

# Annex 1

## Rozas Airfield



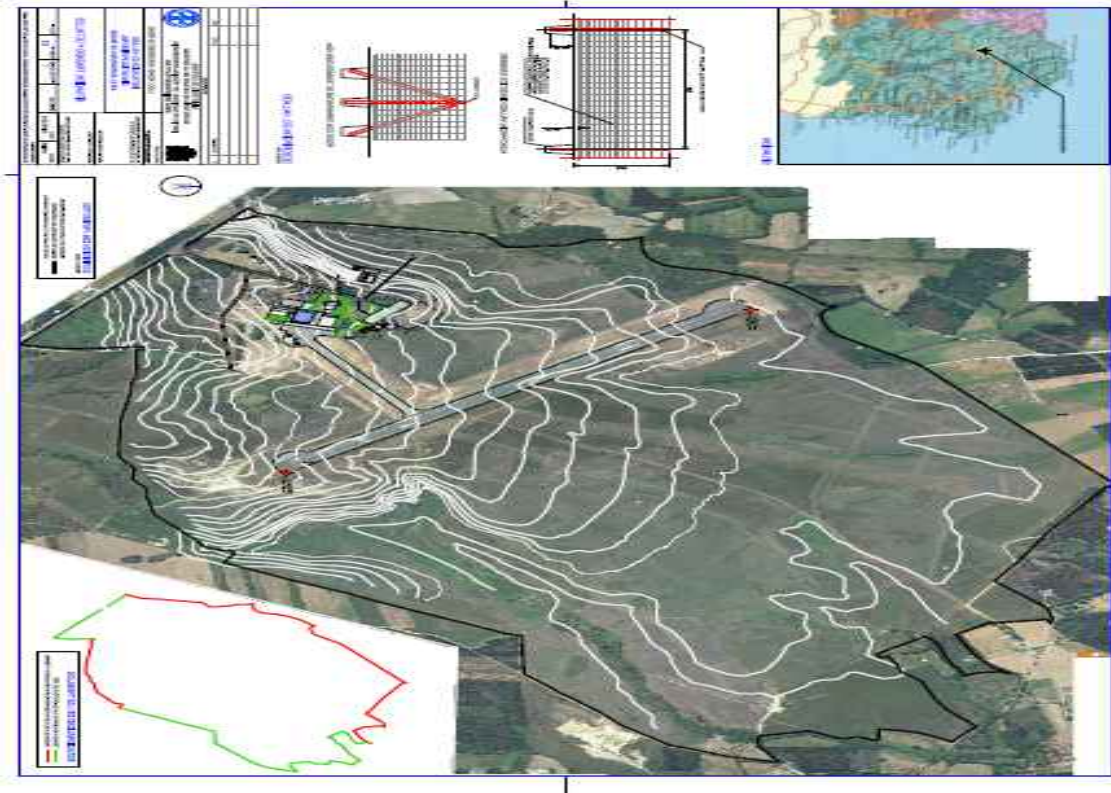
*Photo: Aerial view of the Rozas Airfield (Galicia).*

The Rozas Airfield is the main infrastructure around which the Civil UAVs Initiative has been developed. A research centre (CIAR) and an industrial park have been built within the actual airfield.

Located in the municipality of Castro de Rei, in the province of Lugo, 15.2 kilometres from the city of Lugo, the Rozas airfield was built in 1943. The airfield is now owned by the Ministry of Defence and its management is entrusted to INTA (National Institute for Aerospace Technology). The Xunta de Galicia signed two agreements with INTA, one for the creation and management of the CIAR and the other for the development of an Industrial Park.

Since 2015, the Rozas Airfield has been turned by the Xunta de Galicia and the INTA, in collaboration with the Ministry of Science and Innovation, into **a unique scientific-technological infrastructure dedicated to promoting R&D&I in**

**UAVs.** For such purpose own funds have been allocated together with European funds.



*Illustration: Perimeter of the Rozas Airfield (Galicia).*

Currently, a large number of unmanned aircraft (UAVs) are being developed or tested worldwide. These aircrafts need to pass certification processes, for which it is necessary to have infrastructures adapted to these characteristics and with a correct risk management that allow carrying out test flights in safety conditions. The existing infrastructures in most of the countries developing UAVs, however, are not adapted to meet the needs of these vehicles.



