# PJ.33 FALCO NEWSLETTER

## CONTENT

## PAGE 1

Progress of Solution 1 Solution 01b: Task 2.5

### PAGE 3

Progress of Solution 2 LDACS Flight Tests

## PAGE 4

Interview Solution 1 (ENAIRE)

### PAGE 5

**Interview Solution 2 (INDRA)** 

## PAGE 6

Milestones Events Short News

## **EDITORIAL**

Dear Readers,

we are approaching the end of the year 2022, and again it has been a year with a lot of very interesting activities and highlights we can report about in this newsletter. First of all, there is the progress we made in part one of the project, the increased flexibility of ATCO endorsements solution. All partners finished the definition and development of technical and non-technical enablers driving the idea of a more flexible ATCO deployment to sectors. On top of that, a set of validation exercises were performed successfully at five different locations around Europe during the second half of 2022, leading to a lot of new insights and findings. Secondly, the LDACS complements solution, is in the meantime about to be successfully closed, while all the objectives are accomplished. One prominent highlight is surely the flight trial campaign which was performed in July 2022, and for which you can find more details in this newsletter. I want to take the opportunity again to thank all project partners for the outstanding work, which make this project being a successful one. Enjoy reading this third newsletter, and as always please feel free to share it widely

Michael Finke PJ.33 FALCO Project Coordinator



## **PJ.33 FALCO IN BRIEF**

| <b>GRANT NUMBER:</b> | 101017479                 |
|----------------------|---------------------------|
| DURATION:            | 30 months                 |
| BUDGET:              | 7 593 152,51 €            |
| <b>PROJECT LEAD:</b> | Michael Finke             |
|                      | German Aerospace          |
|                      | Center, DLR e.V.          |
| PROJECT WEBSITE:     | sesarju.eu/projects/FALCO |

### PJ.33 CONTINUES TO BE FULL OF...



## **PROGRESS OF SOLUTION 1**

During the past few months, the consortium has been focused on the preparation and execution of validation exercises for Solution 01a. There are five of them led by DLR, NLR, ENAIRE, NATS and Skyguide.

The procedural and technical enablers identified during the initial phase of the project have been key to the preparation of the validation exercises. During summer, all partners have focused on the development and integration of these enablers. The combinations of enablers used in each exercise represent the different variations of the proposed new flexible endorsement strategy for ATCOs.

A selection of KPAs is measured during executions. These include Safety, Capacity, Operational Efficiency, Predictability, Cost Efficiency and Human Performance. Alongside this, solution-specific PIs are addressed (e.g., user experience or situational awareness) to help in the quantification of solution benefits and impact.

Validation exercises started in September and are planned to finish by the end of November. Analysis of the results and preparation of the VALR will follow.

 The combination of procedural and technical enablers supports flexible
 ATCO endorsement

### SOLUTION 01B: TASK 2.5

Since the publication of the 2<sup>nd</sup> issue of this newsletter, a white paper describing the path towards Generic Controller Validations (GCV) has been drafted. GCV is the last step of IFAV concept and allows ATCOs be entitled to control sectors not linked to their geographical locations. The concept brings the maximum flexibility in the ATCO rostering and deployment process within/between ATSUs of the same or different ANSPs.

As the maturity phase of the GCV concept is early v1, the concept has still major research and development issues to be tackled. For the creation of the whitepaper, the Delphi method was used: based on the results of multiple rounds of questionnaires sent to a panel of experts, in this case T2.5 partner, each expert can adjust their answers according to the group response. Three rounds of questionnaires were conducted to define and refine the following areas:

- Licensing, Competence and Training
- ANSP and Competent Authorities Roles
- Regulation and Legal Aspects
- Procedures and Tools support

Unit Endorsement drastically changes as controllers are entitled to work with a system and sector types not linked to geographical locations. It is assumed that sectors are classified according to their structural complexity and their "control style" and endorsements are sector type based. Next figure proposes a new Training and Licensing Model.



ANSPs and NSAs would maintain their current responsibilities, but Training Organizations might play a more relevant work at all as Training and Assessment is homogenised and standardised. to allow greater flexibility between ATCOs from different ANSPs. All this will imply the modification Commission Regulation (EU) 2015/340.



