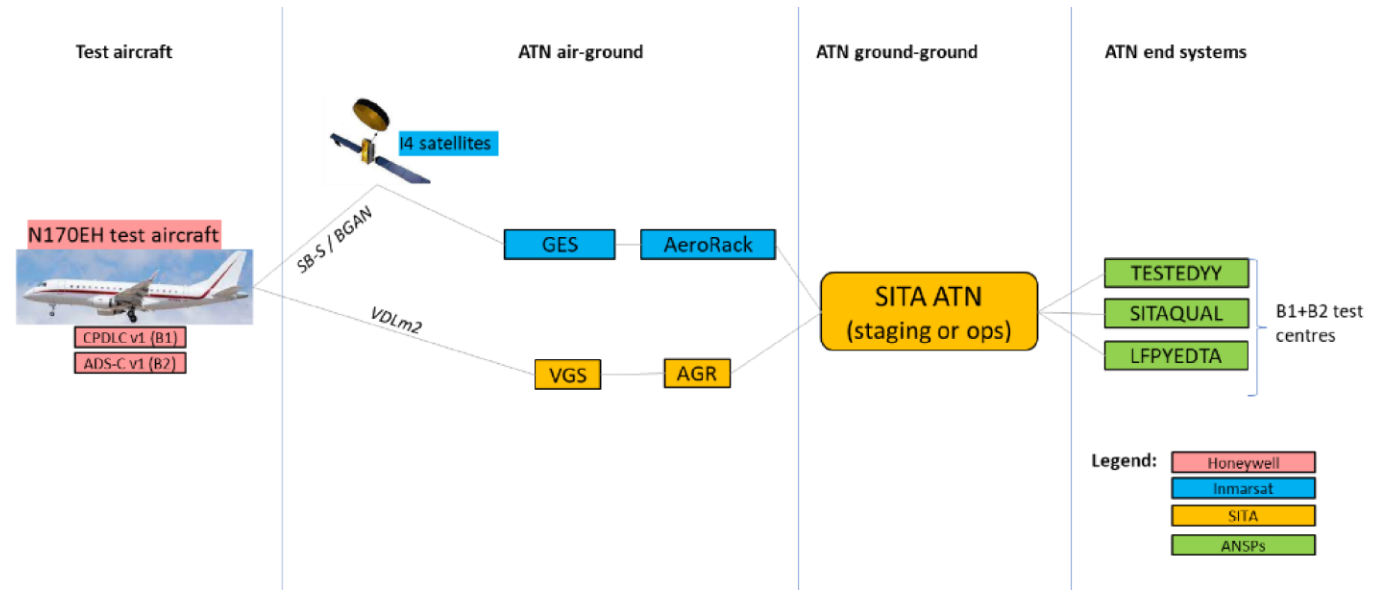
	Step 1: Security extension SB-S 2.0	Step 2: ATN/OSI layer	Step 3: ATN/IPS layer
Services provided	Implementation of Air Ground VPN Aircraft Cockpit Domain - ACARS FANS 1/A - ACARS AOC - Satvoice Airline Information Service Domain (AISD) - IP connection (AOC/EFB)	SB-S 2.0, plus the following ATN-B1 (CPDLC), ECAC ATS-B2 (CPDLC + ADS-C), ECAC Multilink	SB-S 2.0, plus the following ATN B2 ATN B3 in future
Deployment status	Fully implemented and validated In operation since Nov 21	Infrastructure fully implemented and flight tested Ground AOA (IRIS Service Provider) expected Q1 23 Terminal certification expected Q4 22 Start of commercial flights Q1 23	Early prototype flight tested with Boeing ECO D in 21 More mature prototype will support SESAR validation exercise Q3 22 Further prototype development are expected in 22-23

