Project Achievements

SESAR Wave 2 Program, Solution PJ.01.08A2

A successful 5-day RTS (Real Time Simulation) was performed between 9th of May to 13th of May 2022 at Malmö-Sturup, Sweden, led by LFV/COOPANS. The validation activity was performed in the LFV/COOPANS NARSIM with 6 ATCO CWPs (Controller Working Positions), and 5 pseudo pilots. The airspace used in the validation consisted of en-route sectors in the Sweden FIR, using inbound/outbound traffic scenarios corresponding to a peak period of traffic in Stockholm Arlanda (ESSA), including overflying traffic. Three ”in-horizon” airports were also defined generating departures towards Stockholm Arlanda. The project received valuable and positive feedback, and we look forward to reporting results later in the year, after analysing all the feedback and recorded data.

Automated CTA

Operational Improvements (OI):

- Pre-processing of automatic Controlled Time of Arrival for in-horizon departures.
- Automatic Controlled Time of Arrival.

Key Factors - In-horizon departures will receive a preliminary CTA while on the ground before engine-start. This will ensure the aircraft takes the delay at the gate with the engines shut down instead of airborne holding. Automatic CTA enables optimized flight trajectories and reduced workload for Air Traffic Controllers.

In this concept, aircraft predictability is an important element to improve situational awareness and the ability to plan with higher precision. The aircraft capability to send its actual trajectory data to the Ground ATC system while flying to maintain a RTA (Required Time of Arrival), will raise the level of precision for ATC.

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Predictability
Enhanced Queue Management
Stability of Traffic Flows
Improved Fuel Efficiency
Reduced Airborne Holding
Time Efficiency Improvements
Improved Environmental Performance
Enhanced Situational Awareness

Project Achievements - Detailed information

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The concept of automatic CTA management consists of two operational improvements (OI):

- Pre-processing of automatic Controlled Time of Arrival for in-horizon departures.
- Automatic Controlled Time of Arrival.

This solution has developed the extended arrival manager (E-AMAN) prototype, (an evolution of Thales LAS France SAS Arrival Management (AMAN) system), that will support i4D/CTA, TTL/TTG (Time To Lose/Time To Gain) advisories for Stockholm Arlanda airport and will provide sequencing of the traffic flow. MTCD (Medium Term Conflict Detection) is performed as part of the process of allocating a CTA to an aircraft. If there is an existing or new conflict detected within a pre-defined time horizon, the CTA will not be automatically uplinked to the aircraft as a safety precaution for the ATCO.

Pre-processing of automatic Controlled Time of Arrival for in-horizon departures

For aircrafts departing inside of the E-AMAN horizon, the arrival constraints implementation process starts on the ground prior to engine startup. The process includes arrival time allocation, aircraft performance and trajectory sharing from the aircraft FMS, resulting in an enhanced TOTT (Target Take Off Time). Any delay of the flight will be taken on the ground at the gate prior to engine startup.

Automatic Controlled Time of Arrival

Arrival time constraints are implemented for flights that depart from airports located outside of the E-AMAN horizon and are flying en-route entering the E-AMAN horizon.

Validation objectives

The RTS validated the technical and operational feasibility to automatically implement CTA without direct ATCO involvement. The aim was also to analyse the impact on air traffic management by the use of increased automation in the context of CTA, specifically the impact on fuel efficiency, predictability, safety and human performance.

Simulator platform

The validation was performed on LFV/COOPANS NARSIM advanced ATC simulator including the Thales AMAN prototype and an FMS (Flight Management System) engine module simulating FMS equipped aircrafts.

Airspace and traffic

The airspace used in the validation consisted of three en-route sectors in Sweden FIR manned by operational ATCO's. Traffic scenarios included overflying traffic and inbound/outbound Stockholm Arlanda traffic corresponding to peak periods. Three "in-horizon" airports were used with departures towards Arlanda. Unmanned ACC (Area Control Centre) sectors all around Arlanda TMA were populated with arrival traffic flows automatically processed by NARSIM in order to saturate the AMAN. The traffic inside the TMA sectors were managed by NARSIM without Air Traffic Controllers involvement.

Exercise runs

15 exercise runs, each lasting 50 mins, were performed during the validation. Reference scenarios included the Extended AMAN horizon without the use of CTA, only TTL/TTG. Solution scenarios included different amounts of flights capable of achieving a CTA (30, 70, 100%), as well as various MTCD look ahead times (0, 10, 20, 30 mins).