At a technical level, IFAV tools must be developed to their maximum extent, providing the local knowledge on sector specificities and procedures. Additionally, common features across Europe on CWP and simulators are key for GCV implementation. Or even new CWP displays different from today will be a potential solution. For the creation of the roadmap, two main documents have been taken as references: the ATM Master Plan along with Strategic Research and Innovation Agenda (SRIA) to retrieve the time framework and main milestones. This information combined with the necessary tasks identified in the four research areas, sets the roadmap towards GCV deployment. Finally, the white paper was shared with the consortium and presented in a workshop in June 2022 as starting point for Task 2.6. From there, the next step is to validate the whitepaper with external reviewers.

## **PROGRESS OF SOLUTION 2**

Since the publication of the second newsletter a lot of important activities have been performed in Solution 2:

In the first Thread (Planning and Execution of LDACS Flight Trials), the flight campaign was successfully carried-out in July 2022. During the LDACS flight tests, nine flights were performed between 11<sup>th</sup> and 22<sup>nd</sup> of July. The Technological Validation Platform, comprising equipment from FREQUENTIS, DLR, AIRTEL and HONEYWELL, has been built to verify the LDACS data link in a real world environment via flight testing.

The second Thread deals with the development of LDACS Digital Voice. The development activities were completed and the Technological Validation was set-up in the laboratory in Vienna. This Platform interconnected laboratories from FREQUENTIS in Vienna and INDRA in Madrid as well as DFS in Langen. The LDACS Digital Voice environment in Vienna comprised two LDACS ground stations and two LDACS airborne station that were connected via so-called Digital Voice Gateways with the Voice Communications Systems at the different sites. The validation exercise was finally completed in the week commencing from 26 September.

### **LDACS FLIGHT TESTS**

Before the LDACS Flight campaign could be performed, the Technological Validation Platform was built with the aim to verify the LDACS data link in a real world environment. Following qualitative tests, involving prototype equipment from project partners were performed.

By quantitative measurements (computed from log files) following system performances were extracted:

- Latency of data transmissions between the airborne and ground endpoints
- Duration of handover
- Throughput/loss of data transmission

The purpose of this validation exercise was to perform tests for technological validation of information exchange between aeronautical applications over the air interface using LDACS radios and the ATN/IPS technology to demonstrate that the flying aircraft can switch the connection from one LDACS ground station to another. In this flight test campaign three LDACS radios were involved: two LDACS radios acting as LDACS ground stations, and one LDACS radio configured as LDACS airborne station.

LDACS AS and GSs prototypes were developed by Frequentis, Honeywell provided the Airborne Router and the Airborne End-System, and AIRTEL contributed to the validations through provision of the Ground End System. These main contributions were integrated into the validation platform at DLR premises in Oberpfaffenhofen and into DLR's test aircraft as shown in Figure 1 (a) and (b).

In this exercise three LDACS radios were used: Two LDACS ground radios were used and one LDACS radio was configured to act as LDACS airborne station. Furthermore, the ground stations were synchronized in time to allow for verification of the specified hand-over procedures.





(a) (b) Figure 1: (a) DLR test aircraft; (b) antenna installation of GS2 installed in Oberpfaffenhofen

## **INTERVIEW – SOLUTION 1:**

### FERNANDO FERRÁNDEZ MARTÍN LUIS DÍEZ LÓPEZ JOSÉ DAMIÁN FERRER HERRER (ENAIRE)

ENAIRE is the leading air navigation and aeronautical information service provider in Spain. As a public business entity, it manages the Spanish airspace providing air traffic services to 2 million flights carrying over 250 million passengers each year.

Fernando Ferrández Martín is the head of the European Convergence Division and is responsible for ENAIRE's Innovation Plan.

Luis Díez López is a fully endorsed ATCO currently working for Madrid ACC and participating in several SESAR projects as operational advisor and validation ATCO.

José Damián Ferrer Herrer is a senior engineer with ENAIRE where he works on the Unit and Competence Training Plans within the ATC Development and Training Department.



