CLEAR SKIES

SESAR Deployment Manager is bringing real benefits to the ATM sector as it aims to rebuild the invisible structure in the sky

Freek de Witte, head of stakeholder relations, SESAR Deployment Manager
Aviation is a highly regulated industry, based on high safety standards and global interoperability involving advanced airborne systems, onboard aircraft technology and complex ground solutions that together build up the global air traffic management system. Modernizing this environment is challenging, however a lot of work has already been done to bring the ATM system into the 21st century.

**Technology as enabler**

The creation of a Single European Sky (SES) to ensure sustainability of aviation and the capability to accommodate the forecast increase in European air traffic includes SESAR, one of the most ambitious infrastructure modernization projects launched by the European Union (EU). In line with the European ATM masterplan, SESAR is developing new aviation solutions that are now being deployed. SES is a European legislative package aimed at establishing a safer, more efficient, more cost-effective and more environmentally friendly ATM. The SESAR project is the technological pillar of the SES, and probably its most important.

Technology is essential in making the European sky less fragmented, more capable and better prepared to support the continental leadership of our aviation industry. To accommodate and effectively manage the expected traffic growth in the coming years, while maintaining its safety track record, Europe will continue to need state-of-the-art technologies and operational procedures. SESAR, the SES ATM research program, was designed to consolidate fragmented efforts and to steer R&D toward implementation.

The SESAR project has been managed through a very good example of a public-private partnership between the European Commission (EC), Eurocontrol and major aviation companies. Known as the SESAR Joint Undertaking (SESAR JU), it has recently delivered a full catalog of suggested improvements and an impressive list of technological solutions to be implemented in order to achieve SES.

By the end of 2016, the SESAR JU will have delivered over 60 solutions as part of the drive to modernize Europe’s airspace, covering improved automation, increased digitization and essential communication between airports, airlines and air navigation services.

**Securing global leadership**

The R&D phase for SESAR is now complemented by the deployment phase, which will look at deploying the six ATM functionalities defined by a European regulation known as the Pilot Common Project (PCP), the foundation for the SESAR Deployment Program (DP) developed by the SESAR Deployment Manager (SDM), an industry partnership that has been given the lead for making the PCP solutions a daily reality under EC oversight.

The six PCP ATM functionalities, which must be deployed by EU member states, are: extended arrival management and performance-based navigation in the high-density terminal maneuvering areas; airport integration and throughput; flexible airspace management and free routes; network collaborative management; initial system-wide information management; and initial trajectory information sharing.

SDM was created by the stakeholders in European aviation (airlines, airports operators and ANSPs), which are responsible for managing the implementation of SESAR-developed solutions.
SESAR and its deployment will enable sustainable growth, which will see a 10% reduction in total fuel burn, resulting in lower CO₂ emissions and the reduction of noise around airports thanks to new departing and arrival procedures. Flight routes will be more direct and flight profiles will be more accurate and better quality, thanks to new ATM technologies and infrastructure.

Involvement, coordination, cooperation and convergence with neighboring regions are all key to SESAR's success and will dictate the degree to which it benefits from technological investment. Through such cooperation, Europe will retain and strengthen its influence on the modernization of aviation worldwide. Maintaining SESAR's R&D and deployment will, it is hoped, ensure continuing progress toward a modernized global ATM system.

The deployment program
The initial set of solutions to be deployed in the 2015-2024 timeframe is defined in the PCP. The DP is used in the Connecting Europe Facility (CEF) framework to provide financial support for the modernization of aviation in Europe. DP 2015, developed by SDM and consulted throughout the European ATM community, has already triggered more than 200 investment projects.

The SDM plans, coordinates and monitors the realization of projects that contribute to PCP implementation while benefiting from significant EU co-funding through the CEF managed by the EC. Development of material supporting deployment, including guidance material, specifications, standards and regulation, involves a large number of participants in various government departments and is often based on voluntary contributions from industry.
SESAR Iris Precursor aims to make aviation safer by developing a new satellite-based air-to-ground communication system for ATM.

SATELLITE TECHNOLOGY FOR DATALINK COMMUNICATION

In March 2016, SESAR members, together with partners and the European Space Agency’s Iris Precursor, carried out a joint flight trial, successfully demonstrating that existing satellite technology systems are a viable option for air traffic services datalink. The trial showed for the first time how Iris Precursor technology can be used to provide end-to-end air-to-ground communications for initial 4D flight trajectory management, connecting aircraft and ATM ground systems to optimize aircraft trajectories in four dimensions: latitude, longitude, altitude and time.

Carried out by the members of the SESAR Joint Undertaking (SESAR JU), the flight trial represents an important milestone in the continued collaboration between the satellite and ATM industries in Europe. The Iris Precursor has been specified for datalink communications over the existing SwiftBroadband (SBB) satellite network from Inmarsat, using the Aeronautical Telecommunication Network (ATN) as the standard protocol for the datalink services implementing rules.

The SESAR flight trial was performed on February 23, 2016, on an Airbus A330 MSN871. The aircraft took off from Toulouse, flew over the Balearic Islands and returned to Toulouse, passing above Madrid. During the flight, i4D ADS-C reports and CPDLC exchanges were performed with the Eurocontrol Maastricht Upper Area Control Centre (MUAC). It showed that ADS-C contracts could be successfully maintained with two ATC centers (MUAC and Airbus Toulouse) for over two hours. During this time, i4D ADS-C reports were generated, resulting in downlinking trajectory updates approximately every 20 seconds with 20 waypoints – an update rate well above that expected when initial 4D trajectory exchanges are implemented. In addition to the i4D trajectory exchanges, various CPDLC messages were exchanged during the flight, with a remarkable round-trip time of below two seconds throughout.

The flight trial also tested the handover between the Inmarsat satellite spot beams, which were completely transparent from the perspective of the aircraft. In terms of connectivity, the trial experienced no loss or provider aborts, a frequent issue with the existing VDL2 terrestrial datalink.

Datalink is a key enabler for the SESAR vision, in particular the implementation of 4D trajectory-based operations. This flight trial demonstrates that with efficient datalink services, flight plans can be continuously updated during a flight to maintain the optimum trajectory to destination, enabling ATC to offer better routings, sequence aircraft far in advance, and maximize airport and airspace capacity. It also confirms that the Iris Precursor services based on the Inmarsat legacy network can successfully complement the existing terrestrial VDL2 infrastructure.

By 2018, Iris Precursor is expected to support CPDLC in Europe and open the door to initial 4D trajectory management. In the longer term, Iris will evolve to support full 4D and operate in a highly secure multilink environment with future terrestrial datalinks.
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JIM AJAYI
Europe & Americas
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