

# PJ.33 FALCO NEWSLETTER

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## EDITORIAL

Dear Readers,

the new SESAR Wave 3 Project PJ.33 FALCO started on 1<sup>st</sup> January 2021. Being a project with two very different solutions, namely Solution 1 "Increased Flexibility in ATCO Validation (IFAV)", and Solution 2 "LDACS complements", this project does not only face various scientific challenges, like the development and validation of new ATCO endorsement strategies or of a voice LDACS capability in a relatively short project lifetime. Also, the administrative, organizational and formal challenges are larger than for earlier SESAR projects. In addition, the project was set up under COVID-conditions, which led to the situation that most people involved in the project have never met in person before. The more I'm very impressed that the project is up and running with an outstanding collaboration of all partners of the consortium, and I'd like to thank all for the strong encouragement being spent in the project. At the same time, we're happy to present the first newsletter being published in the project, we hope you will enjoy reading and feel free to share it largely!

*Michael Finke*

PJ.33 FALCO Project Coordinator



## PJ.33 FALCO IN BRIEF

<b>GRANT NUMBER:</b>	101017479
<b>DURATION:</b>	24 months
<b>BUDGET:</b>	7 593 152,51 €
<b>PROJECT LEAD:</b>	Michael Finke German Aerospace Center, DLR e.V.
<b>PROJECT WEBSITE:</b>	<a href="https://sesarju.eu/projects/FALCO">sesarju.eu/projects/FALCO</a>

## THE FIRST SIX MONTHS OF PJ.33 HAVE BEEN FULL OF...



## PRINCIPLES AND BACKGROUND OF SOLUTION 1

As of today, every Air Traffic Controller (ATCO) works in defined geographical areas, called sectors. In order to work in any specific sector an ATCO needs to obtain an endorsement for that sector. This is achieved by attending a training referring to the specific sector, and passing an examination. However, obtaining an endorsement for one specific sector does not qualify the ATCO to work in any other sector. Every ANSP has to hold available enough endorsed ATCOs for each sector taking into account staff shortages, e.g. due to sick leave. This results in high personnel demand and thereby also in high costs.

The overall goal of Solution PJ.33-W3-01 is to make the ATCO deployment more flexible, in order to cover a larger geographical area by the same number of employed ATCOs while, at least, maintaining the same level of safety and flight efficiency. This is to reduce personnel and thereby increase cost efficiency. The increase in flexibility of ATCO deployment will be achieved through innovative technical and procedural means such as the *Needed Skills Approach* and the *Technical Approach*.

✈ *It's about providing the ATCO with as much information in as little time possible.* ✈

## NEEDED SKILLS APPROACH

In order to obtain an endorsement for a specific sector or unit under the current system, an ATCO must have all of the knowledge and skills to be able to work in that sector under all possible conditions. This high level of competency requires a high training demand (both initial and recurrent).

It is therefore interesting to examine whether there is a more graded approach possible to the endorsements, in order to increase ATCOs' flexibility. Since the traffic is variable, and the complexity will also vary, it might be possible to deploy ATCOs with variable competencies, depending on the situation in the sector.

For example, if the traffic situation is simple for a sector, then it might be possible to deploy an ATCO that is fully qualified, and fully endorsed on a different sector, provided the ATCO fulfils the needed competency level required for exactly this operational situation.

This concept investigates a new way to determine individual competencies, and to predict the minimum required for an operational situation. It applies a "variable" level of competency resulting in flexible endorsements.

## TECHNICAL APPROACH

Another approach to enable a more flexible endorsement of ATCOs is through further tool support. The idea is to reduce the necessary training for an ATCO on specific sectors to be able to handle the traffic in a safely manner. The emerging knowledge and experience gaps have to be made up by new or enhanced ATCO-tools or -functions. As a result, a flexible ATCO endorsement following this approach must be specific to these systems, and can only be valid when they are available and working.

