Space for safe skies

ESA Iris Program

Satellite Communications for Air Traffic Management (ATM)
Satellite Communications
for the innovation of the
European Air Traffic Management System

A great opportunity for the
European Space industry
to contribute to the future of aviation safety with EC, SESAR, EASA
Safer, cleaner and cheaper flights

Iris supports the European Commission initiative

Single European Sky (SES)

- **Airlines benefits**: optimized airplane trajectories with lower fuel costs
  
  European ATM System will control 15 million flights by 2035 (+50% than in 2012), improving safety by a factor of 10

- **Passengers benefits**: reduction in flight times and less delays
  
  19.4 million minutes delay in 2010. On average, flights was 49km longer than direct flight

- **Environmental benefits**: lower CO2 emission (10%)

- **EU economy and society benefits**: increase European capacity, lower ATM costs (50%)
**Iris in cooperation with SESAR**

**A new EC Aviation Strategy**

- The milestone to generate growth for European business
- The tool for safer, cleaner and cheaper flights while generating benefits for users, airlines, environment, EU economy and society

**Iris part of the European ATM Master Plan (SESAR-JU)**

- Recognized as the future satellite communications datalink
- Included in the Communications Roadmap for deployment

**Iris as new generation of satellite based datalink communication**

- Iris is one of the 63 SESAR Solutions to modernise Europe’s ATM system delivered through SESAR 1 programme (just concluded)
- A basis for deployment activities and further research in SESAR 2020

2. [https://www.atmmasterplan.eu/](https://www.atmmasterplan.eu/)

(*) SESAR - Single European Sky ATM Research; SESAR JU (Joint Undertaking) is the European partnership managing the Single European Sky ATM Research (SESAR) Program for the new generation ATM system
What is Iris?

- **Satellite-based communication system** for ATM, part of the future satellite communications datalink infrastructure

- **Technology** to provide safe and cyber-secure air-to-ground services

- Support **operational and business** applications
Iris long-term vision

- Iris is a viable solution portable at global level, oceanic and continental areas
- Iris will address all aviation market segments (e.g. RPAS and rotorcrafts)
- Originally conceived in 2008, Iris Programme is developed in steps:
Major challenges in Iris

- **Implementation** of a fully representative end-to-end Iris system

- **Technology development** e.g. User Terminals and Ground network

- **Operational demonstrations** with airlines in coordination with SESAR

- **Certification** of the Service Provider
Iris is a reality

- **Iris Precursor**, lead by Inmarsat, upgrade of the SBB network
  - Technology capable to provide services fulfill ATN-B2
  - Complementary to legacy systems (e.g. VDLM2 for continental)
  - Cyber-secure technology for ATN/OSI in support to i-4D services

- **Flight demonstrations** have been already performed in collaboration with SESAR JU on Airbus aircrafts.

(*) initial 4-D - four dimensional trajectory (latitude, longitude, altitude, and time)
Conclusions

- ESA’s Iris Programme is the framework for the development of the satellite-based solutions for Air Traffic Management
- SATCOM as immediate viable solution and component to work in multi-link in the long-term
- Need to work together towards a timely and performance-driven deployment

https://artes.esa.int/iris
Iris contact points

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Documentation available at http://artes.esa.int/artes-10
Back-Up
Iris precursor on SESAR flight trials

Iris Precursor successfully tested with Airbus test aircraft

End to end connection was successfully performed with Eurocontrol MUAC and Airbus

Message exchanges for 2 hours

2 spot-beams change during the flight (transparent to on-board systems)

Announced at the World ATM conference with large media coverage

- [http://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/Space_keeps_us_safe_as_air_travel_rises](http://www.esa.int/Our_Activities/Telecommunications_Integrated_Applications/Space_keeps_us_safe_as_air_travel_rises)
**Iris precursor on NLR flight trials**

**Flight trials** with a fully representative Iris terminal on a NLR test aircraft have been conducted in October 2016.

CDPLC and ADS-C applications were used over ATN-OSI protocol.

