Valsts aģentūra
"Civilās aviācijas aģentūra"

LGS
LATVIJAS GAISA SATIKSME

“IMPLEMENTATION OF THE UNMANNED AIRCRAFT MANAGEMENT AND MONITORING SYSTEM” DEVELOPMENT PROJECT

FINAL REPORT

UNMANNED AIRCRAFT MANAGEMENT AND MONITORING SYSTEM CONCEPT

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Content

Definitions

In order to ensure consistency with the legal framework of the European Union (hereinafter – EU) and the results of the CORUS project co-financed by EU Research and Innovation Framework Programme *Horizon 2020*[1], the following definitions and abbreviations are used in this document:

(A) "unmanned aircraft" (hereinafter – UA) means any aircraft operated or constructed for the purpose of autonomous operation or remote piloting without a pilot in the aircraft;

(B) "unmanned aircraft system" (hereinafter – the UAS) means an unmanned aircraft and equipment control it remotely;

(C) "unmanned aircraft system operator" (hereinafter – the UAS operator) means any legal or natural person, operating or planning to operate one or more UAS;

(D) "UAS geographical zone" means a part of the airspace defined by a competent authority to facilitate, restrict or prohibit UAS operations in order to prevent risks related to safety, privacy, personal data protection, security or the environment arising from UAS operations;

(E) "UA management and monitoring system" means a set of methods, processes, resources and solutions that facilitate the implementation of secure UAS operations, including coordination with manned aviation;

(F) 'visual line of sight operation' ('VLOS') means a type of UAS operation in which, the remote pilot is able to maintain continuous unaided visual contact with the unmanned aircraft, allowing the remote pilot to control the flight path of the unmanned aircraft in relation to other aircraft, people and obstacles for the purpose of avoiding collisions;

(G) "beyond visual lime of sight operation" (hereinafter – BVLOS) means a type of UAS operation which is not conducted in VLOS;

(H) "persons not involved" means persons who do not participate in the operation of the UAS or who are unfamiliar with the instructions or security measures provided by the UAS operator;

(I) “aircraft model club or association” means an organization legally established in a Member State for the purpose of conducting leisure flights, air displays, sporting activities or competition activities using UAS;

(J) “direct remote identification” means a system that provides for the local transmission of information on the operated unmanned aircraft, including the marking of the unmanned aircraft, so that this information can be obtained without physical access to the unmanned aircraft;

(K) “geo-awareness” means a function which, on the basis of data provided by Member States, detects a possible breach of airspace limitations and alerts remote pilots so that they can take immediate and effective action to remedy the breach;

(L) maximum take-off mass’ (‘MTOM’) means the maximum Unmanned Aircraft mass, including payload and fuel, as defined by the manufacturer or the builder, at which the Unmanned Aircraft can be operated;

(M) “aeronautical information management” (hereinafter – AIM) means the dynamic, integrated management of aeronautical information services through the provision and exchange of high quality digital aeronautical data in cooperation with all parties;

(N) “U-space” means a UAS geographical zone defined by Member States in which UAS operations are permitted only with the support of U-space services;

(O) “U-space service” means a service that is based on digital services and automation of functions and designed to support the safe, not endangered and efficient access to the U-space airspace by a large number of UAS;

(P) “manufacturer” means any natural or legal person who manufactures a product or arranges for this product to be developed or manufactured and places this product on the market under their name or trademark;

(Q) “distributor” means any natural or legal person in the supply chain, other than the manufacturer or the importer, who makes a product available on the market;

(R) “making available on the market” means supplying a product for distribution, consumption or use on the Union market in the course of a commercial activity for payment or free of charge;

(S) “open” category” means an UAS operation category as defined in Article 4 of Implementing Regulation (EU) 2019/947;

(T) “specific” category” means an UAS operation category as defined in Article 5 of Implementing Regulation (EU) 2019/947;

(U) “certified” category” means an UAS operation category as defined in Article 6 of Implementing Regulation (EU) 2019/947.

1. Introduction

During recent years, the unmanned aircraft systems (UAS) industry has developed rapidly and the number of operations and types of unmanned aircraft (hereinafter – UA) used has increased. These makes it necessary to address security and safety issues during UA operations, as well to integrate the use of airspace. At an early stage it became clear that the use of UAS could be cost-effective in many industries and their use scope is very wide.

