SESAR Showcase

A Conference & Exhibition of SESAR 1 Results

Amsterdam, 14-16 June 2016

SESAR JOINT UNDERTAKING

EU 2016

Electronic visibility via ADS-B for small aircraft

John Korna, NATS

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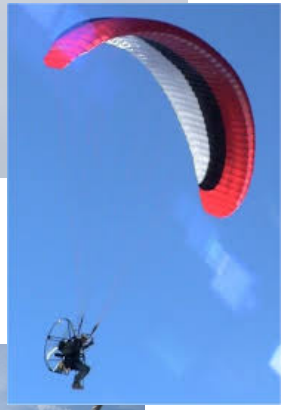
The SESAR General Aviation challenge

SESAR is predominantly aimed at scheduled commercial air traffic and €100M+ airframes

How is SESAR relevant for pilots and operators of smaller aircraft?

What about the private pilot?

General Aviation



Project EVA: objectives

Enhancement of flight safety through improved mutual visibility of General Aviation Traffic, and Air Traffic Services, demonstrating or putting in place:

- Improved Air-Air situational awareness via traffic prompts
- Interoperability of 1090MHz ADS-B devices A/A and A/G
- Seeking & supporting development of appropriate enabling regulatory instruments

Project EVA: structure

Regulatory engagement and development

50 flights in UK and German Class-G airspace:

- ADS-B devices
  - Singly, Pairs of same device type, ADS-B target of opportunity
- Multi-device
  - Mix of 1090MHz device encounters + opportunity ADS-B
  - 1090MHz and proprietary devices + opportunity ADS-B

Ground detection and operational use of low integrity ADS-B

Communication & Education, Education, Education

With valued additional assistance from:

Electronic Visibility

Electronically transmit own ship position and receive positions of other traffic so as to:

- Alert the pilot to nearby aircraft when operating under Visual Flight Rules and so;
- Improve the distance and probability that other aircraft are visually acquired, enabling;
- Timely assessment and if necessary, execution of avoidance manoeuvre(s), in accordance with the Rules of the Air.

Works best when everyone participates and are interoperable!

What is ADS-B?

Automatic – Requires no pilot or external activity to produce data reports

Dependent – Depends on accurate inputs from the aircraft's navigation system(s)

Surveillance – Provides aircraft ID, position, altitude, velocity, and other data to other users

Broadcast – Information is continually broadcast, and receivable by equipped ground stations and aircraft within range

See and Avoid

Pilots visually acquire and avoid other traffic by:

- Looking out of the window,
- Monitoring radio traffic information services where available, or
- Luck

This is the aircraft you are looking for!


