

Tartu U-space sandbox Vision Document

U-space sandbox is part of the unmanned aviation ecosystem and test environment in Tartu, supporting the implementation of U-space in Estonia in accordance with EU Implementing Regulation 2021/664¹. We have a vision of developing a wider test environment for climate neutral aviation technologies, where the Tartu region offers opportunities for the development and testing of unmanned aviation and new technologies on a wider scale. U-space sandbox is part of that test environment, serving as an integration platform for U-space and validation platform for the national aviation authority.

1. U-space sandbox serves as a core part of the test environment for broad-based development and deployment of unmanned aviation technologies. Under the leadership of the Transport Administration who takes on the role of the Competent Authority, the unmanned aviation test site, which will be established by 2024, is used by companies and other stakeholders that need special conditions for safe testing of their smart technologies, use cases and business models, as well as companies that want to develop solutions supporting U-space implementation. The creation of the U-space sandbox is led by a working group in which aviation-related institutions and companies participate in cooperation. During the development and implementation of the U-space sandbox, other problems related to the concept of unmanned aviation will also be solved, including:

- defining the roles and responsibilities of U-space stakeholders in the implementation of U-space in Estonia, in alignment with the EU Implementing Regulation 2021/664;
- establishing conditions for the research and development of innovative aviation concepts and technologies, including safety standards, and for the safe and secure testing of automated, autonomous and networked aviation systems;
- advancing the operational concept of interoperable U-space, integrating manned and unmanned air traffic in shared airspace (to comply with the requirements of EU Implementing Regulation 2021/666²).

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32021R0664&from=EN#d1e897-161-1>

² <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32021R0666&from=EN>

2. Estonia as a forerunner of digital innovation and ICT is a key enabler of creating a future aviation ecosystem. The development of unmanned aviation test environment and U-space sandbox supports the ambition of becoming an **international aerospace innovation hub** that:

- enables local companies to enter the market with new technologies supporting digital and smart mobility;
- offers foreign companies favourable opportunities to locate their R&D activities to Estonia and advance the deployment of scalable solutions;
- creates prerequisites for closer networking regarding R&D activities of Estonian research and educational institutions in cooperation with unmanned aviation companies, leveraging on the ICT and start-up sector expertise.

3. The implementation of the test environment as a complex functional platform is first carried out through the realisation of the Tartu U-space sandbox, gradually evolving from a test area for unmanned aviation to an aerospace innovation hub for enabling R&D of various new aviation technologies:

- Enabling UAS test site with U-space sandbox (initially with a limited scale of services) as an integration and development platform for the stakeholder groups interested in testing the technologies and use cases in the early stages of development, before reaching full functionality;
- A functional U-space sandbox is tested and implemented initially with the aim of supporting national U-space implementation and providing common information services (Common Information Service, CIS) with support from at least one U-space service provider (USSP);
- Development and testing of the ATS (air traffic service) coordination mechanism that meets the requirements of Implementing Regulation 2021/665³;
- Identifying and analysing the ways of establishing U-space airspace with the Competent Authority and regulator and testing use cases to outline necessary requirements and conditions regarding U-space airspace, which create a better understanding the issues that may arise with the implementation of U-space in Estonia;
- Safety and risk analysis is performed together with the Competent Authority to establish safe and secure operating conditions of the test site and U-space sandbox from the perspective of flight safety and airspace management;

³ <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32021R0665&from=EN>

- Further additions to initial U-space sandbox configuration and development of the test environment would take place in accordance with the maturity level of the tested functionalities and in directions that consider the regulatory framework as well as the requirements and needs of the stakeholders.

4. U-space performance requirements established by the Competent authority and regulator drive the evaluation of how the functioning and operation of the U-space sandbox are further developed:

- enabling U-space services and service providers to comply with the requirements set forth in the established regulations concerning the U-space legal framework and the course of national implementation of U-space;
- enabling compliance to safety and performance requirements for UAS operators to participate in test area activities and, if necessary, to align and validate operations and solutions in the U-space sandbox.

5. Performing safety analysis at each stage of development of the test area and U-space sandbox in coordination with the Competent Authority ensures that the R&D and testing activities taking place in the U-space sandbox are safe for the people and the environment within its limits. It is also relevant to create conditions for the UAS operators, following the established rules, to have confidence in their safety while performing testing and validation activities in the U-space sandbox. In addition, such a test environment supports the validation of developed solutions through a U-space regulatory platform, which enables the Competent Authority to perform their certification, coordination and oversight activities (i.e., tasks according to EU Implementation Regulation 2021/664, Article 18). Thus, **the U-space sandbox serves as an integration and a regulatory platform for U-space, enabling fast-tracking the end user access to U-space.**

In addition to supporting national U-space implementation in Estonia, the U-space sandbox and test environment for aviation innovation should provide opportunity and conditions for the companies and other stakeholders to develop and test the use cases and business models that are scalable, enabling economic benefits for new sectors. **EU Drone Strategy 2.0**⁴ has stressed the importance of regulatory sandboxes and living labs to support member states and their municipalities to take initiative in regional planning of urban and rural areas and creation of

⁴ https://transport.ec.europa.eu/system/files/2022-11/COM_2022_652_drone_strategy_2.0.pdf

dedicated infrastructure (e.g., accommodating vertiports or take-off and landing sites) for enabling Innovative Air Mobility to advance. Public participation in regulatory sandboxes, living labs and demonstrations should be encouraged to include local/regional aspects in the final decision regarding **Innovative Air Mobility** (IAM) deployment. Therefore, the envisioned test environment should advance U-space implementation as an enabler for the IAM ecosystem to flourish and realise business ambitions of companies to bring innovative, safe and scalable products and services to market.

Definitions:

U-space - the regulatory framework for organising European unmanned air traffic according to EU Implementation Regulation 2021/664

Test areas - an area defined by specific airspace and ground for performing test flights

Test environment - test area together with the necessary digital and ground infrastructure, hangars, laboratories, 5G, etc.