Currently, the use of UAS is regulated by both international, European Union (hereinafter – EU) and national legal acts and by some technical and technological regulations. However, considering the diversity of existing technical systems and the different approaches used by EU countries, it is necessary to determine UAS operations management system which should be implemented in Latvia. Latvian "Civil Aviation Agency" (hereinafter - CAA) within the framework of the Operational Program "Growth and Employment", action "Sustainable Transport System" specific support objective "to promote safety and compliance with environmental requirements at Riga International Airport" is implementing the Project "Implementation of an unmanned aircraft (UAS) management and monitoring system". Project was launched in 2021 and the task of the Project is to create a monitoring system for UA, which will ensure the availability and interoperability of all services related to UA management in the e-digital environment. The implementation of the system will improve environmental and security measures at Riga International Airport (hereinafter – RIX) and Liepaja International Airport (hereinafter – LPX), as well as security in the airspace of the Republic of Latvia (hereinafter – Latvia).

In order to reasonably and sustainably develop the UAS management system in Latvia this Concept (hereinafter – the Concept) was prepared that describes the possible way for the development of such system.

1.1 The need of the Concept

In order to systematically develop UAS operations management in Latvia and to perform their further successful integration into the general air traffic, a mid-term vision must be developed. It will support more efficient use of available financial and human resources and should reduce possible threats or collisions in the airspace of the Republic of Latvia. Although the general direction of development of the field of UAS is described in the EU's planning and

guidelines documents, not all the options offered are necessary for implementation in each Member State, as national airspaces differ in terms of configuration, traffic volume and specific national regulations. This Concept is a step to create a national, common framework for the development of the field of UAS.

1.2 About the Concept preparation

The development of this Concept consists of several stages, in which experts from the CAA and the State Joint-Stock Company "Latvijas gaisa satiksme" (hereinafter – LGS) was involved, who exchanged their views on both planned structure and the content of the document.

During Concept preparation, previous studies have been considered, namely, the "Recommendations for the Integration of Unmanned Aircraft in Latvia" (2018–2019), the Eurocontrol and CAA "Riga Airspace Assessment" (2019), final report of the International Civil Air Navigation Services Organisation (CANSO) on the use and development of UAS operations in Europe (2022) and conclusions and recommendations from the stakeholder's meetings organized by the CAA.

During the Concept development an online surveys and interviews with Latvian stakeholders were conducted. Two stakeholder's focus groups were organized to exchange ideas and identify future needs in the field of UAS operations. Also, the interviews with the world's leading IT solution developers in the field of UAS management were conducted. The set of data obtained was used as the basis for UA monitoring and system model creation, which allows UAS users, CAA and other stakeholders to request and receive services in user friendly manner and digitalized way, while complying with the set of requirements contained in the regulatory framework.

This Concept is based on currently available information on the legal framework, technological capabilities in both the operations and management of UAS. The conclusions, solutions and planned activities contained in this document may be modified or changed as a result of the development of new conceptual solutions and technologies or due amendments of the regulatory framework.

1.3 The main goal of the Concept

The main goal of the Concept is to provide a proposal for a management system that would facilitate the further safe and integrated implementation of UAS operations in the airspace of the Republic of Latvia. The Concept provides the first steps and a vision for how UAS operations could be organized, structured and managed.

This document proposes the basic structure, i.e. framework of the UA monitoring and management system model, which will allow stakeholders to develop services and solutions in the field of UAS, including if a decision is made to implement U-space concept in Latvia.

1.4 Concept Objectives

The Concept objectives are to:

- describe the vision for the gradual further development of UAS operations for low altitude flights (this document mainly deals with UAS operations in the open and specific category (see 4.1.3));
- identify the parties involved in the UA management and monitoring system, their roles and responsibilities;
- identify problematic issues in the field of UAS in Latvia and provide proposals for their solution;
- identify services supporting UAS operations;
- identify the needs of the parties involved;
- promote the safety, security, privacy and environmental protection during UAS operations;
- describe the possible flow of basic information for the coordination and execution of UAS operations;
- provide an action plan for the implementation of the Concept.

