Adacel’s Tom Evers describes how their Aurora ATM is enabling initiatives to improve airspace efficiency, aiding efforts to reduce fuel burn and associated aviation emissions.

Aurora ATM: conflict resolution for controllers

“...In the ATM world today there are two big givens; the Big Sky theory for aircraft separation doesn’t work and first-come-first-served is not efficient...”

A challenge facing both NextGen and SESAR is how to best support optimal aircraft trajectories. Airspace efficiency is largely determined by the separation standards that a controller must apply. To ensure safety, these standards are based primarily on the capability to accurately determine aircraft position and to reliably communicate with them – the lesser the accuracy and reliability, the greater the separation distances that must be applied.

Fundamental to both SESAR and Next-Gen are the technological and procedural changes necessary to optimize trajectory management in oceanic, en route and terminal airspaces. The aim is to reduce system constraints that impede aircraft from flying profiles that maximize efficiency. In other words, how to safely apply minimal separation standards in a world of dissimilar aircraft.

Until fairly recently, traffic in oceanic or procedural airspaces was managed by tedious, time consuming manual plotting – this remains true in many parts of the world today. This lack of ATM automation and surveillance severely limits the ability of ATS providers to handle higher volumes of traffic and respond to increased demands of airlines for user preferred routes and flight levels and the ability to dynamically re-route traffic in flight. Against this background, ATS providers struggled to reduce separation standards and increase efficiency in airspaces worldwide.

ATS providers recognise that new ATM systems need to be able to process a variety of aircraft capabilities and separation standards and to reduce the burden on the controller to identify and manage each flight’s CNS capabilities while applying the smallest associated separation standard.

Aurora was developed to address these needs and to provide advanced automation tools to controllers to allow them to manage traffic more effectively. Without getting into a litany of features, Aurora provides complete 4D profile protection using advanced conflict detection which allows the smallest appropriate separation based on individual aircraft performance characteristics and equipage. The system closely integrates controller pilot data link communications (CPDLC) with advanced flight and surveillance data processing and automatically updates electronic flight strips with updated position reports and clearances.

Aurora provides the controller with immediate feedback for conflict resolution and assessment of route and altitude changes. Automated conformance monitoring alerts them when aircraft are out of conformance with their cleared profile. The automation and accuracy of the trajectory based conflict probe is the key to enabling controllers to routinely accommodate user preferred routes, dynamic airborne reroute procedures. New operational concepts like cruise climbs and support for tailored arrivals are being supported by Aurora in various trials programs.

Aurora ATM on trial

Trials for procedures aimed at improving efficiencies and reducing emissions have been conducted for oceanic flights over both the Atlantic and the Pacific. Adacel was not directly involved in the Asia & South Pacific Initiative to Reduce Emissions (ASPIRE) trials within Pacific oceanic airspace, but the Aurora technology was. The ATM automation capabilities used in the US and New Zealand controlled airspaces through which most of the ASPIRE flights have been conducted are provided by the Aurora software.

Adacel is actively involved in the SESAR Joint Undertaking’s Atlantic Interoperability Initiative to Reduce Emissions (AI4E) trials. Together with Air France and TAP Portugal, Adacel is participating in a team headed by NAV Portugal to conduct proof of concept flights within North Atlantic oceanic airspace bounded by the adjoining New York and Santa Maria FIRs. This is a natural fit as Aurora provides the oceanic ATM automation capabilities employed on both sides of the Atlantic within the US and NAV Portugal oceanic control centres. The specific trials called Project NATCLIM (North Atlantic cruise climb lateral deviation Mach number) has the objective of optimizing aircraft trajectories through the adjoining airspaces to test unrestricted cruise climb profiles and dynamic lateral and longitudinal route optimization.

Briefly, the trials have involved Air France flights cruising through the Santa Maria and New York FIRs from Paris to the French West Indies and Central and South American destinations. Additional trials were conducted using TAP Flights between Lisbon and Oporto Stations and destinations in North, Central and South American again transcending the New York and Santa Maria airspaces.

Results were encouraging and validated the test procedures. While fuel savings for individual flights were not large, cumulatively, they would be significant. Bearing in mind that the trials involved only the airspace within the New York and Santa Maria FIR boundaries, the consensus was that if extended to neighboring FIRs through which the aircraft transit, then additional fuel savings would be realized. Within the context of the trial airspace, cruise climb had no significant impact on flight times; however, measures to optimize routes for the conditions of the day did.

Challenges remain and Aurora will continue to evolve to enable ANSPs to manage effective change. As always, safety remains of paramount importance. Likewise interoperability among ATS providers and advanced technology such as Aurora’s capability to manage profiles based on individual aircraft performance and equipage will be essential to the success of SESAR and NextGen initiatives for trajectory optimization.