Within this framework, the **Rozas Combined Airborne Research Centre (CIAR)** has become a unique and pioneering infrastructure for conducting certified tests with unmanned aerial vehicles.

With an investment of **more than €10 million since 2015**, the CIAR is managed jointly by the Xunta de Galicia and the National Institute for Aerospace Technology (INTA) -the Spanish government's public research body and the main reference for aerospace R&D in Spain. It offers a service for testing airborne platforms and has advanced equipment making the CIAR one of the benchmark centres in this field at European level.

With its extensive and modern scientific equipment, as well as a control tower, mission control room and simulation centre, the CIAR provides companies and other organisations with a **unique infrastructure in Europe for testing** unmanned aerial vehicles (UAVs).

Rozas is an operating airfield, and therefore has all the necessary equipment for the safe operation of both manned and unmanned aircraft. It has a privileged location where UAVs can fly in a restricted space, enabling the necessary tests for the development of UAVs and the evaluation of flight campaigns carried out in an efficient and safe environment.

The airspace around the CIAR can be segregated, a special feature for the verification of RPAs, and with value-added services allowing the analysis of specific solutions required to be tested in the context of RPAs and UTM traffic management and their integration with ATM systems.

The corridor of segregated space extends up to a distance of 180 km and provides access to the Atlantic Ocean maritime space via the Lugo coastline.

The characteristics of the CIAR sensor equipment, together with the low saturation of the surrounding airspace and the ease and flexibility offered by



CIAR, in coordination with the Spanish aeronautical authority, represented by AENA, make it a very suitable environment for the execution of insertion testing in non-segregated airspace of unmanned heavy aircraft. Its characteristics include:

- A **Mission Planning System**. Before starting a mission, it is incorporated into the system, including geofences with other planned missions and restricted areas that can be configured as desired.
- An alert system against possible problems of real-time incursions to the defined geofences.
- A single point of control, where all the necessary elements for the tests and their supervision can be configured and activated.
- A flexible and agile system for capturing all the data required to be measured in the tests, their transmission, recording and distribution.

The CONTROL TOWER is the operational core of CIAR. There are three basic and essential stages for each operation:

- Operational Safety.
- Instrumentation.

Supervision of the operation of the CIAR user by INTA. Service provided to CIAR users to visualise the operation of their systems.

With this infrastructure, Rozas offers an integral and complete, innovative service for the performance of tests of Aerial Research Platforms, both manned and unmanned, tests and experimental works necessary to certify, qualify,



verify, standardise, integrate, test and research components, equipment, subsystems and systems.

The control tower includes the different work positions to cover the described needs, as well as all the necessary instrumentation and the man-machine interface. The infrastructure has been designed ad hoc, taking into account the particular features associated with monitoring an RPA system: the human factor does not disappear, but changes its role and also moves to the ground segment.

### **Flight safety and control system**

The **FLIGHT SAFETY AND CONTROL SYSTEM** is capable of guaranteeing safety (at a strategic and tactical level) in the experiments of both research and validation and certification of the ATM operational concept, so that it is possible to support the coexistence of different flights (all of them cooperative and with transponder [existence of Secondary Radar]) in which the aircraft transmit their position, identification and characteristics and the new Unmanned Air Traffic Management Services are validated.

Its elements include:

- **Tracking system:** automatic and flexible system, which includes the elements required to be able to receive (high angular rate of monitoring, possibility of receiving the signal of different frequencies simultaneously), to distribute, process, display and store on land and in real time all the information transmitted by the operating systems through radio frequencies for the S and C bands (with the possibility of being able to update and use other radio frequency bands not requiring drastic change



of the system) by automatically tracking the objective / objectives. In turn, this system allows the sending of already processed data over the network to any other system (s) efficiently.

- Control software: allows access to all system elements from a single configurable control point, in addition to displaying the desired information on any monitor with a friendly interface.
- Time base. A universal reference time base is available for all CIAR operations.
- **Omnidirectional antenna** with working capacity in both S-Band and C-Band.
- A **dual-axis automatic tracking antenna** with working capacity in both S-Band and C-Band.

