

Name of the exercise: EXE-06.01-002 'Free Routing operations in high complexity cross-border environment'

Date: 14th – 29th November 2018.

Location: CRIDA/ENAIRO Premises – Madrid.

Points of Contact: R. Garcia (r glasheras@e-crida.enaire.es), F. Ruiz-Artaza (fartaza@enaire.es), P. Calzon (pilar.calzon@ineco.com)



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Exercise Overview

EXE-06.01-02 is part of PJ06.01 Project – **Optimized traffic management to enable Free Routing in high and very high complexity environments** – funded by SESAR 2020 programme and led by DSNA. The exercise evaluated the V3 E-OCVM phase (pre-industrial development and integration) of performing structurally limited Free Route operations in high complexity cross-border ACC environment, with two distinct FDP (i.e. one Flight Data Processing, FDP, for each ACC from the same ANSP).

The exercise performed a **Real Time Simulation** that connected Barcelona and Madrid ACC to validate the processes and procedures for FRA cross-border, to be followed by Air Traffic Controllers, ATCos, in this complex environment.

EXE-06.01-02 provides information on how cross-border free route works in high complexity environments, its technical feasibility (i.e. interoperability with distinct FDP through OLDI adaptation) and its performance assessment (related to Fuel Efficiency, Predictability) including transversal areas (Human Performance, Capacity and Safety).

The Operational Concept behind

The scope of the solution focuses on needs regarding Separation Provision (Airspace), ATM Performance Management, Free Route Airspace Design, Coordination and Transfer and Collision Avoidance ATM Capabilities to enable Free Routing operations in upper airspace in high complexity cross-border environments, with minimum structural limits to manage airspace and demand complexity.

Free Routing technical and operational development will provide airspace users with significant opportunities to optimize their flights in line with individual operator business needs and/or military needs and therefore boost greener Air Transport operations.



The concept will increase Fuel Efficiency and Predictability with no negative impact on Safety and Capacity. The structural limits will be kept as a minimum and will be used to order flows that will allow to ensure that traffic remains manageable by ATCos.

Significance & Relevance

Exercise scenarios were built upon real traffic samples executed in Spain in July 2017. The traffic samples were adapted by Eurocontrol to the Free Route environment ECAC wide.

To simulate a cross-border environment between Barcelona and Madrid ACCs, two INDRA iTEC platforms, each one with its own FDP, were connected via OLDI adaptation (i.e. messages between ACCs not only interchanged with reference to published points).

The FDP of the platforms were adapted to exchange Free Route information and included advanced executive and planning controllers aid tools.

Staff involved

Staff from several disciplines have been involved in the planning and performance of the exercise:

- Concept experts from Enaire, Crida, Ineco, and Eurocontrol
- Technical experts from Crida and Indra
- Human Factors experts from Ineco, Crida, Skyguide, Enav, and Dsna
- Safety experts from Ineco
- Workload experts from Enaire and Ineco
- Pseudopilots from SENASA

ENAIRO Operational staff has been involved in the preparation and execution of the RTS exercise:

- Refining and developing the concept and procedures.
- One Dry run was performed in June, 12th to 14th with 4 controllers to verify the scenarios and define the mode of operation.
- 12 ATCos from Madrid and Barcelona ACC were involved in the RTS and gave feedback on the concept feasibility.