MAP
LIGHT

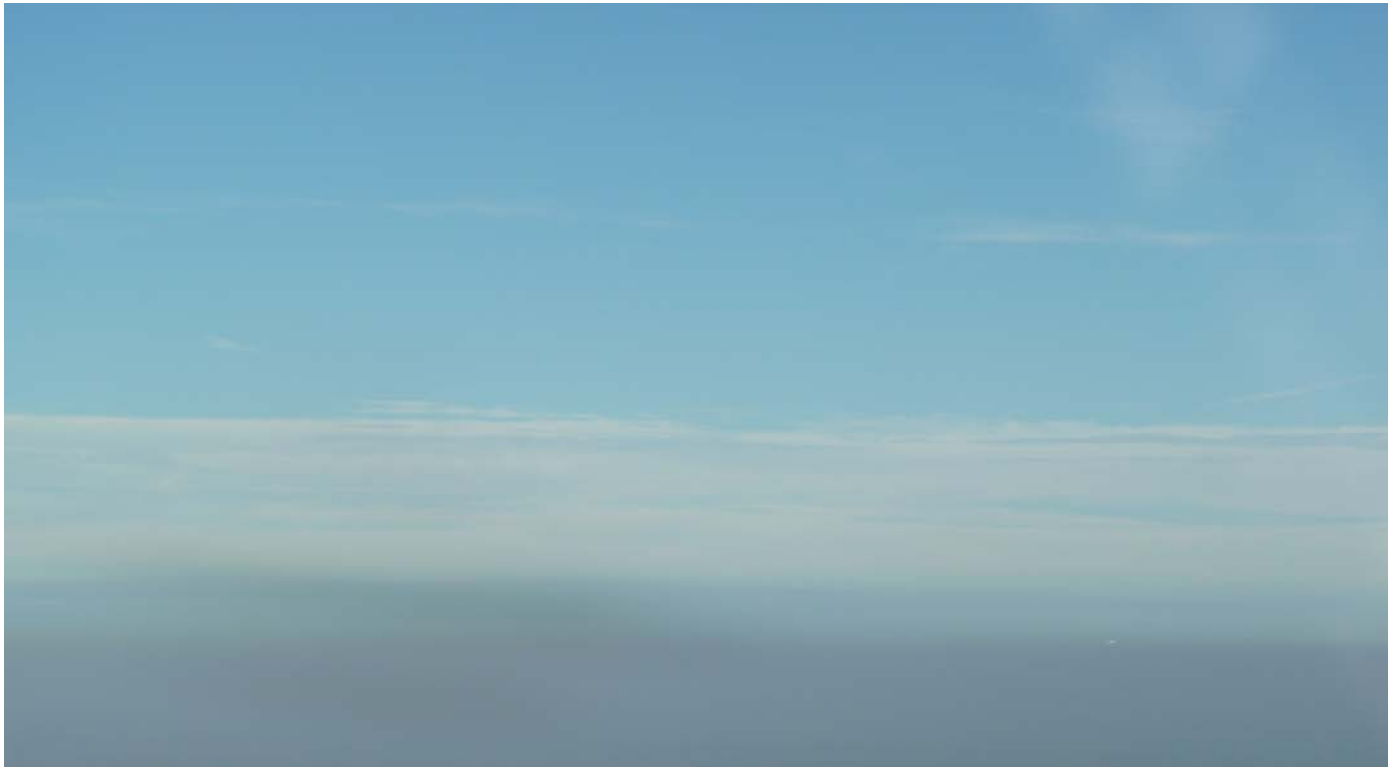
So…

Did you spot anything?

In your estimate, how far away was it?


MAP
LIGHT

Look out the window they say…



See, BE SEEN and Avoid

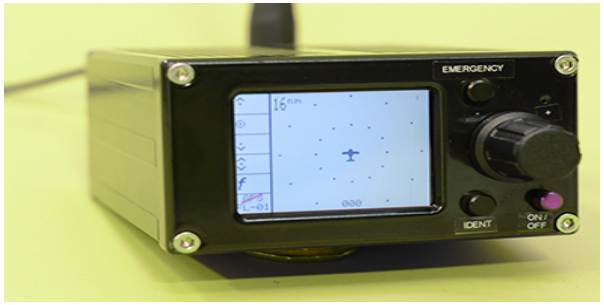
Pilots visually acquire other traffic by:

- Receipt of an electronically sourced prompt as to location and relative direction of other aircraft,
- Monitoring radio traffic information services,
- Look out of the window
- Look out of the window as prompted by a device,
- Luck

Demonstration ADS-B products

LPAT

- Low-Power ADS-B Transceiver
- No interrogation functionality
- ADS-B In and Out
- Portable equipment
- NATS specified, FUNKE built



TABS (& TSAA)

- TABS specification developed by FAA
- TABS directly interoperable with TCAS
- TSAA spec for ADS-B IN led by FAA with European involvement
- Installed equipment
- Developed by Trig avionics

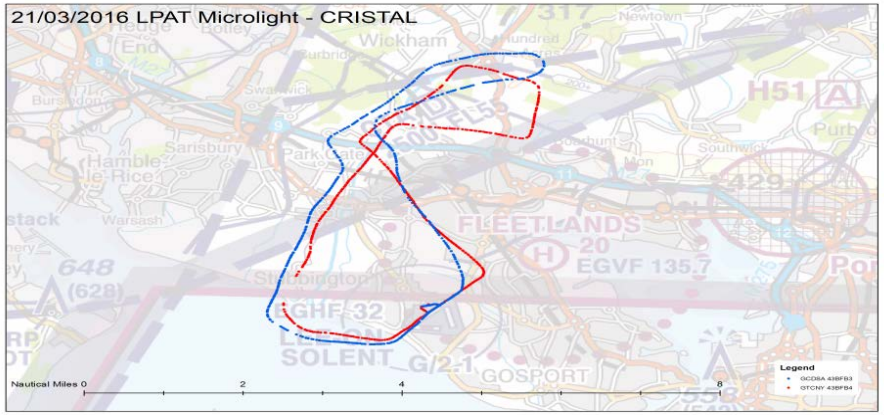
Existing Mode-S transponders coupled to non-certified GPS sources