1.5 Expected results of the Concept

The following main results of the Concept are expected:

- a vision of UAS operations with adequate access to a widely used resource (airspace) without threatening flight safety is described;

- an approach to the further safe implementation of UAS operations in Latvian airspace is structured;
- a description of the possible structure and functions of the UA management and monitoring system model (hereinafter – the Conceptual model);
- measurable targets for safety, security, privacy and environmental protection are set;
- the monitoring goals of the UA management and monitoring system are defined.

The Concept must find answers to the following questions:

- How should UAS operations be organized so that they do not threaten the manned aviation security?
- What is needed to be able to take the necessary monitoring and control measures?
- What (support) services are needed in the field of UAS?
- What data exchange is required to facilitate UAS operations without threatening security, safety, and privacy?
- What is a possible Conceptual model?
- What are the possible steps for further implementation of the Concept?
- What issues shall be addressed separately for the successful development of UA management and monitoring system?

1.6 Methods of achieving the goals

In order to achieve the above goals and objectives, actions must follow from the conceptual basic elements set out in the EU regulations and guidelines of the European Aviation Safety Agency (hereinafter – the EASA), and national requirements. In addition, systematic, coordinated and continuous work by stakeholders is needed to achieve the goals set. The areas of development outlined in this Concept will need to be transposed into specific projects for which action plans for the implementation of procedures and technologies are set out.

1.7 Expected benefits

Following the implementation of the Concept, the following benefits are expected:

1. a clear and structured vision of the UA management and monitoring system, taking into account the needs of the parties involved;

2. created preconditions for the conduct of integrated UAS operations in the airspace of the Republic of Latvia;
3. safer and more streamlined UAS operations, including reducing threats for flight safety;
4. more convenient and one-stop services available in e-environment for UA remote pilots and UAS operators;
5. simplification and optimization of the parties involved in the UA monitoring and management system as a result of automated data exchange;
6. improved access of law enforcement authorities to information on UAS operations for the performance of supervisory and control functions specified in regulatory enactments.

1.8 Assumptions, risks and restrictions

This Concept provides a vision for the future development of the field of UAS. How the UAS will evolve depends on many variables, for example, the requirements of the applicable regulatory framework, the availability of resources, the interests and involvement of UAS users. This chapter highlights the most important considerations that have been taken into account in drafting this document.

Assumptions:

- The EC, the EASA and the International Civil Aviation Organization (hereinafter – ICAO) will prepare legislation and guidelines in accordance with the current needs and level of development of the field of UAS;
- All necessary resources and support of stakeholders will be available for implementation of the Concept;
- The Concept will be supported and taken into account by national policy makers when preparing medium-term planning documents;
- Stakeholders in the field of UAS will be actively involved in the implementation of the Concept.

The following restrictions were taken into account during the preparation of the Concept:

- The Concept applies to those UAS that can operate in the open and specific category;

- The Concept only covers those UAS operations that do not intentionally threaten or lower the level of security, safety, privacy or harm the environment.

The risks associated with the implementation of the Concept are listed in Table 1.1.

Table 1.1

Risks associated with the implementation of the Concept

Area of risk	Description	Risk mitigation measures
Regulatory framework risks	The solutions proposed in the Concept have not yet been represented in regulatory enactments.	• Analysis and timely improvement of regulatory framework.
Necessary human resources	Lack of qualified personnel for implementation of the Concept.	• Personnel professional development activities; • Outsourcing; • Attracting external resources.
Financial risks	Lack of funding for the implementation of the Concept.	• Effective use of existing solutions and systems and available resources; • Prioritizing the implementation of solutions; • Timely identification of additional external financial resources.
Technical and technological risks	Wrong choice of technology or emergence of the latest solutions.	• Exchange of experience and participation in research projects; • Comprehensive evaluation of the proposed solutions, involving technical and operational personnel.
Integration	Problems with system interconnection.	• Pre-implementation market research on potential solutions; • Gradual development of systems; • Mutual coordination between the parties involved.

2. Regulatory framework

The regulatory enactments in force in the Republic of Latvia in the field of aviation are drafted following the international standards and the recommended practices of the ICAO (in 19 annexes to the Convention on International Civil Aviation of 7 December 1944 (hereinafter – the Convention) and the EU regulatory framework in force.

