Reality Check

Peter Alty outlines European efforts to push the U-space envelope with PODIUM

Recent visitors to Eurocontrol headquarters in Brussels, will surely have been impressed by the aviation 'hall of fame' in the corridors between the reception and the main meeting rooms.

The colourful wall-sized images of airlines, military, business and general aviation aircraft testify that Eurocontrol's main focus is to ensure that around 30,000 flights per day arrive safely at their destinations, with minimal delays, and with maximum efficiency.

While practically all the wall-sized images relate to manned aviation, there is also a striking image of a multi-rotor drone next to the Brussels Airlines Airbus A320 in a Tin-Tin 'Rackham' livery! An important reminder that Eurocontrol and its stakeholders take both the current and future implications of unmanned aviation very seriously.

For several years, Eurocontrol experts have held leading roles in working arrangements like the ICAO RPAS Panel and JARUS, preparing the way for the safe integration of large RPAS into conventional airspace. More recently, the Eurocontrol-led SESAR Horizon 2020 CORUS project has published the concept of operations for U-space, describing its longer-term vision for the integration of drones into the very low level airspace below 500 feet and possibly higher.

Eurocontrol also leads PODIUM which stands for Proving Operations of Drones with Initial UTM. The main aims of the project are to: demonstrate the use of U-space services and technologies in realistic operational environments; to assess their current maturity in terms of ease-of-use and benefits; and to provide recommendations relating to deployment, standards and regulation.

The main project partners are Airbus, Delair, Drone Paris Region, DSNA, Integra Aerial Services, Naviair, (Royal) NLR, Orange and Unifly. The project has performed a series of demonstrations throughout late 2018 and the first half of 2019 at five sites: Hans Christian Anderson airport; Odense; the Drone Paris Region cluster, Brétigny-sur-Orge; the Netherlands RPAS Test Centre, Marknesse; Groningen Airport Eelde; and Rodez-Aveyron Airport.

The SESAR Horizon 2020 PODIUM project presented its main conclusions and recommendations on U-space to an invited set of stakeholders at a dissemination event held at Eurocontrol in Brussels on October 17.

Discussing the project and sharing some of the key insights about U-space, Eurocontrol project coordinator Peter Alty believes that while the need for U-space solutions is clearly supported and pre-flight services appear mature, there is still plenty of work to do before U-space really takes off in the flight execution phase.

In practice, he says, they have found that the best way to explain U-space services and technologies is not to read a glossy brochure, but to actually use them 'hands on' in real situations.

Some of the main services PODIUM validated were: flight preparation services including E-registration, E-identification, automatic flight plan validation, automatic and manual flight permissions, and no-fly zone creation and flight execution services including drone surveillance and

tracking, generation of no-fly zones in flight, conflict detection/alerting, and the ATC collaborative interface.

Assumption

A key assumption regarding U-space is that the existing CNS-ATM infrastructure will not be able to cope with the high traffic levels foreseen for drones in the future. With this in mind, PODIUM used a range of tracking technologies including ADS-B 1090 MHz, GSM-based LTE and an ultra-narrow-band L-band technology developed by Airbus.

The core UTM systems were provided by Unifly including aeronautical, national and local legislation data and full suite of UTM services and human machine interfaces and Airbus which offered a fusion solution for multiple tracking inputs, and an integrated Controller Working Position. And Orange which did a great job with its Access Point Name, firewall and roaming connectivity solution, enabling the participants to make use of cloud-based UTM services in a seamless way.

"If you can't measure U-space, you can't improve it!" was the key message from the Eurocontrol validation experts. Right from the start, Eurocontrol and its partners were in full agreement that it really wasn't worth doing the project just to do a few showcase events with a set of VIPs in attendance. What was needed was some decent validation work which pushed the U-space envelope. Hence, Eurocontrol provided a team of validation experts including specific expertise in human performance, safety and security.

The project performed 18 operational scenarios for VLOS and BVLOS flights, involving 73 actual demonstration flights and 138 flight authorisation workflows, at the five sites in Denmark, France and the Netherlands. Drone operators, air traffic controllers and nominal U-space supervisors were involved throughout the project. Further to familiarisation flights and mock-ups in late 2018 and early 2019, the bulk of the flights were performed in the April-June period. Five public days attended by local stakeholders were also held at each of the sites. ▶

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Following the SESAR Horizon 2020 PODIUM project which was designed to address the future regulations overseeing drone traffic, **Delair** delivered its own recommendations to support a safe, standardised and efficient airspace for large numbers of drones.

It says working towards a EU level regulatory framework with a clear roadmap aligned to a European aviation strategy will be critical for the drone industry's future.

Throughout 2019, PODIUM partners performed real demonstrations of visual-line-of-sight (VLOS) and beyond-visual-line-of-sight (BVLOS) flights at different locations within Europe.

In France at the Rodez-Aveyron Airport, Delair's played its role:

- as a **BVLOS-certified drone manufacturer** to develop changes to the drone hardware in order for the drone to transmit its position, in real time, to air traffic controllers.
- as a **drone operator** to perform the flight and ensure drone pilots were able to communicate with controllers working in the tower, via a collaborative UTM (unmanned aircraft system traffic management) interface developed by Airbus.

Delair UAVs are latest-generation fixed-wing drones, designed and built in France. These autonomous aircraft can be used for a variety of large area imaging, mapping, monitoring and maintenance tasks which were not previously practical, secure or even possible with other traditional or airborne approaches.