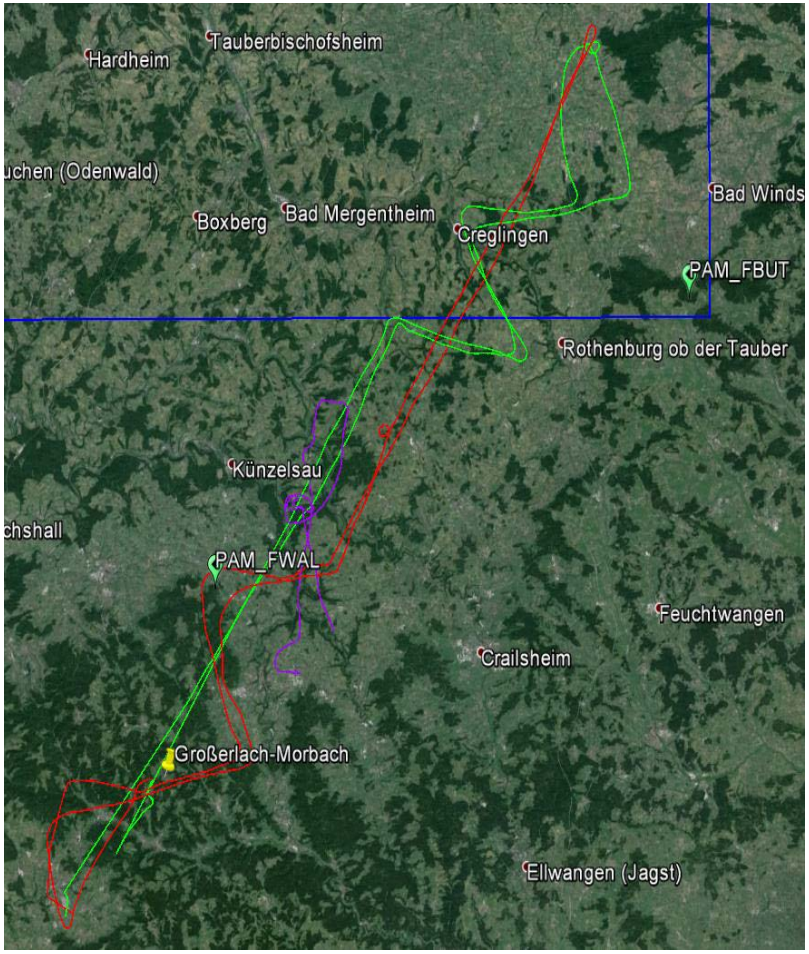
Proprietary Devices: FLARM™ family & PilotAware