2.1 International law

Latvia has acceded to the Convention since 1992, so that Latvia is bound by the Convention, its annexes and the manuals issued on the basis thereof, but they are not directly applicable, therefore, their application must be provided for in the regulatory framework.

In 2005, consultations were launched with Member States and international organizations on the inclusion of UAS operations in civil airspace in order to understand the procedures needed to prevent threats to civil aircraft and to enable international UAS operations. Over the years, several studies have been conducted on both the necessary regulatory framework of UAS, including the need for standards and regulations, and the technical regulations for UAS operations. The ICAO Informal Meeting in 2007 defined the role of ICAO in the development of strategic guidelines, with this document to be used as a basis for the development of regulations by different countries and organizations in an effort to achieve the most harmonized regulatory framework possible.

At the 40th Session of the ICAO Assembly in September 2019, Member States emphasized the importance of reviewing and improving the technical, economic and legal aspects of UAS. In the light of the above, ICAO expert groups are continuing their studies to develop rules based on them that will facilitate the safe and efficient integration of UAS into airspace and aerodromes, while maintaining the existing level in the field of aviation. The results of this activity are currently parts 101, 102 and 149 of the ICAO Model UAS Regulations. ICAO regulations and advisory documents offer Member States a common understanding of how to implement or supplement existing UAS regulations, but their application must be provided for in national regulatory enactments.

2.2 European Union law

Given the rapidly evolving development of UAS technologies, the need for a secure environment for the deployment of UAS services is increasing in order to reduce and avoid the risks associated with the use and deployment of this technology. Consequently, the responsible institutions of the EU are working intensively and constantly improving the regulatory framework in order to minimize the risks and at the same time use the opportunities offered by UAS technologies.

As a first major step related to the operation of UAS, the first strategy adopted by the EC in 2014 to open up the European market for remotely piloted aircraft systems (RPAS), i.e. for the use of UA for civilian purposes, should be noted. Recognising the significance of UAS in the future transport and logistics environment, as well as their potential with respect to new cargo delivery services and other innovative applications, and taking note of the added value of UAS in the achievement of the decarbonisation targets, the EU concluded that establishing a regulatory framework is an important and necessary step in order to create a well-functioning, reliable and safe environment needed to develop a competitive EU's UAS services market. Therefore, already in 2015, based on the Riga Declaration on Civil RPAS (Drones), the EU included in its aviation strategy the need to develop a basic regulatory framework for safe UAS operations in the EU's territory, as well as to develop detailed rules and industry standards. The aim of this strategy is to support the development of UAS in Europe, while addressing security, safety, privacy and environmental issues, and it is regularly updated to assess progress and set new priorities.

In 2017, the EU Joint Undertaking Single European Sky ATM Research (hereinafter – SESAR) presented its vision for the secure integration of UAS in airspace based on the SESAR study "European Drones Outlook Study" published in 2016. At the same time, an expert working group began its work in 2017 to advise the EC and help implement measures that can facilitate and accelerate the integration of UAS in airspace by creating an appropriate operating environment for them, including an operational infrastructure and support system.

On the basis of the preparatory work, Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing the EASA, and amending Regulations (EC) No. 2111/2005, (EC) No. 1008/2008, (EU) No. 996/2010, (EU) No. 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No. 552/2004 and

(EC) No. 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No. 3922/91 (hereinafter – Regulation 2018/1139) extended the competence of the EU to all UAS, regardless of their weight and size, and is also referred to as the Basic Regulation. Regulation 2018/1139 is the main regulation that gives the EC and the EASA legal competence to regulate civil aviation in Europe. The Basic Regulation lays down the context as to how implementing and delegated regulations are drafted, as well as how requirements of regulatory enactments are stipulated and what is regulated and supervised, or will be regulated and supervised in the future, by the EU. The EASA undertook to develop detailed rules and regulatory framework foundations for UAS operations.

These activities have laid the foundations for the first unified set of rules related to UAS operations, which was adopted by the EC in 2019 and which entered into force in 2021, replacing national regulatory framework and creating a unified European market for UAS services. From 1 July 2019, a set of rules consisting of two separate but interconnected regulations enter into force:

1. Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft (hereinafter – Regulation 2019/947) or the Implementing Regulation;
2. Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and operators of third country unmanned aircraft systems (hereinafter – Regulation 2019/945) or Delegated Regulation.