Therefore, in a first step it is important to identify and collect all necessary parts and objectives a student ATCO is trained at, and which abilities are gained during the OJT to operate a specific sector with its local characteristics in a safely manner. At this part the PJ.33 project work is based on work of previous projects like PJ.10-W1-06 and PJ.10-W2-73 IFAV.

Within the succeeding design of tools it is of special interest how to provide the ATCOs with information in a useful, non-bothering, comfortable- and confident-making manner. Also, considering user experience we will get the awareness, when and why the ATCO feels safe to handle a sector, as that is important for the acceptance of new tools and working methods. Apart from that this subjective sense of safety – which results from sector-trained experience – could be enabled by new tools.

## PRINCIPLES AND BACKGROUND OF SOLUTION 2

A long-term vision of commercial aviation depends on preserving our climate, and a green recovery requires future-proof aeronautical communication networks that enable secure, efficient air travel.

L-band Digital Aeronautical Communications System (LDACS) is an innovative concept for aeronautical communication. LDACS addresses the limitations of existing technology and provides modern, secure broadband communications with more than 200 times the data throughput of the current system.

With LDACS, safety is boosted through higher continuity of service, guaranteed bandwidth, and reduced latency. Air Traffic Management (ATM) services can work together more efficiently across national borders in Europe.

The overall goal of Solution PJ.33-W3-02 is twofold:

- First to make progress with the LDACS Air-Ground (A/G) datalink through planning and conducting an LDACS flight trial, whose findings will complement the results obtained in Solution PJ.14-W2-60 "FCI Terrestrial Data Link (LDACS)" and will increase the overall maturity of the LDACS technology.
- Second to start the developments required to make LDACS capable of supporting digital voice.

## LDACS CONCEPT

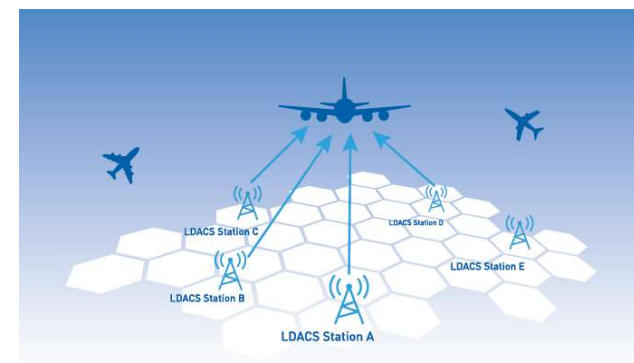
LDACS is a terrestrial aeronautical A/G radio system that enables IP-based data communication between the cockpit and the ground. The IP-based (IPv6) data communication is currently standardized by the International Civil Aviation Organization (ICAO), with plans for it to be the basis for future air-to-ground data communication. Built on technologies that are used for public 4G/5G cellular networks, LDACS is adapted to and optimized for the specific requirements that a fast-moving aircraft operating at high altitudes must comply with. It provides efficient, secure, and high-bandwidth voice and data communications with embedded navigation capability. LDACS will be deployed in the aeronautical L-band (960 to 1164 MHz), sharing the spectrum with the legacy navigation and surveillance systems operating in this band. LDACS is highly spectrum-efficient, so it can work within the aeronautical spectrum without interfering with existing systems. As aircraft move between LDACS cells with overlapping coverage, the handover is seamless, automatic, and transparent— which means that the technology will support the future dynamic airspace management concept.

To support future services, LDACS can provide data throughput from 550 kbps up to 2.6 Mbps depending on the selected adaptive coding and modulation scheme. This is 50 to 200 times higher

than the throughput of VHF Data Link (VDL) Mode 2 that is currently in operation.