G-TCNY

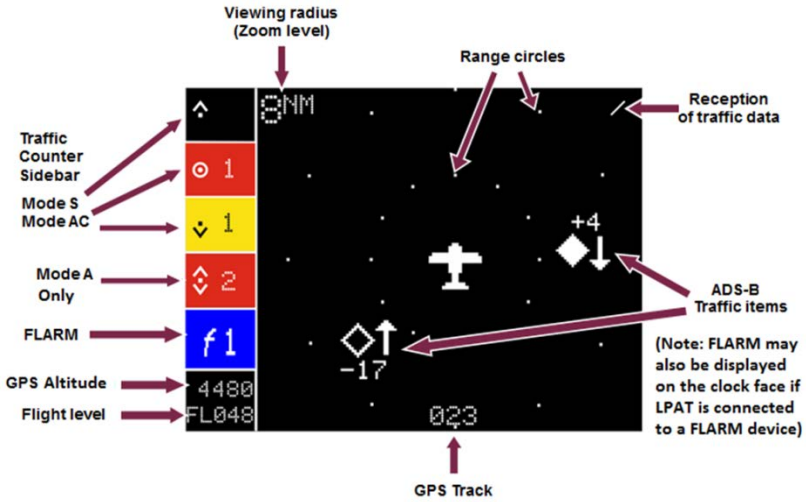

NO HOLD

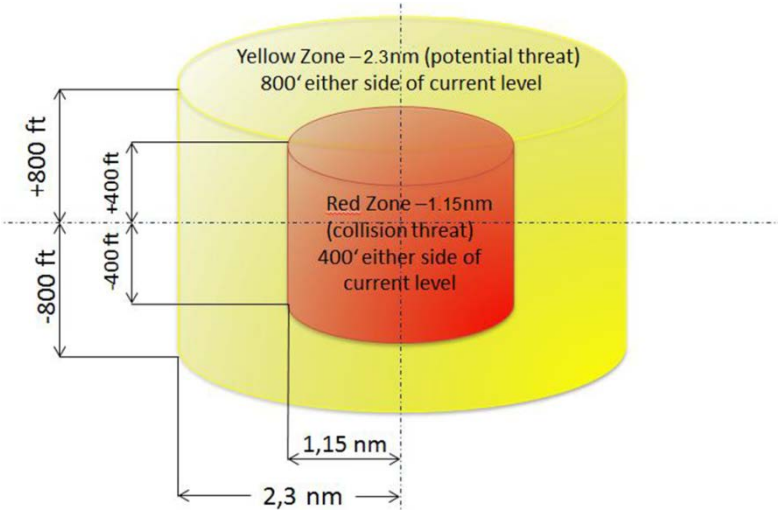
Example Flight Profiles






EMERGENCY
4nm
-12
2887
FL027
167
IDENT
ON / OFF

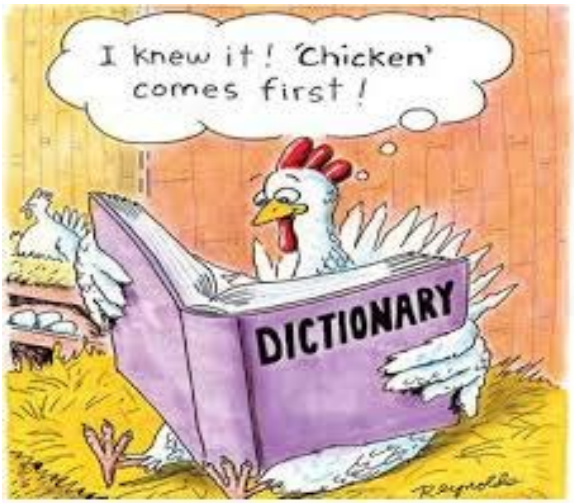

Viewing radius (Zoom level)
Range circles
Reception of traffic data
Traffic Counter Sidebar
Mode S Mode AC
Mode A Only
FLARM
GPS Altitude
Flight level
8NM
+4
-17
4480
FL048
023
ADS-B Traffic items
(Note: FLARM may also be displayed on the clock face if LPAT is connected to a FLARM device)
GPS Track


Yellow Zone – 2.3nm (potential threat)
800' either side of current level
Red Zone – 1.15nm
(collision threat)
400' either side of current level
+800 ft
+400 ft
-400 ft
-800 ft
1,15 nm
2,3 nm

OTW view of an LPAT Encounter

THREE
O'CLOCK

Outcomes



Improved Situational Awareness

Technologies work
- Air to Air
- Air to Ground
- Together

UK approval standard imminent for portable units, CAP-1391

Pilot display needs differ

Risk: Pilot look-out becomes dependent on technology prompt

Who equips first?
- Aircraft – You? Me?
- Ground/Aerodromes

What's in it for me:
- Reduced MAC risk
- Ground app's, may be a barrier to infringement sanctions by regulator

What next?

NATS plans to exploit outcomes through localised programme of deployment, exploitation and further work

- Expand Pilot cohort experience of ADS-B benefits
- Demonstration of Class G ATS barriers and benefits
- ANSP applications for low integrity ADS-B in TMA

Continued stakeholder engagement to facilitate the wider adoption and exploitation of VFR ADS-B products

RPAS (re-)use case for ADS-B suitable products in support of airspace integration studies

Summary

Large scale demonstration of appropriate, lower cost capabilities for VFR General Aviation to enhance safety

Enhance aviation safety inside and outside controlled airspace for all stakeholders

See, BE SEEN, And Avoid

Thank you for your attention

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4D Trajectory Exchange using SatCom Iris Precursor

