SkyKeeper Suite® coupled AMAN-DMAN solution could facilitate airports to absorb air traffic increases in the coming years

Innov'ATM's coupled AMAN-DMAN system was used by skyguide in their simulations at GVA Airport to test the concept and as a tool enabling ATCOs to optimize runway operations, increase capacity and preserve safety and the environment. The project objectives were met at the end of the 18-month trials with encouraging results.

Current predictions estimate that by 2036, air passengers will double to 7.8 billion, we can observe today an increasing number of European airports being congested, which translates into delays for passengers, time and fuel wasted by aircraft waiting and the loss of potential for economic growth. Among the SESAR PJ02 EARTH project objectives, is finding a solution to respond to these issues by, as an alternative to building new infrastructure, increasing existing runways' capacity in order to absorb growing traffic and reduce fuel consumption.

Skyguide led validation exercises, with its subsidiary Skysoft-ATM within the project, led by EUROCONTROL in order to assess the impact of trajectory based integrated Runway Sequence function for traffic optimization. With the added challenge of operating a single runway at Geneva (GVA) Airport, the context was used to conduct simulations and validate the runway capacity increase with a dynamic coupled AMAN-DMAN (arrival manager-departure manager) as opposed to using separate tools to manage arrivals and departures, or set patterns.

The SkyKeeperSuite® Coupled AMAN-DMAN solution developed by Innov'ATM was used, integrated with SkySoft-ATM and ROSE GmbH's Skysim and the AMOS TWR/APP/ACC simulator, in skyguide's simulation exercises to optimize air traffic management. The solution provided Air Traffic Controllers (ATCOs) with a dynamic tool to increase the predictability of runway capacity and optimize runway configuration with an optimal sequence of traffic calculated using Artificial Intelligence algorithms. A range of methods of optimization and configuration were developed and tested throughout the 18-month project in order to find the most appropriate and efficient method for the context.

Project start date:
September 2017

Project end date:
March 2019

Duration:

18 months

Location:

Geneva Airport

Single Runway
Mixed mode

Key figures:

-3
minutes
taxi time
at departure

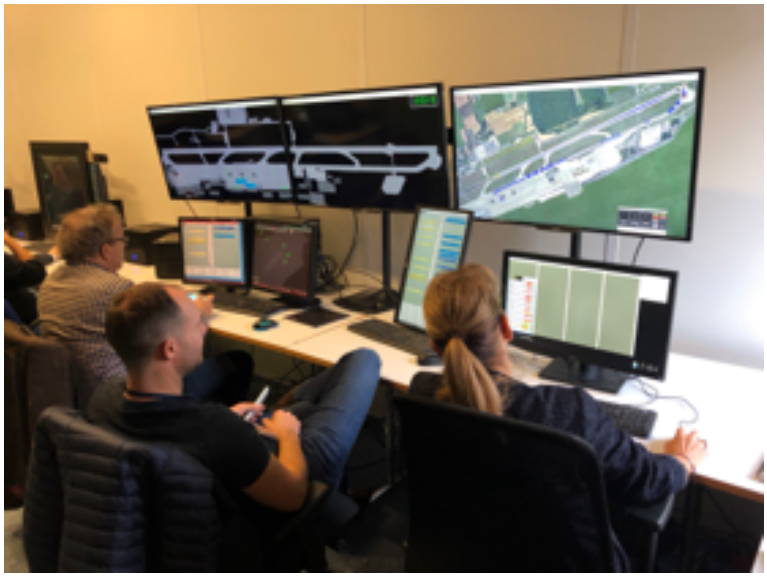
reduction of noise &
fuel consumption

reduced workload &
stress

trusted by ATCOs

key figures listed above were achieved in a simulation environment aimed at pre-industrialization

These exercises enabled the team to conclude that the SkyKeeperSuite® Coupled AMAN-DMAN solution brought considerable improvements to the mixed mode single runway traffic at GVA Airport.

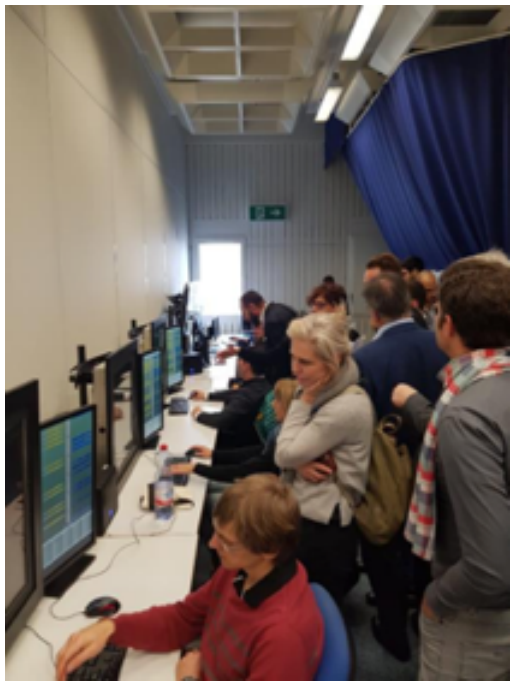


On average, departures spent 3 minutes less taxiing which reduces the environmental impact, in particular by cutting down noise and reducing fuel consumption. But most importantly, it was found that the solution improved ATCOs situational awareness and decreased significantly their mental stress and workload. The reduction of workload implies a high potential for capacity increase in the future even if the validation exercise was not focused on demonstrating capacity benefits. The system's accurate prediction and high level of anticipation was shown through sequences that remained unchanged as time progressed, enabling ATCOs to trust the sequences and maintain a high level of safety supported by a shared situation awareness between all the operational actors following a common plan: the integrated arrival-departure sequence.