The **security system**, functionally, responds to this detail:

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- It guarantees the safe planning of the missions to be carried out at a strategic level ensuring the minimum safety distance between aircraft coexisting in the same volume in which the different security functionalities of the future UTM system and their integration into the ATM system can be validated. The system is configurable to be able to adapt to the different separation criteria depending on the types of aircraft and missions to be performed. The CIAR considers that all aircraft are part of a system in which the Air Traffic Management Services allow to offer a safe and high-efficiency infrastructure operation.





- Information on air activity, both within and outside the centre, is provided at all times on the basis of the data transmitted in real-time by the aircraft. This information is processed to analyse adherence to planned missions and assess potential conflicts arising, considering relevant uncertainty factors.
- It allows the evaluation of the transformation of aircraft into intelligent agents that can communicate with each other using machine-to-machine interfaces in order to safely make the best use of existing airspace capacity. The tool, based on simulation, allows the evaluation of the capacity of the RPA developer's systems to guarantee the correct negotiation between the agents that constitute the ecosystem of aircrafts involved in situations that may affect safety. This, through an interoperable platform with the Decision Making system developed by the manufacturer/operator of the RPAs.
- It is able to provide the relevant data, metrics and indicators of the system that allow users to demonstrate and quantify the potential benefits of new services in terms of security, capacity and efficiency of UTM operations and their ATM integration. This guarantees a greater acceptance of the research results and the performance of demonstration activities necessary to build confidence in the effectiveness of the concepts.
- The infrastructure allows the monitoring of the development of the functionalities of the dynamic ATM through a system that provides intelligent supervision and analysis. It also allows the automation of the extraction of the sequence of events to avoid collision. The information generated allows us to offer a unique service at the European level to be able to debug the functionalities of ATM systems and ultimately offer certification services.



- It is able to identify security failures of both on-board systems and ATM system functionalities and evaluate different security indicators for CIAR users by analysing the impact of their tools on the state space.
- It is able to demonstrate and quantify the potential for the design of new on-board and land equipment of RPAs in terms of security, capacity and efficiency of ATM operations. This guarantees a greater acceptance of the research results and the performance of demonstration activities necessary to build confidence in the effectiveness of the concepts.

Roza's **COMMUNICATIONS SYSTEM** includes 5 control posts (modular, as needed in case future expansion is necessary). These are five control posts with basic voice communications capabilities for CIAR (with air traffic control, with other control centres, with land and air) and capable of evolving to extensive ground-to-air and ground-to-ground communications networks, having a system that allows them to access radio resources in a shared way, with control of privileges and also have a communication system with the other locations in the centre.

This system guarantees communications between the control room, operating platform and security, and between operations and technical control of instrumentation.

Finally, the CIAR includes a **WEATHER ON SITE SERVICE**, which is crucial for planning the flights of the different tests to be performed.

To carry out a correct planning of long-term flights, it is necessary to have a detailed knowledge of the meteorological conditions governing the region in each season of the year, being able to determine if they are suitable for a





particular flight. To achieve this objective, we must have access to historical meteorological data series and subsequently perform an analysis of them. The display and reception of these meteorological data is monitored at the Control Centre and at other locations of interest to the people conducting their test campaigns. The meteorological variables to be displayed are the standard for the flight of any aircraft. This system has coverage that allows covering from the Rozas Airfield to the maximum distance to which the tests will reach, limited in this case by the flight safety system 180 km and 360° coverage in Azimut depending on the terrain and flight level of the aircraft.

The specific system includes:

- Short-term prediction system (from 6 to 36 hours) according to the characteristics of the CIAR and its area of influence. Due to the need for general forecasting models and others more oriented at low atmospheric levels, two types of modelling have been installed, both operational and high resolution, capable of generating hourly outputs from a series of meteorological fields.
- System for observing the meteorological factors that most affect the planning of flights in CIAR: electric shocks, visibility, fog and low clouds, wind at ground level and even layers near the boundary layer, etc. For that, the Rozas Airfield has extensive instrumentation.
- A centralised data collection and visualisation station that allows the operator to estimate the weather risk for the purposes of CIAR.
- A data repository that stores the data of all observation systems and allows the post-process analysis of each meteorological variable that intervenes.