Patrick LELIEVRE

Head of ATM Development at Airbus

SESAR Showcase
Amsterdam, 14-16 June 2016

4D Trajectory Based Operations

ATM transformation

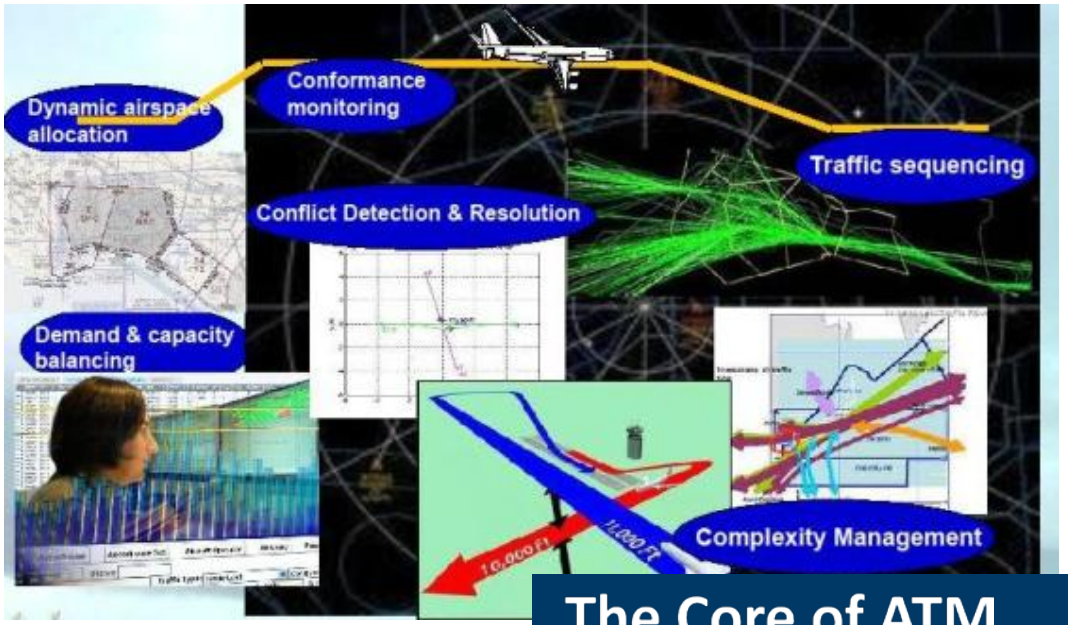
Today, ATC is based on the knowledge of where the aircraft is and is planned to go. **Tomorrow**, ATC will be improved with the accurate knowledge of where the aircraft will be

Game changer for ATM

From A/C Models to **real A/C 4D trajectory** … For increased **predictability** in ATC / ATM tools

Airborne 4D predictions

The FMS provides **trajectory predictions, enhanced with altitude and time estimates** that the aircraft will fly



The Core of ATM Transformation

European communication context

Short-term 2020 | Mid-term 2025-2030 | Long-term 2030+

- IOC → FOC: CPDLC for routine communication (ATN B1)
- IOC → FOC: CPDLC & ADS-C for Initial 4D (ATN B2 / OSI)
- IOC: Full 4D (ATN B3 / IP)

in operation: ATN/OSI over VDL2 (as per ICAO GANP)

VDL2 performance issues

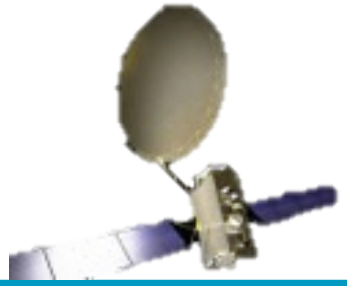
Under analysis
ELSA project

VDL2 capacity issue

Exhaustion suspected from 2025
➔ **consider additional means as a complement to VDL2**