"The solution provided ATCOs with a dynamic tool to permit a constant and precise use of the full RWY capacity by optimizing the sequence of traffic flows (ARR and DEP) using AI algorithms." – Daniela Steiner, skyguide

The aim of PJ02 is to perform R&D on solutions up to a maturity level that proves that expected benefits are delivered when integrated in a pre-industrial environment. Once all the results of validations and other R&D activities have been consolidated, it is expected that the solution will be ready for industrialisation (e.g. including standardisation) and deployment. Innov'ATM aims to implement its SkyKeeperSuite® Coupled

AMAN-DMAN solution in contexts similar to the one in Geneva.



"The development of a coupled AMAN-DMAN for Geneva environment was quite a challenging task taking into account the limited time and resources and the absence of any background information (i.e. no existing AMAN in Geneva, no previous reusable material from SESAR like the other partners of the SESAR project). Innov'ATM adapted very well to these constrains, the cooperation was really good and made possible to meet the objectives starting from a white page. The development following an Agile approach with a close cooperation between end users and Innov'ATM engineers during very short and frequent development sprints allowed us to explore the different possibilities, focus on the essential topics and find a solution suitable for Geneva operational environment. The good scores in terms of Punctuality, Fuel Efficiency and Human Performance that we could measure during our real time simulations confirm the expected benefits of the Coupled AMAN/DMAN concept in the most constrained operational environment: single runway in mixed mode operations." – Montserrat Mendoza Navas, skyguide

"The opportunity to participate in this project enabled us to fine tune our sequencing algorithms and adapt our solution to the operational context of the GVA TMA. Our challenge in developing our Coupled AMAN-DMAN was to validate the concept of integrating the management of arrivals and departures in a single tool. The objective was to create a flexible solution, dynamically adaptable to traffic peaks and these exercises enabled us to find the balance between the performance of our algorithms and the usability of the tool in an operational context." - Stéphane Bascobert, Innov'ATM

ABOUT SESAR

The Single European Sky ATM Research (SESAR) project, set up in 2004 as the technological pillar of the Single European Sky to modernise Europe's air traffic management (ATM) system, is now making significant progress in transforming the performance of Europe's ATM network. The goal of SESAR is to contribute to the SES HighLevel Goals of tripling capacity, halving air navigation service costs, reducing emissions by 10% and improving safety by a factor of 10. Established in 2007, the SESAR Joint Undertaking (SESAR JU), a public-private partnership, is responsible for defining, developing and validating solutions in preparation for their deployment. The SESAR JU does so by harnessing the research and innovation expertise and resources of the entire ATM community, from the Network Manager and civil and military air navigation service providers, to airports, civil and military airspace users, staff associations, academia and research centres.

ABOUT SKYGUIDE

Skyguide is the Swiss Air Navigation Services Provider. Skyguide has 1500 employees with over 540 civil and military air traffic controllers. Over 300 engineers, technicians and ITExperts are responsible for the development and maintenance of the complex technical installations and facilities. Operators of aeronautical data manage the necessary information to assure a smooth continuation of the air

traffic. Other experts are in charge of the planning and development. In addition, there's the administrative staff and the numerous instructors at the skyguide training centre, who are in charge of training the personnel in the operations. Skyguide operates at 14 locations in Switzerland. Skyguide handles air traffic operations at Geneva and Zurich national airports, at regional airports, and at several military aerodromes. Furthermore, Skyguide ensure the maintenance of 240 installations throughout the country. Skyguide is headquartered in Geneva.

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ABOUT SKYSOFT-ATM

SkySoftATM's corporate mission is to rethink the design and the implementation of ATM systems using a new innovative approach. SkySoftATM's brings new and original concrete solutions to the many challenges facing today's Air Traffic Control. SkySoftATM's provides Technical and Project Management expertise in a whole range of ATM system, which includes ATC Simulators, Air Traffic Management, Radar Training, Legal Recording and consulting. SkySoftATM solutions are custom-made and based on combining and configuring our functional modules around a conceptual core developed in close cooperation with our clients during the analysis and requirements specification phases. SkySoftATM collaborates with various partners that have been identified as sharing similar working methods and entrepreneurial spirit.

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ABOUT INNOV'ATM

Innov'ATM specializes in the development and implementation of solutions aiming at optimizing air traffic management, airport resources and the secure insertion of drones in the airspace using Artificial Intelligence algorithms. SkyKeeper Suite® is a modular solution that provides aviation stakeholders with decision-making tools to support them in their operational activities. SkyKeeper Suite® includes: a 4D Live Trajectory Predictor, a Coupled Arrival and Departure Manager (AMAN/DMAN), a Surface Manager (SMAN), an Airport Collaborative Decision Making solution (ACDM), a Parking Manager (PMAN) and an Air Traffic Flow Management (ATFM).

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This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation program, under grant agreement No 731781.