

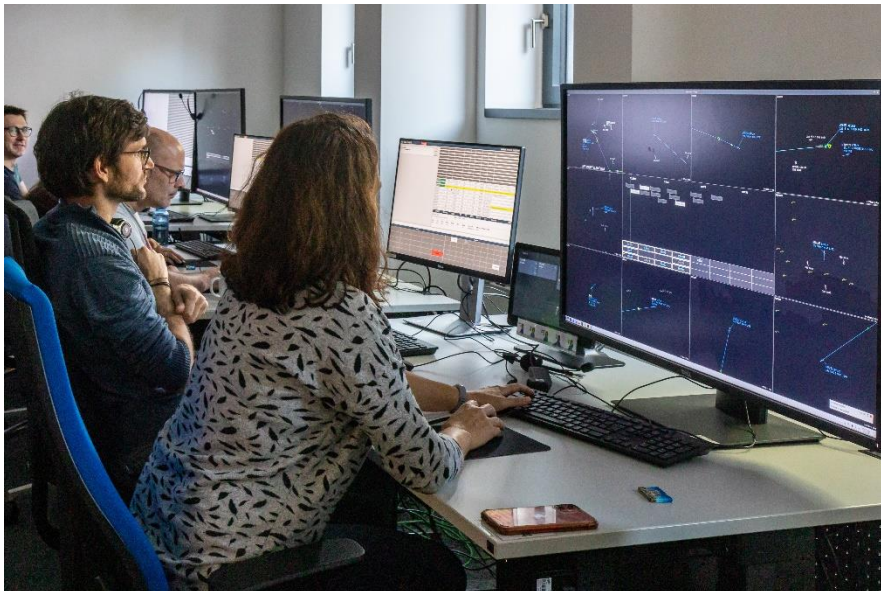
FCA

Flight Centric Air Traffic Control

2nd Newsletter - September 2024

News

Exercise 001 Getting Ready for Human-in-the-loop Validation



The countdown is ticking for exercise 001 – DLR & UKSATSE. Only weeks are left until the highlight of the exercise – a human-in-the-loop validation campaign with kind participation of ten of UKSATSE's air traffic controllers will take place.

While UKSATSE is preparing the participants of the simulation campaign and intro-

ducing them to the Flight Centric ATC concept, DLR's team is implementing the various validation scenarios and thoroughly testing the simulation environment in regular sessions. Simultaneously, coordination with the solution's safety and human performance experts takes place to ensure that all relevant data is captured and a smooth assessment can be conducted afterwards.

Another milestone of the exercise was reached in June, when a three-day workshop was conducted in the exercise. It brought together air traffic controllers from UKSATSE and experts in operations, safety and human factors from Integra and Eurocontrol. The workshop included hands-on training with DLR's TrafficSim and its human-machine interface, followed by discussions on HMI usability and the role of supervisors in Flight Centric ATC. The feasibility of the HMI prototype was confirmed by ATCOs and valuable feedback for further development was gathered, and a step towards a clear definition of the supervisor role in FCA was made.

Now, the focus is on finalizing all preparations as we look forward to a successful and insightful validation campaign. If you want to know more about the results and FCA, join us for Open Day. Scroll down for the invitation.

Fast-time Simulation Supporting Exercise 001



The highlight of Exercise 001 is the real-time human-in-the-loop simulation of flight centric approach over airspace of the Ukraine. The exercise is supported by the fast-time simulation running the same scenarios but using a conventional sector-based approach to air traffic control. The goal of the fast-time simulation is to compare flight

centric and conventional approaches and further extend measured metrics for a deeper understanding of the concept. The primal goal is to understand changes in tasks and workload performed by air traffic controllers.

Several scenarios are being prepared to evaluate various situations. Basic scenario uses nominal traffic to have a baseline for comparison with other scenarios as well as flight centric baseline scenario. Additional scenarios include thunderstorms, conflict resolution failure, and datalink failure. All scenarios will be simulated with teams of executive and planning controllers as well as a single-person operation to be able to better compare both approaches.

Current work finalizes setting all scenarios and tuning the behaviour of simulated air traffic controllers to be as close to realistic human behaviour as it is possible for fast-time simulation. Initial parameter settings and simulations look promising and the team is getting ready to deliver outstanding results.