ATN/OSI System validation: 4 Levels of validation

- **Aircraft avionic** (terminal & CMU) : Certification; Inmarsat type Approval ; SITA/Collins approval
 - Lab testing + flight test
 - **INM ground Infrastructure** : Iris Service Provider (ISP) AoA
 - Lab testing using real hardware (IRIS test facility)
 - **End to end validation**: validation of interface with ground ATN network and ANSPs
 - Lab testing – flight test
 - **IRIS demonstration**: long term performance monitoring
- ➔ All system functionalities are verified (including multilink with VDL); Formal testing to support certification to finish by end of May

Honeywell ATN/OSI development status

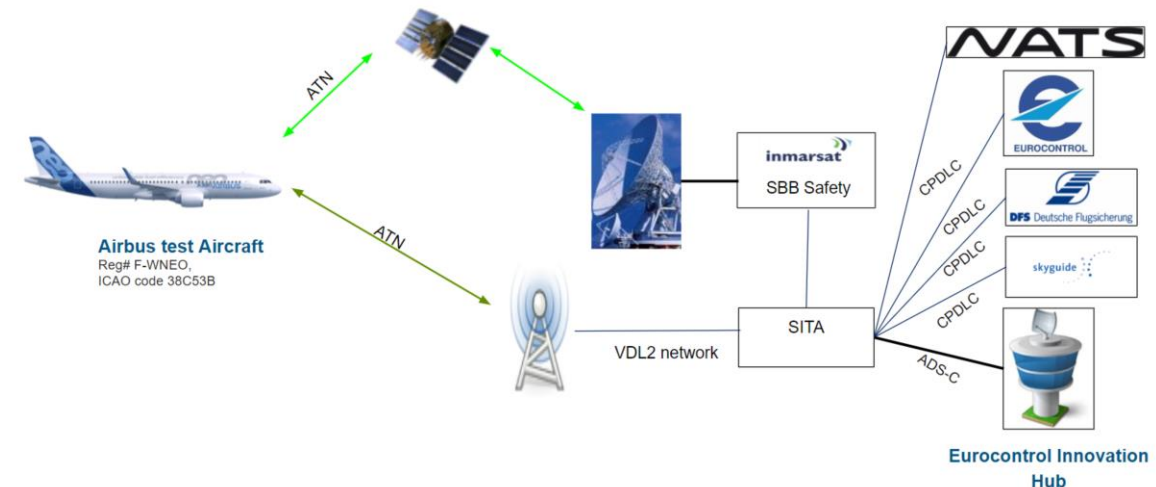
- 2 flight test campaign from the US; 1 in Europe
 - ≈ 40 flight hours
 - All the intended functionality was successfully tested in flight, including Multilink with Vdlm2



- Next steps
 - ATN/OSI feature certification to be added to Aspire 400 in 2022
 - CMU: ATN/OSI over SB-S capability to be available on CMU Mk2+ by the end of 2023

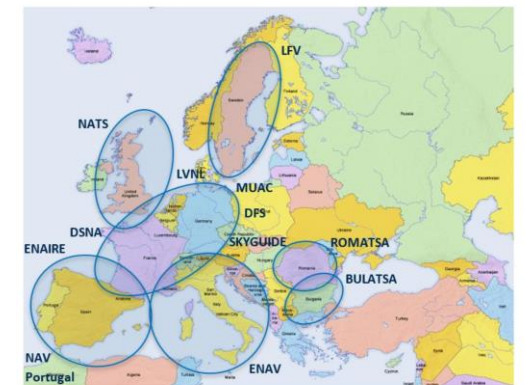
Airbus ATN/OSI development status

- Airbus currently performing test campaign of final avionic version, candidate for certification
 - FANS C over Satcom avionic certification expected Q4 22.
- Airbus will perform **first** flight using operational ATN B1 and B2 CPDLC & ADS-C/EPP exchanges via SATCOM Media on 30th March 22
- With support from NATS, MUAC, DFS, Skyguide, SITA and Inmarsat



