

# 4D Trajectory Based Operations

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The overarching concept of ATM modernization is the move from airspace-based operations (e.g. traffic separation based on current position and radar plot) to Trajectory Based Operations, relying mainly on accurate flight planning data, and accurate predictions of aircraft positions (the 4D aircraft trajectory), shared and synchronized between all stakeholders, including the Network Manager, the Air Traffic Control Units, the Airlines Control Centre and the aircraft.

**Key Words:** ATM, TBO, Trajectory

## 1) Introduction

This presentation describes Airbus activities in the development and deployment of Trajectory Based Operations (TBO) and its benefits for the Air Traffic Management system in general and for the airspace users in particular. TBO is one of the pillar of the European ATM modernization program (SESAR) and is identified as an enabler for a better trajectory management through digitalization and automation.

## 2) Technology and benefits

The presentation starts with a short video explaining the concept of operations and the principle of aircraft trajectory data shared with the ATC ground tools and with the ATC controller.

Activities within European SESAR program were conducted to develop and mature the ATC ground tools as well as the airborne avionics. In 2019-2020, a Very Large Demonstration was organized in Europe with several ANSPs and airlines flying real commercial flights and providing trajectory data. Thousands of flights allowed to collect a lot of data and confirm the potential of this technology.

Transmission of aircraft trajectory data through ADS-C is an enabler for many ground ATC applications: first immediate application recently deployed at Eurocontrol MUAC is to cross check the aircraft intentions with the flight plan known by the controller. Second applications have been worked within several SESAR projects is the improvement of Conflict Detection tools using A/C predicted data. Other ones will allow to improve Arrival Managers with a better predictability of traffic and a better synchronization, improve Dynamic Capacity Balancing and manage complex traffic situations. Some use cases will be explained.

## 3) Data link

Technologies and ATC data link mandates throughout the world will be reminded.

ATS B2 services have been developed and standardized to allow ATC data link communication in high density airspaces.

Airbus strategy is to develop and deploy standardized ATS B2 technology on all new aircraft. The technology is available on A320 and A330 and will become also available on the other Airbus programs in the future, in order to be compliant to the European Common Project 1 mandate targeted for Jan 1<sup>st</sup> 2028 in Europe.

Airbus FANS C avionics product (data link router) and roadmap will be described.

A focus on IRIS program will also be addressed: IRIS allows to transmit controller-pilot data link communications through satellite using Inmarsat SB-S network. IRIS will provide an alternate communication means to complement and alleviate. IRIS program is entering its pre-commercial flights phase in 2023 with launch customer EasyJet.

## 4) Conclusion

TBO concept is now becoming a reality with the progressive deployment of B2 applications in European ANSP and the market uptake of ATS B2 capable aircraft. There is a high potential to further enhance the ATC ground tools in many areas and get the full benefit to allow optimized trajectories and CO2 reduction.

## References

- 1) 4D-TBO : a new approach to aircraft trajectory prediction  
<https://www.airbus.com/en/newsroom/stories/2020-12-4d-tbo-a-new-approach-to-aircraft-trajectory-prediction>
- 2) SESAR DIGITS-Airspace User:  
<https://cordis.europa.eu/project/id/783178/reporting>