LDACS is a cellular communications system that uses a coordinated multiple-access scheme, ensuring collision-free channel access with guaranteed low latency. LDACS is designed to meet the requirements of air traffic control to ensure that safety-critical data between aircraft and ground systems can be transmitted efficiently throughout controlled airspace. LDACS cell coverage is up to 200 NM. Since this is comparable with today's Air Traffic Control (ATC) Very High Frequency (VHF) voice and data radio ranges, it allows to reuse VDL Mode 2 radio sites and infrastructure.

Based on similar concepts used in 4G/5G mobile radios, LDACS is a future-proof technology. It enables high-throughput, low-latency data link communications well beyond the scope of current and proposed VHF communications.



## INTERVIEW – SOLUTION 1: GEORGE KOUDIS (NATS)

*NATS is the main ANSP in the UK, and has been involved in IFAV since SESAR 2020 Wave 1 began. NATS is a member of PJ.33 FALCO and the team are looking forward to working with our partners to develop the technical and procedural enablers required to support a deployment of the IFAV concept across European airspace.*

*George is a Technical Lead in R&D at NATS and has been at the company for 4 years. Before joining NATS, George completed a PhD to analyse the environmental impacts of aviation at Imperial College London and then worked for an aviation consultancy firm based in London.*



### 1 WHERE DO YOU SEE THE GREATEST BENEFITS IN HIGHER FLEXIBILITY OF ATCO DEPLOYMENT?

In my opinion, the greatest benefit that IFAV can provide is an increased resilience in ATC operations. The COVID-19 pandemic has shown us the importance of being able to react dynamically and adaptably to an ATC challenge that continues to evolve and change. Aside from direct benefits, the IFAV concept can act as an enabler for a wide range of concepts currently in development across Europe!

### 2 WHERE DO YOU SEE THE BIGGEST CHALLENGES?

I believe that our biggest challenge is to ensure that the IFAV concept supports the highest possible levels of human performance and safety. We must introduce new tools, procedures and training methods to mitigate any possible degradation to the operation.



### 3 WHICH PART OF PJ.33 FALCO HOLDS THE MOST INTERESTS FOR YOU?

My personal interest lies in understanding how we can support the widely varied range of ATCO tasks with new tools. That might be achieved through the automation of simple tasks or the "intelligent" display of critical information, and could provide considerable benefits to the whole aviation industry!





## INTERVIEW – SOLUTION 2: THOMAS GRÄUPL (DLR)

*The German Aerospace Center DLR is the scientific research centre of the Federal Republic of Germany for aeronautics and space. It conducts research and development activities in the fields of aeronautics, space, energy, transport, security and digitalization.*

*Thomas Gräupl is a senior researcher with the Institute of Communications and Navigation of the German Aerospace Center DLR. He has been involved in digital aeronautical communications well over a decade. Currently, he is working on the standardization of LDACS within ICAO and SESAR.*



### 1 IN WHICH AREA DO YOU SEE THE BIGGEST SHORTCOMINGS OF THE CURRENT ATM COMMUNICATIONS THAT THE INTRODUCTION OF LDACS WOULD SOLVE?

In aviation, many communication tasks are still performed with analogue voice radio - with all the disadvantages analogue systems have. Some areas of current ATM communication can be supported by digital data links and therefore made more efficient. However, these data links are based on the technology of the 1990s and suffer from similar problems as analogue voice: Frequency saturation, low bandwidth, no support for modern IP networks or lack of cyber-security measures.

LDACS will address these shortcomings and represents a new innovative system for cyber-secure broadband voice and data communication compatible with modern IP voice and data networks.

### 2 HOW WILL PJ.33 FALCO CONTRIBUTE TO THE INTRODUCTION OF LDACS?

Some requirements cannot be validated in the laboratory and require the validation of LDACS through flight tests. PJ.33 FALCO includes the definition, planning, and execution of these LDACS flight tests and the analysis of the results. The flight tests will demonstrate for the first time the integration of LDACS as part of a fully functional ATM

network, including avionics-grade networks and applications. This will raise the technology readiness level (TRL) of LDACS to TRL6.