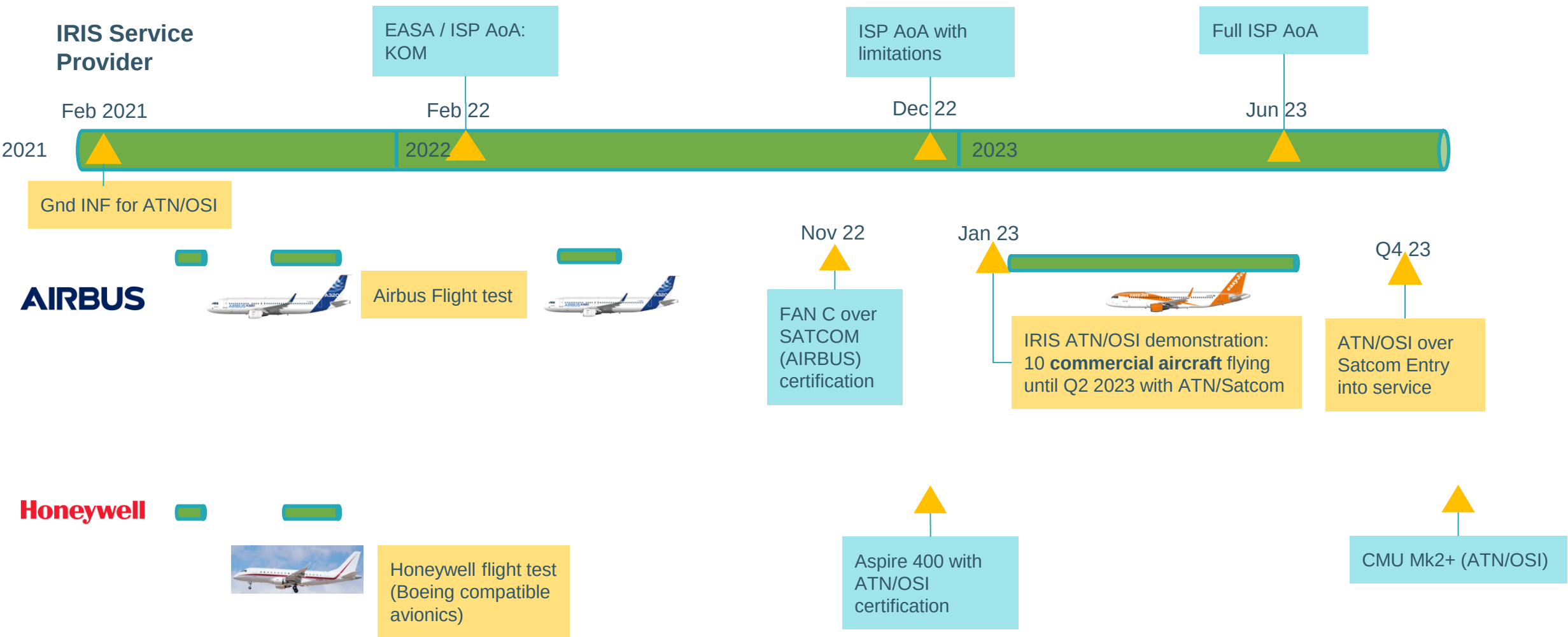
IRIS Demonstration flights with commercial aircraft

- Objective
 - **Demonstrate performance and benefits of the service over 6 months on commercial aircraft**
- Airlines
 - Contract recently signed with Easyjet to perform a large scale demonstration of the service
 - 10 Easyjet aircraft will be equipped between Nov 22 and Nov 23
 - Advance discussion on going with other airlines
- ANSP
 - To date 13 ANSP involved in IRIS and 8 ANSPs have confirmed participation to demonstration: BULATSA, DFS Germany; DSNF France; ENAIRE Spain; Eurocontrol MUAC; NATS UK; ROMATSA; SKYGUIDE.
 - Discussions on going to extend the ANSP participation



: European map showing approximate areas of responsibility for ANSPs participating within Iris IOC programme