Develop additional data communications means over ATN/OSI

European communication context

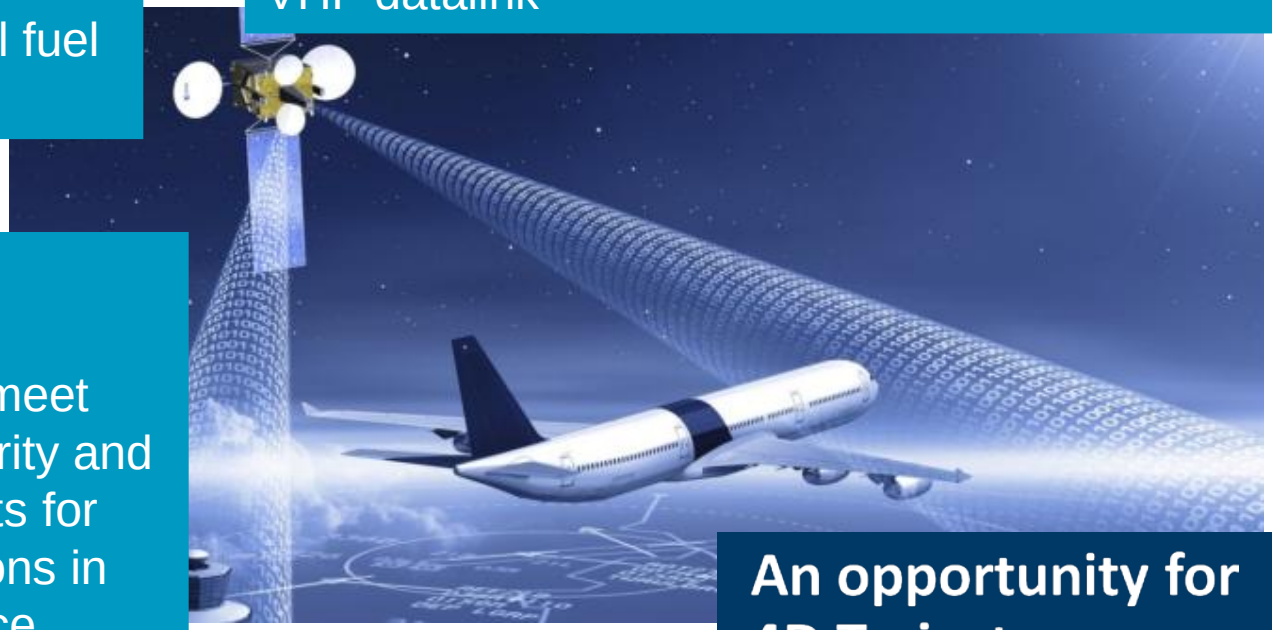


Satellite Communications

Has revolutionised ATM in oceanic / remote airspace leading to improved aircraft routing and substantial fuel savings.

Additional bandwidth

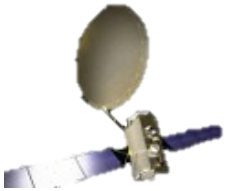
Iris Precursor can provide additional bandwidth for continental operations currently operating VHF datalink



Iris precursor

Will enable SATCOM to meet the stringent safety, security and performance requirements for safety critical ATM functions in dense continental airspace

An opportunity for 4D Trajectory Management



The SESAR way forward

SESAR 15.02.05

–

Demonstrate integration and use of ATN/OSI-based Air Traffic Services over Satcom using Swift Broadband network and associated performances into an operational Datalink ATM

i4D demo in Lab environment at Airbus and MUAC

ATN/OSI over SBB performance assessment (Flight Trial)

