



Today's speakers

Integrated arrival and departure runway sequence

➤ Ake Wall, Senior Air Traffic Controller, Operational and Validation Expert, LFV

Avionics developments for improved vertical profile

➤ Johan Boyer, System Engineer, Thales

Enabling environmentally-friendly approach profiles

➤ Fethi Abdelmoula, Research team leader, DLR

Can machine learning help improving environmental impact assessment ?

➤ Gabriel Jarry, Research engineer, DSN



Question	Answer
<p>Is the integrated sequence updated between the two events?</p>	<p>Update can be made automatically based on the updated information or arrivals and departures (event based) or based on manual inputs (by the controllers). The frequency of the automatic update processes has been tailored to balance the need for update and the need to have sufficient stability so as to support the operational tasks.</p>
<p>When and where do you have such almost equal number of arrivals and departures simultaneously using the same runway? Please give the real life case.</p>	<p>Integrated runway sequence can handle both situations where there is a balanced flow of arrivals and departures and situations where there is a peak of arrivals or a peak of departures. In the real time simulation we have a good experience of this. For more details, please see the validation report in the solution datapack, which is publicly available at https://cordis.europa.eu/project/id/731781/results (please download the PJ02-08 datapack, and check out the V3 Arlanda simulation in the validation report).</p>

<p>The video seems to not run for the audience...</p>	<p>Please check link on youtube, search "Integrated Runway Sequence Function": https://www.youtube.com/watch?v=uryuweDiWv4</p>
<p>What is the maximum arrival flow rate typically seen at Arlanda?</p>	<p>With segregated runway operations, rate is around 39 arrivals/h</p>
<p>what are the benefits noted in terms of the gate-to-gate performance improvements</p>	<p>Increased predictability (landing times/on-block times/take-off times) and precision with calculation including both arrivals and departures will support all stakeholders at the airport</p>
<p>There is currently no requirement nor tolerance window around the TTOT (Target Take-Off Time) and at some A-CDM airports ATCOs don't even have the TTOT displayed: is it displayed in ARN ATCOs HMIs and what kind of tolerance window is aimed at around the TTOT calculated by the sequencer?</p>	<p>Unlike the CTOT, which is a constraint and has a tolerance window associated to it, the TTOT is not a constraint and therefore does not have an associate tolerance window. The TTOT reflects the shared (and progressive refined) planned take off time. The TWR controller is not expected to refer or try to meet the TTOT.; instead, the TWR controller is expected to focus on meeting the proposed departure sequence as long as practical and fill the available gaps between arrivals.</p>
<p>Is the DM linked to A-SMGCS to get latest accurate events (surveillance, routing with taxing time updated?</p>	<p>This was not done in the PJ.02-08-01 validation, but we are discussing the option of including updates on departures based on A-SMGCS information in the upcoming</p>
<p>in case of 2 parallel runways and peak in arrivals, does your integrated sequence will use the departure runway for arrivals for a period ?</p>	<p>Yes, the solution provides increased flexibility for the utilisation of both parallel runways for the arrivals, and this is planned early (before TOD).</p>
<p>Is this really achievable? And what are the real benefits?</p>	<p>Increased predictability, enhanced coordination with system support, and reduced need for manual coordination between TWR and APP, as well as capacity improvements (around 5%) and environmental benefits (mostly through reduced time at the holding point for departures, because they will have started up at the right time)</p>
<p>Is wake vortex and category of aircraft integrated ?</p>	<p>Yes, the calculation of integrated runway sequence include both radar separation minima and wake vortex minima</p>

<p>Could you highlight the benefits in terms of environment?</p>	<p>Lower carbon dioxide emissions. Lower fuel consumption. Reduced queueing Option to select runway to reduce noise</p>
<p>I'd like to have more information, what happens if there's a swap between a light and a heavy on departure? You can lose capacity...</p>	<p>The approach controller gets an on-screen indication of what the gap should be (for each pair of aircraft); If there is a swap before finetuning, 10 min. before landing, the system will adjust the arrival gap; later updates will be manually coordinated by TWR and APP.</p>
<p>as it was SESAR1 result, is the solution in PCP?</p>	<p>This is not a SESAR 1 solution, but a SESAR 2020 Wave 1 solution. In SESAR 1 we had a solution on integrated AMAN-DMAN for single runway airports (SESAR 1 solution 54, https://www.sesarju.eu/sesar-solutions/flow-based-integration-arrival-and-departure-management), which was flow based. This more advanced solution is applicable at airports with multiple mixed-mode runways (runways used for both arrivals and departures). The solution balances departures and arrivals between the different runways, and the arrival-departure integrated sequence is sequence based rather than flow based, i.e. it is not necessarily based on a fixed pattern of so many arrivals per so many departures, and instead dynamically adjusts the pattern continuously. Neither of the two AMAN-DMAN integration solutions are part of the PCP.</p>
<p>What's the feedback from airplane crews about a late runway change? Does it affect fuel consumption while taxiing to terminal?</p>	<p>Change of runway can be made before TOD, we use the early planning phase. The sequence update 10 minutes before lading/take-off is aimed at refining the time (mostly of the departures), and it is not foreseen that it would involve a runway change. Gate assignment can be taken into account in the runway allocation process in order to minimise taxi time whenever possible.</p>
<p>This has been tried in the US long ago as "flow management" at airports. There is no space for substantive improvement in the environmental impacts since the objectives are contradictory.</p>	<p>With this integrated sequence for runway, the predictability will be highly increased, APP and TWR will have the same view, and the flexibility is retained thanks to the late (10 minutes prior to entering the runway) update process, which to our knowledge had not been proposed by any other AMAN-DMAN integration concept. The environmental benefits come from departures spending less time at the runway holding point (because start-up times are managed so that aircraft can absorb at the gate with engine off the delay that they would otherwise have to absorb at the holding point).</p>