Figure 1: ENAIRE's team during validation exercise

# **1** WHAT WAS ENAIRE'S MAIN MOTIVATION TO JOIN PJ.33?

The evolution of technology allows that the provision of a service does not necessarily have to be done from the dependency where your computers reside, through virtualization. This opens the way for a potential delegation of services to staff from other units under certain conditions, as for example, in contingency situations. The versatility that virtualization can provide clashes with the deep knowledge that air traffic controllers must have on the airspace under their responsibility. The Pj33-W3-FALCO explores mechanisms that could help to replace the lack of knowledge of airspace through tools to support the ATCO, paving the way for a Generic Controller Validation (GCV). ENAIRE, with its 5 Control Centres and numerous Approach and TWR units managed, could provide a better service to their clients by benefitting from the use of PJ33 -W3-FALCO tools when the concept becomes mature enough.

- Fernando Ferrández Martín -

### **2** WHERE DO YOU EXPERIENCED CHALLENGES IN VALIDATING THE PROCEDURE AND TECHNICAL ENABLERS DEVELOPED WITHIN THE PROJECT?

The validation of all the enablers proposed by PJ33-Solution 01a is a challenge to be performed at the same time for a sector. Depending on the type of traffic in the sector, some features are more useful than others. Therefore, the selection of the sectors to be validated is important to cover the maximum possible traffic scenarios to test the enablers.

#### - Luis Díez López –

### **3** HOW WILL **PJ.33 FALCO** CONTRIBUTE TO THE INTRODUCTION OF FLEXIBLE ENDORSEMENT IN THE NEAR AND FAR FUTURE?

We consider that FALCO outlook will likely play a key role within a flexible endorsement implementation. This project will allow us to focus our research on different technical and procedural enablers as to reach the maturity necessary to get more generic controllers aligned with a new EU Regulation. We foresee that some changes on current regulations will be needed to ensure EASA can certificate such a change.

- José Damián Ferrer Herrer –

# INTERVIEW – SOLUTION 2: JOAN MANUEL CEBRIÁN (INDRA)

Indra is one of the leading companies worldwide in technologies related to the air traffic sector. One of our top products is the Voice Communication System (VCS), which has numerous customers and is deployed in several countries.

Manuel Joan Cebrián (male): MsC in Telecommunications Engineering (Spain), Project Manager and Technical Responsible of different projects in satellite communications field since more than 25 years in Indra. He has expertise at technical and management level of Satcom related projects in the frame of ESA, EU and national initiatives. He has been involved in safety critical Satcom communications for ATM in the frame of the ESA Iris program and SESAR Wave 1, 2 and 3 projects. He is leading the Indra System Engineering team for Aeronautical Communication systems. He has also been involved in the PJ33 solution 2.



### **1** WHAT ARE THE MAIN DESIGN CHALLENGES WHEN DEVELOPING A SPACE-BASED SYSTEM THAT IS DERIVED FROM LDACS?

Within FALCO, we have assessed how the Spacebased VHF COM system could evolve from a Spacebased VHF Voice concept to a Space-based LDACS Digital Voice concept.

Our work has identified potential technical challenge areas of the space based LDACS concept, where it can be highlighted the way to counteract the higher Doppler effect caused by the LEO satellite; and the greater coverage area needed, causing slightly higher delays compared to ground communication. In addition, we have identified critical technologies to be further evaluated in depth, such as satellite L band antenna design and the RF amplifier requirements for the LEO satellite. Moreover, the study provides recommendations for future studies on digital voice and the mitigation of performance issues that could arise from higher latencies, architectural differences, and increased mobility effects.

### 2 COULD YOU PLEASE DESCRIBE THE OUTCOME OF THE LDACS DIGITAL VOICE TESTS WITH THE INDRA VCS?

Our team at Indra, together with DFS and Frequentis, satisfactorily carried out the digital voice

validations on the 28th and 29th of September 2022 at our respective premises in Torrejón de Ardoz (Madrid), Langen and Vienna.