Delair's systems are among the first civil drones in the world to receive the required certification for BVLOS operations and its advanced expertise in flying fixed-wing technology under BVLOS in France has resulted in the company actively participating in governmental regulation drone programmes in both Europe and the US.

Delair says it is important to maintain a distinction between the drone operator and the drone manufacturer to clearly and properly separate responsibilities. This is currently done in France, but not at European level where the responsibility usually lies with the operator. The drone operator usually doesn't know the detailed design of the system and is not capable of answering technical questions.

Delair systems have been distributed across the world in thousands of units, which have flown over two million kilometres. However, it only has five pilots, so its experience as an operator is very different. As an operator, it identified critical challenges to address:

- **efficiency** Currently in France, airspace is segregated between drones and manned aircraft. Drone operators must declare their flights in advance, but different hazards may lead to inefficient use of the airspace and more costly operations. Tools such as those developed during the PODIUM project will help increase the efficiency of the operations by allowing better airspace sharing between different users.
- **adopted standards for air traffic controllers** Each air traffic controller has a different opinion regarding drones, and due to the lack of rules their bias can sometimes dictate their reaction. It leads to uncertainty for the feasibility of each operation. Furthermore, the method of interacting is different each time. As a takeaway from the PODIUM demonstration at Rodez, Delair says it strongly recommends integrating the interface between the air traffic controller with the drone pilot's GCS, in order to have a direct and standardised communication between the pilot and the controller, allowing for the development of standard rules and communication.
- **scalability at international level** In order to scale U-space operations and services in an efficient manner, Delair says it is important to adopt standards at EU and international levels. Drone operators should rely on the same rules and procedures wherever they fly. This is key to the rapid and mass adoption of drone-based solutions by businesses across Europe – and globally.

The project collected validation data from 41 post demonstration questionnaires completed by participants; five facilitated de-briefing sessions; and observations from Eurocontrol validation experts and partners.

Dissemination

The PODIUM project reviewed its main conclusions on U-space maturity and deployment recommendations with an invited stakeholder group in Brussels in October. "From a consortium perspective, it was very reassuring to hear that the feedback from the participants confirmed the main findings in the demonstration report," says Alty.

Examples of feedback featured the following comments:

- "I need to work with six authorities to get approval for a BVLOS flight in Denmark." Brad Beach of UAS Denmark.

"The way that ATC handles drones is very unpredictable; there is a real lack of harmonisation in Europe." Bastien Mancini of Delair.

- "I can't use 'see and avoid' to spot a drone when I'm on duty in the tower – the Airbus solution really helps me to see the Delair drone on the screen." Charles Dournel, an air traffic controller at Rodez-Aveyron airport.
- "Identify benefits for the users and they will pay for it!" Jean-Philippe Bonhomme of the Drone Paris Region cluster.
- "I found the supervisor role for the unexpected scenario very challenging. You need an automated system and rules to cope with multiple drones." Jasper van der Vorst of the Netherlands RPAS Test Centre.
- "The conflict detection alerts showed up intermittently, and we weren't sure how best to react." Janus Bill Andersen of Integra Aerial Services.

Alty says the feedback from the participants in Denmark, France and the Netherlands was fairly consistent.

Groning Airport Eelde Tower

"They definitely see the potential benefits, they are confident in the pre-flight services leading to more efficient authorisations but they still have questions about the flight execution phase. Many of them see EASA's work on the high-level regulatory framework for the U-space as an important opportunity to facilitate a harmonised approach in Europe."

Conclusions

The full conclusions and recommendations feature in the demonstration report which was published on the SESAR Joint Undertaking website in late November. Here's a summary of its main findings:

PODIUM concludes that there is a very strong demand from all stakeholders for U-space solutions to ease the burden of obtaining flight authorisations. That could increase situational awareness to enhance safety and efficiency benefits during flight execution. The project concludes that while U-space services for the pre-flight phase are practically ready for deployment - albeit with a number of remarks - significant action is still needed to ensure that U-space services can really take-off in the flight execution phase.

In particular, PODIUM makes a number of recommendations for U-space deployment, stressing the need to:

- ensure that U-space/UTM systems provide drone operators with access to trustworthy and up-to-date aeronautical, national and local legislation data/rules;
- involve drone operators/manufacturers, air traffic controllers and supervisors in the design of the U-space/UTM human machine interface;
- determine the areas of operation for which drone tracking is required, and define the minimum standards for the trackers i.e. accuracy, availability and RF interoperability;
- determine the rules for the safe handling of drone traffic with manned aviation, especially for BVLOS flights in uncontrolled airspace.

Unifly's Dennis Bollen explains the data challenge.

Alty points out that it is important to keep in mind that PODIUM is one of several large scale demonstration projects for U-space that are being performed within SESAR. The SESAR Joint Undertaking will consolidate the main findings of PODIUM and the other projects, in order to prepare a consolidated set of conclusions and recommendations for U-space at a 'programme' level.

"Thanks to PODIUM, we have had the opportunity to work with a number of innovative drone manufacturers and operators - they are providing amazing solutions in areas like surveying, inspection, surveillance and delivery," says Alty. "One thing is for sure, sooner or later, we can definitely look forward to some new images of drones on the Eurocontrol aviation wall of fame!" ATM