Preparations for Exercise 002 Moving Forward

Validation exercise 002 is advancing as planned, with the validation plan close to completion and preparations set for the first dry run, scheduled for November 25, 2024, at the CRIDA laboratory. This dry run marks a significant milestone, focusing on validating the FCA tools developed and ensuring that the traffic simulations prepared are accurate for the upcoming validations. It will also provide an opportunity for air traffic controllers to review and confirm the designed operational procedures, ensuring they align with real-world operational demands.

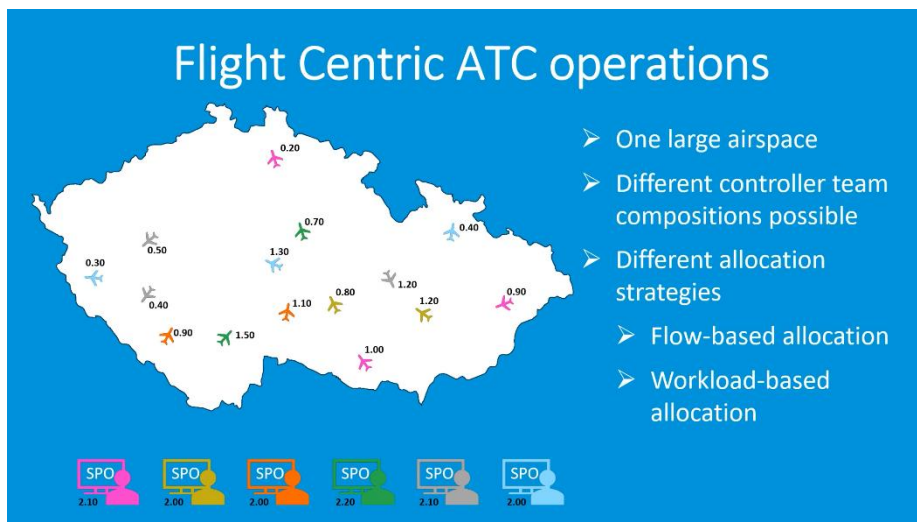
The involvement of air traffic controllers will be crucial in this phase, as they will provide valuable feedback on the procedures being tested and the developed tool support. Their insights will help fine-tune the procedures and the validation infrastructure before moving forward with the full validation phase, ensuring that they are both practical and efficient for real-world application.



In parallel, the statistical analysis to evaluate the potential cost-efficiency improvements of the FCA concept in the Madrid Route 1 ACC area has been successfully completed. The study shows promising results, with an average improvement in ATCO productivity of around 4 %. This analysis has guided the selection of the most suitable traffic samples for real-time validation of key use cases, such as FCA position openings and closings, conflict resolution, adverse weather scenarios, and communication

failures. These findings will provide a strong foundation for the next stages of validation and ensure a rigorous assessment of FCA benefits.

Launching Project's YouTube Channel



We are excited to announce the launch of our new YouTube channel dedicated to showcasing the FCA project. The channel will feature videos introducing the project and the talented researchers involved, giving viewers a chance to meet the team. You will learn about the

project's goals and the researchers' individual roles, offering a closer look at the people driving this initiative forward.

In addition to the YouTube channel, we're continuing our popular #ResearcherFriday campaign on LinkedIn. Each Friday, we spotlight a different member of our team, highlighting their expertise and the vital role they play in advancing our research. Follow us on LinkedIn to stay updated and connect with our growing community of researchers.

Events

Invitation to Exercise 001 Open Day

Curious to learn more about the concept of Flight Centric ATC? DLR welcomes you to its premises in Braunschweig, Germany on November 28th, 2024 for an open day of Exercise 001 – DLR & UksATSE. Take a look behind the curtain and experience the perspective of an FCA air traffic controller during a demo session in DLR's Flight Centric ATC laboratory. To register or for any questions, please contact mara.weber@dlr.de.