<p>In the descent mode the altitude is not constant I guess (as the first slow at the bottom show - ALT). This flight is not alone in the airspace...</p>	<p>For sure, in Descent phase, an aircraft should descend and decelerate to reach the runway, but currently and because the aircraft is not alone, the descent are not performed continuously, and ALT mode is used for separation in order to maintain an A/C at a constant level.</p>
<p>ROME, Geneva, and Barcelona participated in the trials than why did they backtrack from deployment?</p>	<p>Even though these airports participated in the validations, the final validation (in which feedback from all previous was incorporated) took place only in Arlanda, and this is the airport where the solution is now going to be demonstrated. The live demonstration of SESAR solutions is a fundamental part of the SESAR R&D process. Once the demonstration is complete, a detailed demonstration report will be made public. SESAR demonstration reports contain valuable information in support of the deployment of SESAR solutions. Once the demonstration is complete, airports that want to move to implementation will find a "paved road" compared to the first one, in this case Arlanda.</p>
<p>What about STARS in TMA? Are they 3D or 4D optimal?</p>	<p>We have work in SESAR (other projects) on optimising the STARS, which consider the ideal profile (in 4D) for the traffic mix at the airport, and try to find a balance (so that the restrictions are as little penalising as possible considering the traffic mix). However, the FMS developments that Johan is presenting on aim at allowing the aircraft to meet the constraints (whatever they are) as efficiently as possible, rather than at supporting the design of better STARS.</p>
<p>How are you planning to share the PRT between the FMS and ATC?</p>	<p>The PRT trajectory will be downlinked through ADS-C, more specifically through the EPP; first experimentation occurred in SESAR PJ01-03 (Wave 1 project). The SESAR concept is also considering are more advanced concept involving the uplink of information of the planned trajectory from the ATC ground systems to the cockpit, for the PRT to take this information into account when calculating the optimum trajectory (i.e. optimising against the ATC planned trajectory).</p>
<p>What about of sending to ATC via datalink the top of descend?</p>	<p>It has been experimented in other SESAR projects (see, for example, PJ31, for which we had an Open day earlier this week - the information is in the SESAR JU past events page (https://www.sesarju.eu/past-events). However, even if the Top of Descent is known to the controllers via A/G sharing technology (ADS-C/EPP), there is still a need for profile optimization (re-cruise), because for operational reasons (e.g. separation of traffic flows), early descent will still occur (controllers will not always be able to facilitate the optimum Top-of-Descent)</p>