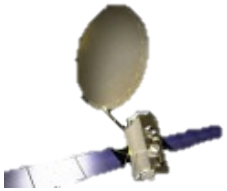
Working together

SESAR 15.02.05

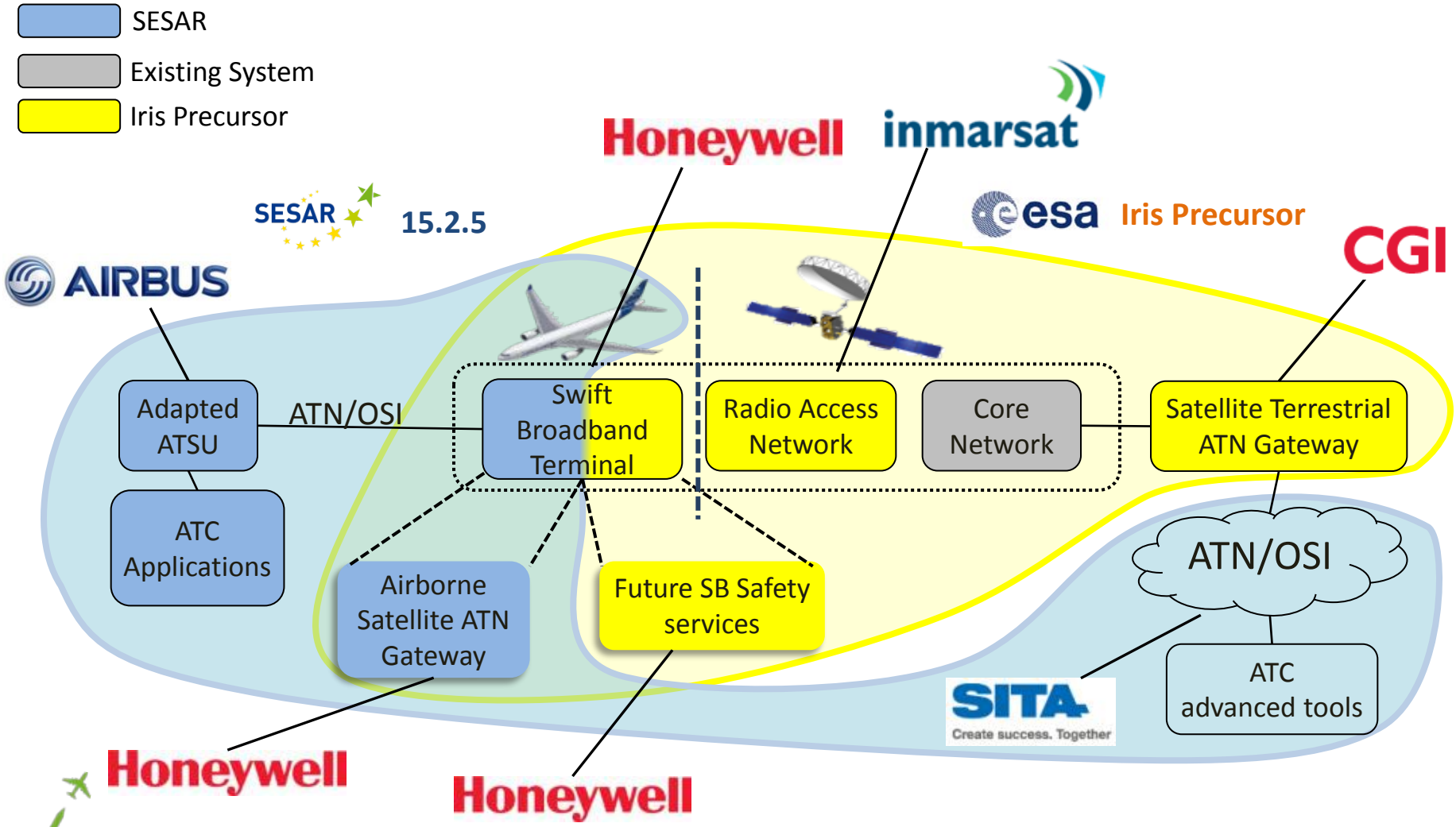
AIRBUS
EUROCONTROL
LEONARDO
indra
ENAV
FREQUENTIS
NATS
Honeywell
THALES
ENAIRE

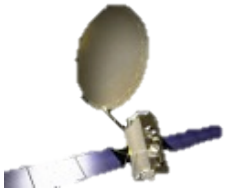
ESA Iris Precursor

inmarsat
COBHAM
AIRBUS
AIRTEL ATN
SITA
Create success. Together
AVINOR
SINTEF
NLR
exodigital
CGI
SED
a division of CALIAN Ltd.
Honeywell
NATS
HELIOS