A promotional poster for the SESAR 3 FCA Open Day. The background shows two men in a control room with multiple computer monitors displaying flight data. The text is overlaid on the right side. At the top right is the DLR logo and name: 'Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center'. Below that, the title 'SESAR 3 FCA OPEN DAY' is in large blue letters, followed by 'EXERCISE 001 – DLR & UksATSE'. The main text describes the event: 'Gain insights into the Flight Centric ATC concept and the DLR & UksATSE validation activities, including a hands-on demo session with DLR's state-of-the-art traffic simulator!'. It then lists details: 'Where?' (DLR Braunschweig, Institute of Flight Guidance, Lilienthalplatz 7, 38108 Braunschweig), 'When?' (November 28th, 2024, 09:45 – 16:15), and 'How to register?' (Confirm your participation via email to mara.weber@dlr.de). A large blue button says 'REGISTER NOW' with 'Limited seats available' underneath. At the bottom left are the 'sesar JOINT UNDERTAKING' logo and the European Union flag with the text 'Co-funded by the European Union'. A small note at the very bottom states: 'This project has received funding from the EU under grant agreement No 101114764.'

Invitation to DASC2024 conference

A poster for the 43rd Digital Avionics Systems Conference (DASC). The left side features a photograph of a city skyline (San Diego) with a large ship in the water. The right side contains the conference details. The title 'DASC 43rd' is in large blue letters, with 'Digital Avionics Systems Conference' below it. The location and dates are 'San Diego, CA, USA - September 29 - October 3, 2024'. Below that, it says '43rd Digital Avionics Systems Conference'. The theme is 'Building Trust in Increasingly Complex Safety-Critical Aviation Systems'. At the bottom, it says 'Join us in San Diego, California, USA for the 43rd AIAA DATC/IEEE Digital Avionics Systems Conference (DASC), the preeminent R&D conference in the field of digital avionics.'

The 43rd Digital Avionics Systems Conference (DASC) will take place in San Diego, CA, USA from 29 September to 3 October 2024. Three papers on the topic of Flight Centric ATC will be presented at this year's DASC:

- “Impact of Flight Centric Air Traffic Control on the Cost Efficiency of Air Navigation Service Providers”, Tobias Finck, Bernd Korn (German Aerospace Center)

- “Evaluation of the Impact on Air Traffic Controllers of Air-Ground Datalink Technologies (LDACS and Current CPDLC) in Flight Centric ATC”, Ana P.G. Martins, Carmo Sonja Klueker, Christiane Edinger, Sebastian Tittel, Mara Weber (German Aerospace Center)
- “Air-Ground Datalink Technologies (LDACS and Current CPDLC) in Flight Centric ATC: Analysis of a Fast-Time Simulation and Outlook on a Complementary Real-Time Simulation”, Mara Weber, Ana P.G. Martins, Christiane Edinger, Carmo Sonja Klueker (German Aerospace Center)

While not directly part of the activities within the FCA project, all three papers complement the project's work in the relevant areas.

Invitation to EASN2024 conference



At the 14th EASN International Conference on ‘Innovation in Aviation and Space towards sustainability today & tomorrow’, which will take place from 8 - 11 October 2024 in Thessaloniki,

Greece, Tobias Finck will present the conference paper: ‘Requirements for an allocation center for the Flight Centric ATC concept’, Tobias Finck and Bernd Korn (German Aerospace Center). This paper complements the work carried out as part of the FCA project on the Allocation Center.

Presentation at AIAA Aviation Forum 2024



This year's edition of the AIAA AVIATION Forum took place in combination with the ASCEND conference from 29 July to 2 August 2024 in Las Vegas, NV, USA. During the conference, Tobias Finck presented his paper on

‘Workload-Based Allocation Strategy for the New Concept of Flight Centric ATC’, Tobias Finck, Annette Temme, Sebastian Tittel and Bernd Korn (German Aerospace Center). This paper considers a new workload formula that enables workload-based allocation of aircraft to controllers in order to achieve an even distribution of workload across all controllers working in the FCA airspace.

Presentation at ICAS 2024



The 34th Congress of the International Council of the Aeronautical Sciences (ICAS) took place in Florence, Italy, from 9 to 13 September 2024. As part of the conference programme, Tobias Finck presented his paper on 'A Roadmap for Transforming Traditional ATCO Teams into Collaborative

Human-Machine Teams'. This paper, which focuses on potential ways to restructure air traffic controller team composition in a Flight Centric ATC environment, offers an insight into the possibilities of the concept beyond the operational feasibility and the impact on human performance and safety, as investigated in the FCA project.

Blog

What is Exercise 001 About?