Objective was to assessing the Iris data-link performances:

- Continuity (availability) of end-to-end communication
- Latency

Coverage in high latitudes have also been successfully verified.

Iris next steps (2017-2020)

- **Iris with initial operational capability**, lead by Inmarsat, is the CURRENT phase based on Iris Precursor to:
  - Implement Iris on commercial flights within European airspace, supporting ATC and AOC services in line with ATN-B2
  - Timely complement VDL2, alleviating the traffic load on the terrestrial networks (especially AOC)
  - Launch a validation campaign, oceanic and continental, in collaboration with SJU
    - Certified user terminals integrated in the cockpit
    - 20 aircraft equipped from 2 suppliers
    - Iris service provision
  - Validate ATN/OSI “Multilink” alongside terrestrial VDL Mode 2
  - Test Initial version of ATN/IPS to be included in the Iris chain but not used in the operational demonstration
Iris with full operational capability
2020 onwards

- **Iris with full operational capability**, subject to the Ministerial Conference 2019, is the next phase to develop the full Iris system:
  - Implement a System capable to provide ATN-B3 compliant services
  - Fulfilling long-term performance and traffic requirements
  - Fulfilling the standard global requirements
  - Supporting the deployment of the 4D services
  - Supporting new commercial and operational services for improving the viability
Iris IOC implementation (2017-2020)

**Iris Pilot: the operational demonstration**, in coordination with SESAR

- Equipment of commercial aircraft for operational flight trials
- End-to-end demonstrations with safety and commercial services connected to ANSPs and Airlines

**Developments for Ground Segment and User Terminal**

- Software and Hardware development to achieve certifiable segments
- Initial implementation of future IP-based services

**Iris Test Facility**

- Interoperability testing between Iris air and ground segment components

**Service Provision set-up and Certification**

- Gathering of system and operational evidence in support of the application for EASA certification
Iris FOC design (2017-2020)

1. **System design** in preparation of future full system development:
   Technology and business roadmap definition
   Design supporting Aeronautical Information Services, System Wide Information, ATN/IPS services
   Extension to user other market segments according to SESAR requirements (e.g. RPAS, General Aviation, Military and Helicopters)

2. **Pre-developments**, design and implementation
   Pre-Development HW/SW of for all segments

3. **Support to international standardization**
   Production of relevant material for submission to ICAO, EUROCAE, and AEEC including MASPS, MOPS, ATN/IPS
Iris IOC Implementation

Deliver safety related data communications in support of short and medium term ATM in Europe and Oceanic regions; Continental ATM Initial Trajectory Based operation in line with SESAR’s 4D Oceanic that require beyond line of sight ATM long range communications

- Deployment of Iris on commercial flights within European airspace, supporting ATC and AOC communications;
- Up to 20 aircraft will be equipped from 2 suppliers, Honeywell and Airbus, and will fly using Iris services with the support of selected ANSP partners;
- Validation of ATN/OSI Multilink alongside terrestrial VDL Mode 2, hence provide a fundamental building block towards SESAR VLD programme;
- Initial ATN/IPS will be developed and validated in Iris IOC but is not yet expected to be certified for operational use;
- Design and implementation of the Iris Service Provider organisation, its operation, and preparation towards EASA certification.
Iris FOC Design

Deliver a system design of sufficient maturity such that the Iris IOC service can be upgraded in a follow on development phase

- Iris FOC will be designed to operate with ATN/IPS as one of SESAR’s future terrestrial technology choices under ATN/IPS Multi-link;
- Supports Iris with IOC enabled operations (backwards compatibility)
- Perform critical key technology pre-developments to de-risk the final implementation of Iris FOC;
- New commercial services (to be defined during project execution)
- Operations with Remotely Piloted Aircraft System (RPAS), Helicopters and military transport;
- Emerging new requirements such as polar communications;
- Same as for IOC implementation there will be Full coordination with SESAR 2020, SESAR DM and the EC;
- Contribute to the development of standards for all aspects of Iris cooperation with the relevant organisations (ICAO, EUROCAE, RTCA, AEEC etc.).
Iris IOC Project Timeline

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