SESAR Solution

AOC Data Increasing Trajectory Prediction Accuracy – Quick-Win

Contextual note

Purpose:

This contextual note is a vehicle to summarize the results stemming from Release delivery activities. It provides a summary of the SESAR Solution in terms of results of the Validation exercises and achievements as well as additional activities to be conducted before or as part of deployment.

This contextual note is part of a package prepared for each SESAR Solution for which exercise results are conclusive and sufficient to support a decision for industrialisation. It complements a technical data pack comprising available deliverables required for further industrialization.

In addition, adequate consideration of the recommendations on the regulatory and standardisation frameworks and the regulatory and certification activities is required. These recommendations are detailed in the 'SESAR Solution Regulatory Overview – AOC Data Increasing Trajectory Prediction Accuracy' included in the technical data pack.

Improvement in ATM Operations

ATC needs to maintain detailed, accurate, and up-to-date trajectories from aircraft take-off right through to landing**.** Trajectory Predictors (TP) have been developed for ATC ground systems in order to compute trajectories as close as possible to real life. This trajectory information provides the Network Manager (NM) and ATC system tools with data of the accuracy required to build reliable sequencing or conflict-detection and resolution tools, which support the Controller tasks.

In advance of the implementation of full trajectory-exchange between aircraft and ATC systems, this SESAR Release 2 concept provides the ATC system with the mass and speed data available at the Airline Operations Centre (AOC) flight planning systems. It is applicable to any TP, regardless of its look-ahead time (5 minute to 2 hour time horizons). Most of the benefits expected from this concept occur in flight segments with strong vertical components, such as in TMAs and in the climbing phase.

Operational Improvements – OI Steps

IS-0301 (Step 1): **Interoperability between AOC and ATM Systems**

Use of trajectory data as available from AOC and transmitted to the NIMS (initially probably on a low periodicity basis) incl. ATOW, engine variant, actual wind profiles, possibly intent data (next waypoint(s)) and airline thrust setting policy, as a complement to ICAO flight plan/ surveillance data /qualified extrapolation, for improved accuracy of ground-based TP computations.

The validation exercises has also demonstrated benefits of the solution in the following OI Steps :

CM-0104-A (Step 1): **Automated Controller Support for Trajectory Management**

Automated tools support the ATC team in identifying, assessing and resolving local complexity situations through assessment of evolving traffic patterns and evaluation of opportunities to de-conflict or to synchronise trajectories.

CM-0204 (Step 1): **Medium Term Conflict Detection with Conflict Resolution Advisories and Conformance Monitoring**

The system provides real-time assistance to the tactical controller for monitoring trajectory conformance and provides resolution advisory information based upon predicted conflict detection.

Background and validation process

The real-time simulation, performed in London where the traffic includes a large amount of climbs and descents, demonstrated improvements of the medium-term conflict-detection (MTCD) system in high-density area control airspace when the underlying trajectory-prediction is enhanced by AOC data (e.g mass & speed data) from airlines, including British Airways, Lufthansa, American Airlines and Flybe.

Validation activities were conducted with NATS Interim Future Area Control Tools Set (iFACTS). iFACTS is a set of tools which provides decision-making support and facilitates the early detection of conflicts in and around the sector.

Results and performance achievements

The main quantitative findings from the conflict-detection model are as follows:

- Approximately a 10% reduction in medium-term conflict-detection false alerts for climb/cruise conflicts (for 5-8 minutes look-ahead before conflict);
- A similar reduction (approx. 10%) observed on climb/climb conflict alerts;
- An increased safety due to a reduced number of nuisance alerts, and a reduced controller workload leading to increased capacity and improved efficiency; and
- Improved cost-effectiveness owing to a better trajectory prediction leading to level-offs avoidance.

Additional activities

A sensitivity analysis showed that ±10% error in AOC mass and speed values had no appreciable effect on the trajectory predictions. The analysis concluded that when setting up MOUs with the AOCs an acceptable ±10% error tolerance should be established. There was, however, no assessment whether the AOCs would always be capable of achieving this degree of accuracy

This validation focussed on the near-term use of flight planning data, prior to the advent of standards and infrastructure to support full trajectory exchange between aircraft and ATC systems.

Actors involved

The involved actors are:

Airspace Users, for the provision of AOC data;

Tactical and Planner Controller, whose toolset largely employ the trajectory prediction data.

Impact on A/C system

There is no impact on A/C system.

A/C system could be impacted when information exchange standards would be developed.

Impact on ground systems

The Trajectory Prediction component of the ground ATC system is impacted.

The concept relies on the following Ground System Enablers:

ER APP ATC 92a: Flight Data Processing: enhance Controller planning tools in En-Route

ER APP ATC 92b: Conflict Management: enhance Controller planning tools in En-Route

ER APP ATC 92d: Conflict Management: enhance Controller planning tools in TMA

Ground system will also be impacted when information exchange standards would be developed

Note: the iFACTS ground system was adapted and configured for the validation. Technical specification is not available.

Consideration of Regulatory Framework

The regulatory dimension of the commercially sensitive data protection has to be further developed.

Consideration of Standardisation Framework

Information reported standards need to be developed for the provision of AOC data to ensure both AOC/ATC interoperability and AOC data reliability.

Considerations of Regulatory Oversight and Certification Activities

The detailed description adapted to each operational scenario has to take into account technical interfaces and local specificities.

The local economic impact of the applicable safety requirements can affect local business cases in significantly different ways.

Intellectual property rights (foreground)

The foreground of this deliverable is owned by the SJU.