After successfully exchanging voice messages in the validation phase, it has been demonstrated that LDACS is capable of supporting digital voice. This solution provides the evidence that this technology is suitable for air traffic management. The results of this activity is used as input to the LDACS standardization activities within ICAO and EUROCAE feeding the upcoming versions of standards related to voice and data communications.

### **3** WHAT NEXT STEPS SHOULD BE TAKEN IN ORDER TO RAISE THE MATURITY LEVEL OF LDACS DIGITAL VOICE?

In order to raise the maturity level of LDACS Digital Voice, it is recommended to continue with this project outputs and developments, increasing the maturity level of the technological solution to TRL6. In order to do that, a validation exercise in a real environment, and if possible, with more data traffic and actors involved would be needed. Furthermore, it is recommended to use commercial avionics radios.

Evolving the technology to TRL6 would enable new operational concepts currently under study, such as flight-centric operations or point-to-point communication between the Pilot and the Controller.

## **MILESTONES**

✤ M5 ACHIEVED

Intermediate SPR-INTEROP/OSED approved 31/03/2022

- M15 ACHIEVED
   Solution 2: Intermediate review meeting 07/04/2022
- ✤ M6 AND M9 ACHIEVED

Test environment for flight tests ready 30/06/2022 & Flight Tests completed 22/07/2022

 M7 ACHIEVED
 Validation Activity finalised 30/11/2022

## **EVENTS**

- TASK 2.6 ROADMAP VALIDATION
   TOWARDS GCV
   Large Attendance Workshop, 24/06/2022
- WEBINAR "EXPLORE LDACS THE NEW DIGITAL LINK BETWEEN AIRCRAFT AND GROUND SYSTEMS" 28/07/2022
- ENAIRE's EXE-33-W3-01A-V2-FLEX.0003 OPEN DAY
   Virtual Open Day hosted by ENAIRE, 30/09/2022

# NEWS

INTERMEDIATE REVIEW MEETING
 Solution 2
 07/04/2022

- EXE-33-W3-01A-V2-FLEX.0001
   INTRODUCTION MEETING AND SECTOR
   MODEL VERIFICATION WITH ATCOS 12/07/2022-13/07/2022
- PJ.33-W3-01A
   VALIDATION ACTIVITY STARTED 19/09/2022
- DLRK PAPER & CONFERENCE 29/09/22
- TVALR FOR LDACS DV SUBMITTED 10/2022

| Mar  |   |
|------|---|
| ari  |   |
| Apr. |   |
| May  | FINAL VALP SUBMITTED<br>30/04/2022  |
| Jun. | FIRST VERSION OF WHITE PAPER  |
| Jul. | 24/05/2022  |
| Aug. | <ul> <li>FLIGHT TESTS COMPLETED</li> <li>22/07/2022</li> </ul>                                  |
| Sep. | <ul> <li>LDACS DIGITAL VOICE VALIDATION</li> <li>Exercise completed</li> <li>09/2022</li> </ul> |
| Oct. |   |
| Nov. | ♦ PJ.33-W3-01A  |
|      | VALIDATION ACTIVITY FINALISED<br>30/11/2022   |

## OUTLOOK

Looking to the future, it is worth noting that we are on the final stretch of FALCO project. The completion of solution 1 and 2 is expected respectively on mid-2023 and end of 2022.

By that time, solution 1 will be focusing in analysing the outcomes of the performed validation exercises and finalizing accordingly the required reports and analysis. This phase is very crucial aiming to draw conclusions and recommendations about the work done within the project framework. Furthermore, the main challenge will be to deliver the data pack on time and to organise the maturity gate.

For the solution 2, a huge progress is achieved which made possible to plan the TRL4 Data Pack submission by end of November and to pass the maturity gate beginning of December 2022.

For both solutions, during the next period, there will be a focus on the dissemination activities through different means. Namely, different Open day are already planned for instance:

- NATS Open Day 30/11/2022
- DLR Open Day 12/12/2022
- FRQ Open Day 14/12/2022

These events will be held to communicate about the project outcomes and recommendations.

## **CONSORTIUM**



# ACKNOWLEDGEMENT



The PJ.33 FALCO Project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017479.