<p>This looks very nice and convincing but unrealistic to be implemented in the real life. At the end optimization of this and many other kinds is not possible. What is the real objective of this?</p>	<p>The sustainability agenda that is ahead of us is not an option. Changing way we do ATC and ATM will be key in reaching our environmental objectives and indeed things will have to change. Project such as this one are driving towards a change of mindset that is necessary for the whole aviation industry to set itself toward reducing the environmental foot print. Staying as we are is not an option. All SESAR solutions are validated in a realistic environment, and in some cases proceed on to the demonstrated live.</p>
<p>Will the slide show be made available?</p>	<p>Yes, the slides, the recording and the Q&A (this chat) will be made available at the SESAR JU past events page (https://www.sesarju.eu/past-events).</p>
<p>Did you involve airlines in the project?</p>	<p>Yes, airlines were involved in the design since the beginning through multiples evaluations (with participation of pilots) on an industrial test bench. The idea is really that the PRT should match with operational practices, and both AU and ATCO are needed for that. As an example, in SESAR, an experimentation in the PJ01-03B about the Permanent Resume Trajectory involved pilots from Air France, Brussels Airlines and Volotea.</p>
<p>Noise abatement procedures already exist.</p>	<p>Indeed, SESAR R&D expects to contribute to the state of the art with new procedures and technologies, which will make it possible to reduce the noise impact compared to what is possible with current noise abatement procedures.</p>
<p>Noise burden around European airports has been significantly diminished during the past decades. Where is that really the problem and for what?</p>	<p>Although individual aircraft have become some 75 % less noisy over the last 30 years, the growing amount of air traffic means that many EU citizens are still exposed to high noise levels. In order to ensure the sustainability of aviation, measures targeting the noise impact will remain necessary at a number of important airports. Additionally, cargo orientated airports are becoming more and more important in this period, generating new nuisances for a new set of population not affected till now.</p>
<p>What is the number population affected by noise around Zurich Kloten airport? What is the size of the acceptable noise footprint?</p>	<p>https://www.zurich-airport.com/the-company/noise-policy-and-the-environment/noise-monitoring/noise-mapping The choice of noise reduction objectives is regulated in EU by Dir 2002/49 and in Swiss by their own legislation partially aligned on EU one.</p>
<p>Do noise constraints influence the airport capacity and how?</p>	<p>We aim at developing a global solution, with which we expect the problem of the impact on capacity could be solved or minimized.</p>

<p>What are the instructions for pilots and ATCO/ATM.</p>	<p>The most important contribution we expect from DYNCAT is to provide guidance on how ATCOs and pilots can apply (ATCOs)/manage (pilots) speed restrictions, e.g. taking in account the aircraft performance and the wind conditions, so as to minimise the impact on the environment.</p>
<p>Haven't these all been already elaborated several times from now?</p>	<p>They are a lot of studies. DYNCAT's expectation is to be able to provide additional value, because unlike previous projects we have access to all relevant data for all flights: Radar, ATC-MP3 Recording, Weather, Fuel, Noise, Aircraft Data (FDR).</p>
<p>Are these recommendations available to download?</p>	<p>The Project reports will be public. The report will be published in time. Please check our Web: www.dyncat.eu to see the date for publishing.</p>
<p>Can we have an advance on the results?</p>	<p>The Project reports will be public. The report will be published in time. Please check our Web: www.dyncat.eu to see the date for publishing.</p>
<p>What are the horizontal layouts of these two trajectories (Vertical profiles shown)?</p>	<p>The layout is the remaining distance to the runway threshold computed under the trajectory</p>
<p>Approach is not complete without comparing 4D trajectories with different vertical profiles.</p>	<p>Indeed, several studies could be lead with these new metrics in order to compare 4D trajectories with different vertical profiles</p>
<p>Does in machine learning program ATCO and ATM system considered.</p>	<p>We have projects across SESAR using machine learning for multiple applications, which use different parameters of the ATM system.</p>
<p>Does this mean, that approach with level flight shortly before glideslope entrance point for speed reduction and flap extension is less noisy and more fuel efficient than CDA profile if we take that particular flight segment?</p>	<p>No, this was an example to underline that only using geometric feature is not enough to capture the real environmental impact. In this particular CDO example, flaps were extended early and the aircraft was not in idle mode which induced an extra consumption and an extra noise.</p>
<p>atypical approach detection -> do you mean applying clustering and then detecting outliers?</p>	<p>Yes this is the idea, dimensionality reduction, probability density estimation and then outlier detection based on the density.</p>

<p>How can people be in control for machine learning for safe operations. Ron Ogan USAF Civil Air Patrol ron.ogan@mswg.cap.gov</p>	<p>First of all, it depends on the type of machine learning algorithms you are using. In the context of safety, we have used unsupervised learning to detect anomalies, which are more or less advanced statistics. Secondly, the idea is not to let the model make the decision, but to use the power of the model as a decision support tool to give reliable information in order to improve the situational awareness of the different actors so that they can make the right decisions.</p>
<p>Are the presentations available? Also, should we wish more information, who can we ask?</p>	<p>All the presentations, recordings and the Q&A file of the SESAR Digital Academy webinars are available at the SJU past events website (https://www.sesarju.eu/past-events)</p>
<p>Do you plan to improve the wind forecasts on the FMS to improve its trajectory prediction?</p>	<p>In the most recent FMS standards, we have already improved the wind and temperature data capacity through the Initial 4D Trajectory concept that has been studied in SESAR Wave 1. We are also studying advanced solutions using open world data for instance.</p>
<p>Is the project to learn the sources of noise in more details or contribute to reducing noise?</p>	<p>The project aims to make the various noise sources visible and measurable. The main goal is to analyse the actions of air traffic control and pilots as possible causes of aircraft noise. The project also provides suggestions for solutions and improvements, which will be implemented in a FMS prototype and tested in the simulator by pilots and controllers. DYNCAT will contribute to reducing noise.</p>