Innovation and R&D projects related to RPAS/Drones

ENAV's Innovation vision of RPAS/UAS/UAM/ATM-UTM according to ATM Masterplan

The ENAV vision on ATM-UTM integration and service delivery considers as a key milestone the integration of the wide variety of new aerial vehicles accessing the airspace alongside conventional manned aircraft.

The implementation of the vision is through U-space, a framework designed to fast-track the development and deployment of a fully automated drone management system, in particular for, but not limited to, very low-level airspace.

Scalable by design, U-space relies on high levels of autonomy and connectivity in combination with emerging technologies. Alongside U-space is the need to integrate large remotely piloted aircraft systems into manned traffic, with special provisions designed to compensate for the fact that the pilot is not on board the aircraft.

ENAV is involved into different projects and activities related RPAS/UAS domains at European and Italian level

Main topics in the ENAV research and innovation porfolio of initiatives:

- IFR RPAS integration in controlled airspace
- Urban Air Mobility/Advanced Air Mobility
- ATM/UTM integration
- UAS specific operations in U-Space at Very Low Level
- UAS cyber security aspects
- EGNOS civil application for RPAS

SESAR W3 PJ13 ERICA- Solution 117 IFR RPAS Integration

This SESAR solution will enable RPAS (Remotely Piloted Aircraft System) flying in IFR conditions to operate alongside manned aircraft in controlled airspace (Class A-C) completely transparently and without any additional mitigations. A long-term operational concept will be developed to address the issues of RPAS flight plan filing, to comply with ATC instructions, following clearances and dealing with emergencies in a manner that is both safe and operationally acceptable to ATC and does not introduce adverse effect on the ATM system.

Intended Benefits:

- Ensuring equitable access to the airspace to RPAS for IFR operations in A/C controlled airspaces (Terminal Manouvering Area and En-route operating environment)
- No reduction of the current levels of Safety and Human Performance

RPASInAir

In order to safely include RPAS in a non-segregated airspace the development of a modified air traffic management process is needed. The accomplishment of this objective goes through the definition of procedures, protocols and counter-measures aimed at managing new categories of critical events which are directly linked to the flight of remotely controlled aircrafts. The main objectives of RPASInAir are:

- Design and develop a laboratory for the simulation of air operations that allows to study, design, experiment and validate new rules, **procedures and air traffic control standards and design, validate and plan air operations and missions with remotely piloted aircrafts.**
- **Develop advanced air traffic control (ATC) functionalities and applications for the integrated management of an air traffic composed by unmanned vehicles.**
- Deployment of a data-center that collects, processes and manages Earth observation data and integrates those data with other sources in order to collect RPAS relevant information in real time
- Development of new sensors capable of detecting different sources of risk: hydrogeological risk, cryospheric risk and risk related to the presence of dust in the atmosphere (volcanic or coming from fires)
- **Test and demonstration of the systems developed in the project (SE, ATM, applications, sensors) in laboratory and real environments**

SESAR2020 VLD CORUS-XUAM

CORUS-XUAM is a two-year very large-scale demonstration (VLD) project that will demonstrate how U-space services and solutions could support integrated Urban Air Mobility (UAM) flight operations. These services should allow electric vertical take-off and landing vehicles (eVTOL), unmanned aircraft systems (UAS) and other airspace users (unmanned and manned) to operate safely, securely, sustainably and efficiently in a controlled and fully integrated airspace, without undue impact on operations currently managed by ATM.

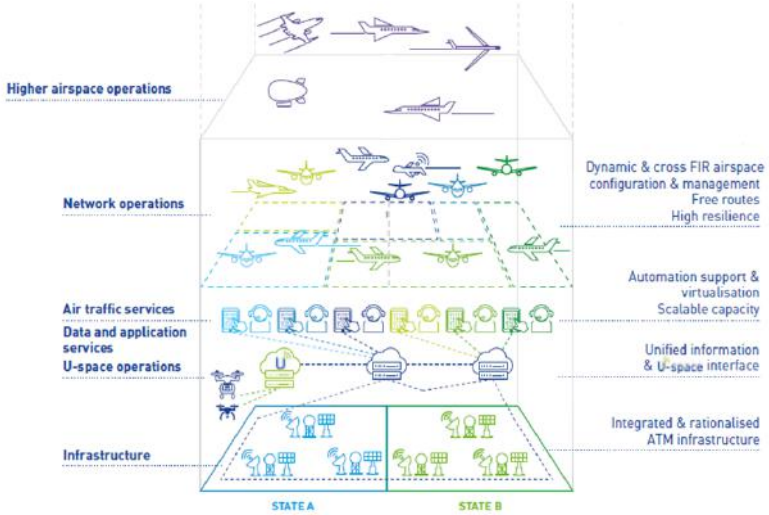
The activities will start with updating the U-space Concept of Operations to address the integration of UAM/UAS operations into the airspace, and identifying new U3/U4 services. This will be followed by the preparation and execution of six challenging demonstration campaigns in Belgium, France, Germany/UK, **Italy**, Spain, and Sweden.