Working together





Demo in lab environment

Airbus Integration test bench

Real ATN network over SATCOM, *CPDLC & ADS-C*

Air Traffic Controller & AMAN

ANSP

A320 initial 4D FMS bench

Initial 4D Datalink Computer

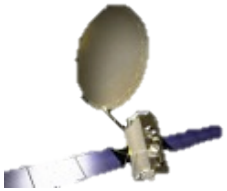
Integration testing

ARINC 741 SATCOM A330 bench

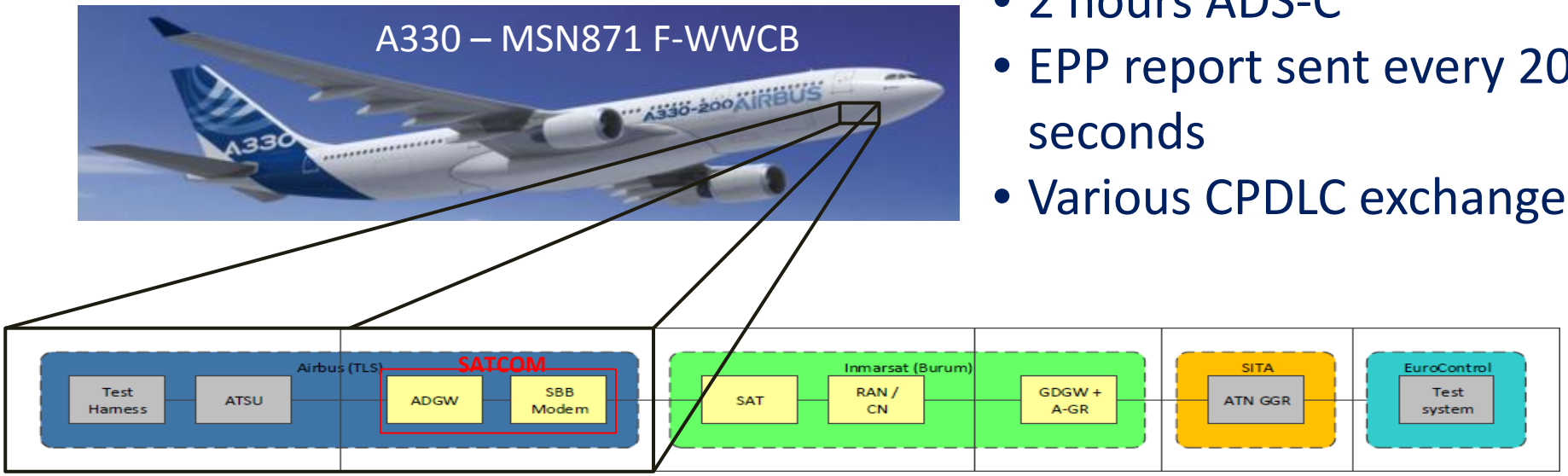
- Exchange of aircraft data in a real environment
- Operational tests with real i4D exchanges
- Communication with ATC center

ATN/OSI over SBB performance assessment

FLIGHT TRIAL

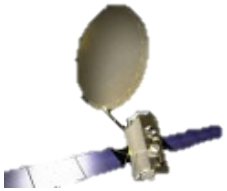


Flight tests outcomes



- 2 hours ADS-C
- EPP report sent every 20 seconds
- Various CPDLC exchanges

- Spot beam handover transparent
- Continuous Service
- 5-7 seconds for ADS-C downlink
- Less than 2 seconds for CPDLC downlink



Main project achievements

Maturity

-

V3 / TRL6
single aircraft

CPDLC performance

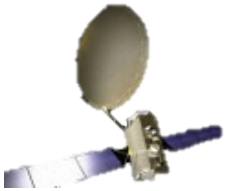
-

Less than 2 seconds
Compliant with standards
Comparable to VHF Mode 2

ADS-C performance

-

5-7 seconds
largely below standards



What does it mean for the ATM community

MUAC

–

Took us by surprise
Real future for SATCOM
The sooner the better!

Inmarsat

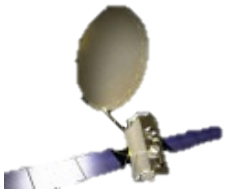
–

Joining forces to improve
European ATM efficiency

NATS

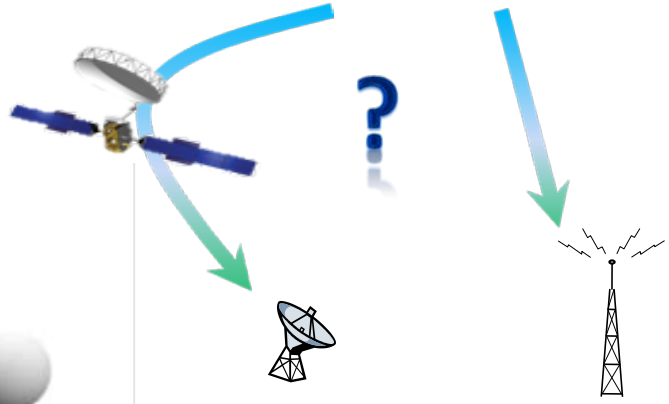
–

Viable complementary Datalink
Multilink capability key in the next 15-20 years
ATC future systems to rely heavily on this
Currently being designed into future platforms



Towards Iris deployment

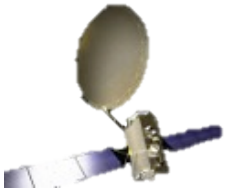
Business and Service Delivery Models Deployment Scenarios



Multilink operation in European Airspace context

Very Large Demonstrations

Funding to deploy SATCOM services



Conclusion

ATM Transformation

-

Trajectory sharing is the core of ATM transformation

Collaboration

-

ESA and **SESAR** collaboration has become a must

Thank You !

SATCOM for ATM

–

Safety Critical ATM functions

Additional bandwidth

Towards the future

-

Potential to be operational quickly

Thank you
for your attention

More information:

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