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Validation Scope

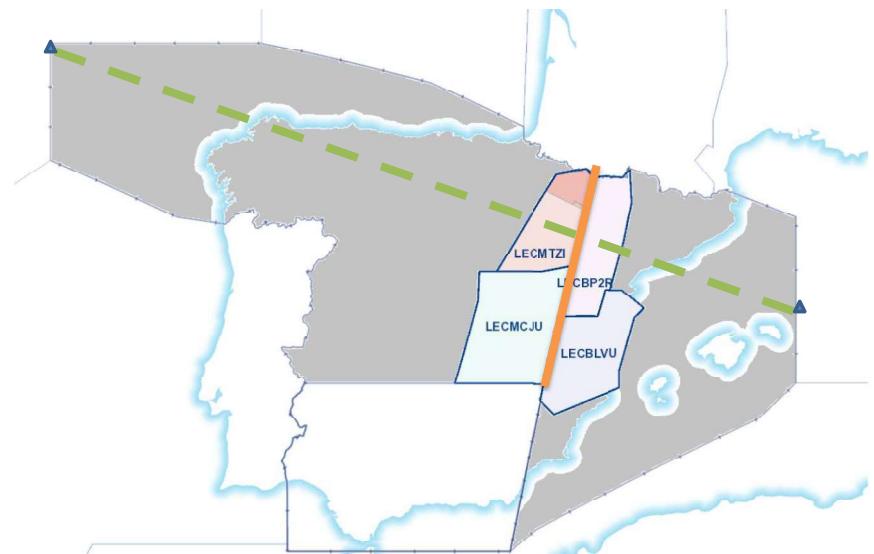
The exercise developed a Free Route Airspace that expanded along the ACCs of Barcelona and Madrid. The airspace included different types of published waypoints (structurally limited concept):

- for aircraft entering or leaving the Free Route airspace;
- intermediate waypoints to separate specific flows that otherwise would highly increase ATCos' workload.

The validation environment included adapted operational procedures, that took into account not only the lack of coordination waypoints between Madrid and Barcelona, but also the new airspace, the technical tools, and iTEC CWP.

The exercise evaluated two different types of technical support, one with basic MTCD, and another one with advanced MTCD for the planning controller and a tactical conflict detection tool for the executive controller. Conflict detection tools were optional for the concept towards PCP and for so, both aspects evaluated.

Apart from normal conditions in Free Route operations, the scenarios included runs that simulated the activation and deactivation of a military area, LED104, that impacted the two ACCs and three of the sectors under measurement, and a run with an increment of traffic up to STATFORD's 2022 forecast.



Simulated Scenario with one flight plan (in green) with only two defined waypoints (in blue) crossing the border between ACCs (in orange)

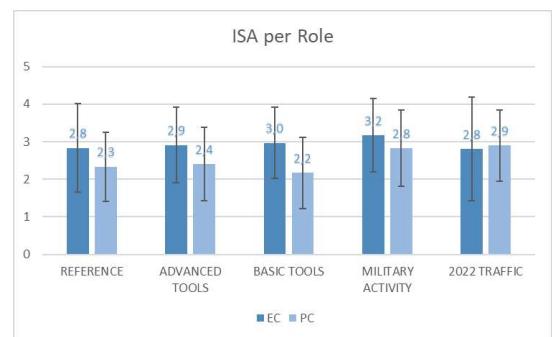
Validation Results

Controllers considered that managing the structurally limited free route operations in high and very high complexity environment, using an adapted set of ATC support tools (conflict detection tools/monitoring aids/etc.), is feasible. The implementation of FRA structures maintaining complexity within manageable limits allows to offer a better trajectory planning while keeping capacity and high level of safety. A sufficient organization of the flows (e.g.: separated arrival and departure flows) allow the ATCos to perform their task with effectiveness. In some cases this can require a new sector design, adapted to FR flows.

Performance benefits from the exercise:

Fuel efficiency is improved:

- AUs are able to plan shorter trajectories what allows to optimize the amount of fuel carried out (KEP improvement of up to 48%)
- Gains in CO₂/NoX emissions of 7.5% and fuel consumption reduction of 6%



Workload assessment in the simulated scenarios

Predictability is highly dependent on the airspace design and although the variance (difference between mean planned and executed flight times) is reduced, no final conclusions where achieved.

Safety and Capacity are maintained within acceptable limits even in this high complex environment where conflicts require higher workload to be solved. ATCos are more dependent of advanced ATC support tools but the work is more evenly distributed between planning and executive controllers.