ENAV leads the Italian UAM demo activity. Operational scenario: Taranto Grottaglie Airport TB

AURA - ATM U-SPACE INTERFACE

AURA, a SESAR W3 project, will identify the requirements for U-space information exchange with ATM through SWIM and will validate a set of selected U-space services, developing the service definition information for the SWIM candidate services. Secondly, it will define a novel Collaborative ATM-U-space Concept of Operations (ConOps) for drones in a fully collaborative environment with ATM that will go beyond the existing concepts developed for U-space and will validate these new concepts.

AURA project will contribute to enable the development of Very Low Level (VLL) markets, allowing the introduction of new actors in a safe, harmonized, sustainable and efficient manner, compatible with current ATM environment. The project will also contribute to avoid the segregation of the airspace and increase interoperability. AURA will provide inputs for the current regulatory and standardization initiatives regarding U-space with a high involvement of external stakeholders through an Advisory Board.



Validation activities are divided into 'clusters'. Each cluster is composed of several partners providing different platforms or operational expertise. All the clusters will follow a common approach, validating the collaborative interface ATM-U-space according to requirements jointly defined

REDOX Remote Early Detection of Xylella

The project aims to create a system for the identification of olive trees diseased by "*Xylella fastidiosa*" through remote sensing techniques from aircraft, **drone** and land surveys at the first onset of symptoms, making monitoring activities faster, more sustainable and more precise. As part of the project, tools and methods of aerial surveying and data processing procedures will be defined, standardized and tested at a prototype level, in order to create an integrated process that can underlie a continuous monitoring service of large areas, even tens of thousands of square kilometers as an entire region, with high levels of accuracy and reduced costs**. Specific U-Space services will support air operators (manned or unmanned) in the design, authorization and implementation of reconnaissance missions, favoring the maintenance of safety conditions both for airspace and commercial traffic and for land infrastructures**

- Large-scale monitoring through aerial platform surveys
- Monitoring on a more detailed scale through surveys carried out by drones capable of acquiring higher resolution data
- Terrestrial monitoring for the analysis of the single plant.
- Design and develop navigation services, to be provided through innovative air traffic management systems for 'unmanned' aircraft (UTM – Unmanned Traffic Management), and data analysis.

CRUISE: Cyber secuRity in Uas mIssions by SatellitE link

The integration of RPAS in a non-segregated airspace sets some real challenges related to cyber-attack risk assessment. Cyber-attacks to RPAS can affect safety of operations and airspace safety or, in the worst hypothesis, they can seriously injure people and damage property. CRUISE's intent is to design, develop and validate a CyberSec Test Range, a technological framework which sees Gottaglie Airport, as a privileged environment where the overall assessment on vulnerability and resilience of UAS with respect to cyber-attacks can take place. The CyberSec Test Range will set up a combination of services combining ICT systems, SATCOM and SATNAV services aimed at evaluating the overall vulnerability of UAS. This includes the analysis of flight platforms, on board avionics and payload sensors. Moreover, quality, consistency and integrity of data collected during VLOS, RLOS, BRLOS operations will be verified. The following categories of cyber-attacks will be subject to the examination:

- Hardware attacks – the hacker has direct access to the RPAS;
- Wireless attacks – the hacker uses wireless communication channels in order to attack command, control and communication systems;
- Sensor Spoofing – The hacker substitutes real data collected by the on-board sensors (i.e. receivers, vision, radar, sonar, LIDAR and IR sensors) with fake data.

THANKS FOR YOUR ATTENTION

CORPORATE PRESENTATION