Validation exercise "EXE001 – DLR & UkSATSE" will validate the FCA concept using the upper Ukrainian airspace (above FL275). In sector-based operations, this airspace is divided into 21 sectors controlled by four area control centers. Exercise 001 merges those into a single Ukraine Flight Centric ATC airspace. FCA air traffic controllers will operate in single-person configuration, supported by conflict detection and resolution tools, a filtering and probing function and other tools refined specifically for Flight Centric ATC.

Complemented by Exercise 002 - EXE002 – ENAIRE/CRIDA & INDRA, the goal of the exercise is to close gaps in the research of the Flight Centric ATC concept that remained open in previous studies and raising its maturity from Technical Readiness Level (TRL) 6-ongoing to full TRL 6. Besides confirming the operational feasibility of the concept, the exercise investigates the impact of the FCA concept on human performance, air traffic controller productivity, CO₂ emissions and fuel consumption.

The highlight of the exercise will be a real-time simulation campaign taking place in two parts in November 2024 at DLR's Flight Centric ATC Laboratory in Braunschweig, Germany. Over the course of eight days in each part of the campaign, a total of ten air traffic controllers from UkSATSE will undergo a system training and different validation runs, covering the investigated use cases. During and after the validation runs, quantitative (e.g. fuel consumption and number of conflict occurrences) and qualitative (questionnaires and debriefing) data will be collected. To allow for a quantitative comparison with conventional operations, the exercise is supported by a fast-time simulation of sector-based reference scenarios conducted by AgentFly Technologies.

Deep Look Inside the Flight Centric – Improving ATCOs’ Productivity

“Deep Look Inside the Flight Centric” is the first blog of a series providing more detailed insight into flight centric concept. Today, ATCO productivity is introduced in the context of the Flight Centric ATC concept. In the conventionally used sectorized airspace, the capacity of an airspace (sector) is usually dependent on the individual capacity of the controllers responsible for that sector. Although sectors can be both split and merged to avoid overload or underload of controllers, there are limits in either direction. When dividing sectors, it is important to ensure that the smaller sectors are always sufficiently large to allow the controllers to carry out their duties without restrictions and to allow conflict resolution. Merging sectors, on the other hand, is limited by the controllers' sector ratings and communication coverage. Thus, it is not possible to achieve an even, optimal distribution of the workload across all controllers in a sectorized airspace, meaning that there is always an imbalance in the workload between the individual sectors of one or more area control centers (ACC). As a result, the potential controller capacities are not fully utilized in the current concept.

Total ATCO hours	Conventional Sector-based	Flight Centric Only	Optimized Combination
Base scenario	8 896	8 771	6 436
Increased traffic 2027	10 219	12 455	8 039
Increased traffic 2035	11 831	16 330	10 031

The Flight Centric ATC concept offers the possibility to eliminate this imbalance while simultaneously reducing the workload a controller has to spend on each individual aircraft, as well as reducing the total number of controllers while maintaining existing traffic volumes. For this purpose, the FCA concept uses three approaches:

- Since the traditional sector boundaries are eliminated with the Flight Centric ATC concept, a new way of allocating aircraft to controllers is required. Instead of rigid allocation based on sector boundaries, innovative distribution mechanisms can be applied with the new concept. Based on workload calculation models which predict the expected workload of each aircraft, as well as the calculation of the current workload of each controller within the FCA airspace, it is possible to achieve a balanced workload distribution. The increased workload of individual controllers, for example due to abnormal situations such as thunderstorm events, can be quickly and easily resolved by re-allocating aircraft.
- The use of new tools, such as the Conflict Detection and Resolution (CD&R) tool, reduces the controller's workload even in complex traffic situations. While these tools require more interaction with the radar HMI, the workload required to identify complex conflict solutions is reduced. Furthermore, the tasks of the planner controller can be significantly reduced, depending on the size of the Flight Centric ATC airspace, due to the elimination of sector boundaries, coordination with adjacent sectors is reduced. The reduced number of sector transitions also reduces the workload, especially for the executive controller.
- When using the FCA concept, airspace control can continue to be carried out by the traditional air traffic control team, consisting of an executive and a planner controller. However, the larger the airspace under consideration, the more sense it makes to reduce the number of planner controllers, since the number of planner tasks decreases proportionally with increasing airspace size. Accordingly, the introduction of new team compositions, such as 1 planner controller responsible for n executive controllers or the use of single person operators, should be considered.

Partners



We invite you to follow us on our channels to get updates of all the project's activities.

www.sesar3fca.eu



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