ATN/OSI roadmap towards service delivery



BUILT TO FLY

ATN/ IPS developments

- Boeing ecoDemonstrator 2021
 - Early Satcom prototype provided by Cobham/INM: Flight tested July 21
- SESAR Slt 77/107 validation exercise
 - More mature prototype is being developed in the frame of IRIS IOC (Honeywell, Frequentis, CGI, INM)
 - SESAR testing planned for August 22 (lab testing over satellite network)
 - Includes interoperability testing with ATN/OSI (through an OSI/IPS gateway)
- Further prototype development and flight test expected by end of 2023 (TBC)
 - Funded by IRIS global (ESA)
 - Aim is to develop further our prototype in 22/23 and organise flight test (Honeywell or Boeing) using SESAR FCI (potentially extended to ANSP test end system)



BUSINESS PERSPECTIVE

Benefits of Iris deployment

- **Ready for deployment – anticipate VDL2 degradation**
 - Early deployment by 2023 can be managed using the natural fleet renewal process
 - Pan-European service from the beginning is possible
 - Value-added services for airlines operations- IP connected EFB
 - Enabling ATM modernisation (i4D/Full 4D, automation) with benefits to airspace users ($\approx 10\%$ fuel/CO2 savings)
- **Mitigating operational risks to airlines/ANSPs:**
 - Satcom has been used successfully for more than 20 years in the oceanic regions
 - No ground deployment: low risk from the technical/operational perspective
 - Global standard / solution
 - Certification started – Initial multilink concept will be demonstrated
- **Global service:**
 - Opportunity and plans to enlarge the service coverage area to adjacent / new regions



CBA summary (1/2): Benefits of Iris

Mitigating VDL2 shortcomings (2023-2038)	Enable CP1 benefits (2028-2038)	Enable Master Plan beyond CP1 (2023-2038)
- Complementing VDL2 to avoid decline of DLS performance in the mid-term - Link2000+ conclusion: datalink has a positive impact on airspace capacity $\approx +10\%$. ANSPs (reduced workload, increased capacity) and airlines savings (delays reduction) - Improved AOC services with IP pipe over Iris Benefits: = total DLS benefits/year * % of aircraft equipped with Iris	- CP1 benefits beyond 2028 depend on key CNS enablers - Iris: an essential Communication enabler to some AF#s, EPP download in particular - A share of the CP1 estimated benefits cannot materialise without a resilient datalink infrastructure Benefits: between 5% to 10% of total CP1 benefits over the period	- NM simulations: SESAR solutions beyond CP1 save up to 4.5' delay per flight in 2035 (then constant). - Unlocking ATM Master Plan benefits relies on increased machine to machine dialogue - Need for multilink datacom infrastructure, Iris is part of it Benefits: 30% of total ATM Master Plan benefits allocated to DLS, of which 50% to Iris
4000 aircraft equipped with Iris by 2038 (forward fit only) Cumulated investment for airlines $\approx$ €155M (disc.) Cumulated Opex for ANSP (Pan-European): 135M€ (disc.)		$\approx$ 10000 aircraft by 2038 (90% of fleet, retrofit & linefit) Cumulated investment for airlines $\approx$ €550M (disc.) Cumulated Opex for ANSP (Pan-European): 135M€ (disc.)

Conclusions and opportunities:

1. Iris benefits largely outpace deployment cost:

- Benefits **today's DLS services** (ATN B1), allows to mitigate the risks associated to the current technology
- $\approx 115\text{M€}/\text{y}$ of benefits in average for CPDLC benefits on airspace capacity and improved AOC services based on IP
- Benefits **the future DLS services**: CP1 (i4D exchanges in particular) and ATM Mater plan need a fully digital cockpit and ATM system. Out of the estimated €34Bn of benefits until 2040, around €3Bn would be at risks without the Future Communication Infrastructure

2. The technology is mature and ready for deployment

- A cost efficient deployment scenario can be implemented by targeting new deliveries
- Fleet renewal is a true opportunity to manage deployment cost
- Early decision on **a coordinated air & ground** deployment: limit the risk to delay the benefits as well as need for retrofit
- Pan-European coverage and deployment allow cost sharing between a large number of ANSPs to the benefits of all
- Incentives for early users could mitigate the risk

3. Global solution