In addition to the flight trials, PJ.33 FALCO will also design and evaluate the LDACS digital voice architecture. The results will be used to support the standardization of LDACS in ICAO and other relevant industry bodies.

### 3 WHERE DO YOU SEE THE BIGGEST CHALLENGES?

The greatest challenges for a complex technology demonstration and validation, as it is performed in PJ.33 FALCO, is certainly the coordination of the preparatory tasks that are running in parallel, handled by different partners that will all have to be finalized before the validations can start.

In addition to that, evaluation criteria, which have only been assessed in simulations or lab tests up to now, need to be mapped to real-world scenarios for the flight trials. Obviously not every scenario can be implemented, requiring the project to plan and choose carefully.

The development of the LDACS digital voice architecture is also challenging, since an operational concept for digital voice is not available, requiring the project also to develop valid assumptions.

## MILESTONES

- ❖ **MS01 ACHIEVED**  
Kick-Off Meeting (WP1), 31/01/21

## EVENTS

- ❖ **SJU INTERNAL MEETING**  
First-ever virtual SJU Internal Meeting, including presentations and a panel discussion, 27/04/2021
- ❖ **PRESENTATION OF "LDACS DIGITAL VOICE"**  
Future Communication Infrastructure-TF 15, 15/04/21
- ❖ **PRESENTING LDACS**  
Set-up of LDACS Communication campaign that comprises a series of four Webinars, April – September 2021 (see: <https://www.sesarju.eu/webinars>)



## NEWS

- ❖ **STANDARDIZATION ACTIVITIES**  
Web-Meetings with ICAO PT-T and ICAO DCIWG/4 are frequently held, beginning 28/01/21
- ❖ **VALS SUBMITTED**  
Validation Strategy has been presented to SJU, 30/03/21
- ❖ **TASK 2.2 KICK-OFF**  
Work on procedural enablers started, 21/05/21
- ❖ **SPR-INTEROP/OSED**  
First draft is finished and in review
- ❖ **NEW CONSORTIUM MEMBER LFV**  
PJ.33 Consortium welcomes new member Swedish Air Navigation Service Provider LFV
- ❖ **INITIATION OF LDACS DIGITAL VOICE FRD DEVELOPMENT**  
The use cases for LDACS Digital Voice have been developed and operational requirements have been derived

Jan.

Apr.

Jul.

- ❖ **BRAINSTORMING WORKSHOPS**  
Workshops have been frequently held to discuss technical and procedural enablers for increasing the flexibility of ATCO validations, beginning 18/02/21
- ❖ **WHITEPAPER DEVELOPMENT**  
LDACS promotion in collaboration with DFS
- ❖ **LDACS FLIGHT TRIALS**  
Definition of technical validation environment
- ❖ **PJ.19 COORDINATION**  
Solutions 1 and 2 have defined their Validation Targets in coordination with PJ.19
- ❖ **BUSINESS CASE DEVELOPMENT**  
Started and considered scenarios
- ❖ **PROJECT LOGO**  
The PJ.33 Logo (see first page) has been approved by DLR Headquarters, 24/06/21

## OUTLOOK

Once the second newsletter has been published, one whole year will have passed and with that half of the project time of PJ.33.

By then, within Solution 1, procedural enablers are targeted to be fully defined. Meanwhile, work on technical enablers will have started and already be on the finish line. Validation activities will as well have started and the roadmap development towards fully Generic Controller Validations will be on its way.

In Solution 2, the Technical Validation Plan for the LDACS Flight Trials is planned to be completely developed, and the sub-contract for certification of the LDACS equipment to be installed in the test aircraft will be concluded. Furthermore, an initial version of LDACS Digital Voice FRD will be developed and an update of the LDACS design will ensue, as well as necessary further developments of the LDACS prototypes, in order to support and use Digital Voice.

## CONSORTIUM



## ACKNOWLEDGEMENT



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