The Implementing Regulation sets out the categories and subcategories of UAS operations, rules and procedures for risk assessment, certification, determining the level of competence of remote pilots, registration of certified UAS and UAS operators, operating conditions for UAS geographical zones and other specific rules related to UAS operations. In turn, the Delegated Regulation sets out, for example, the technical requirements for UAS to operate in all operation categories, the responsibilities of UAS manufacturers, importers and distributors, including the conformity assessment of products, UAS classes and their requirements and other rules.

In accordance with Article 76 (3) of Regulation 2018/1139, EASA is required to issue certification specifications and other detailed specifications, acceptable means of compliance and the application of delegated and implementing acts adopted on the basis thereof. In order to fully ensure the unified and correct application of UAS regulatory framework, the EASA

develops, publishes and supplements with amendments the guidelines, i.e. the "Acceptable Means of Compliance (AMC) and Guidance Material (GM)"[2] (hereinafter – AMC&GM), which provide additional information regarding certain issues included in the Regulations.

On 22 April 2021, the EC adopted a regulatory framework for the U-space, providing that most of the regulatory requirements will apply from 26 January 2023:

- Commission Implementing Regulation (EU) 2021/664 of 22 April 2021 on a regulatory framework for the U-space (hereinafter – Regulation 2021/664),
- Commission Implementing Regulation (EU) 2021/665 of 22 April 2021 amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace (hereinafter – Regulation 2021/665),
- Commission Implementing Regulation (EU) 2021/666 of 22 April 2021 amending Regulation (EU) No. 923/2012 as regards requirements for manned aviation operating in U-space airspace (hereinafter – Regulation 2021/666).

This set of regulations is considered to be a key prerequisite for facilitating the implementation of increasing numbers and complexity of UAS operations in a safe and efficient manner, especially in the environment or parts of the airspace where UAS are used alongside manned aircraft. The EASA, in collaboration with stakeholders, develops and improves guidelines, thus providing support to the industry and competent authorities in the introduction and implementation of U-space.

Regulation 2019/947 introduces 3 elements: registration, geo-awareness and remote identification, which will form the basis of the U-space system, i.e. basic services.

In the Sustainable and Smart Mobility Strategy, the Commission has announced its plan to adopt a new strategy in 2022 (Drone Strategy 2.0). The aim of this initiative is to create a new, sustainable service and transport offer, using digitalisation and automation, while ensuring the interaction between civil and military technologies.

Due to the fact that the field of UAS is new and still in the stage of development, the EU regulation is often changing, it is being amended, which affects the national regulation, the course of its development and the frequency of changes.

2.3 National law

The uniform EU level regulatory framework is applied at the national level from 2021 to promote the development of UA while taking into account the risks related to flight safety, security, privacy and environmental aspects.

In order to comply with the procedure for UA flights to be performed in the territory of the EU, appropriate changes have been made in the regulatory framework at the national level and in July 2021, several regulations of the Cabinet of Ministers entered into force, as well as amendments to the Law on Aviation.

At the national level, the regulatory framework in the aviation industry is set by the Law on Aviation adopted on 5 October 1994 and the Cabinet of Ministers (hereinafter – the Cabinet) regulations issued on the basis of that Law, as well as the Cabinet regulations necessary to enforce the EU law in cases when the respective issue is not governed by law.

As of 1 January 2021, a new Section 11.1 (UA and their Systems) has been included and entered into force, as well as a new Section 124^1 "Administrative Offences in the Field of Unmanned Aircraft" has been added and accordingly the references in Section 125 "Competence in the Administrative Offence Proceedings" have been clarified in the Law on Aviation. The administrative offence proceedings are performed by the CAA, the Military Police (hereinafter – the MP), the State Police (hereinafter – the SP), the municipal police (hereinafter – the MP), the State Border Guard (hereinafter – the SBG) or the Consumer Rights Protection Centre (hereinafter – the CRPC) depending on the offence, in the cases specified in the said Law.

The Cabinet regulations in force at the time of preparation of the Concept, which introduce the field of UAS in the context of the EU regulatory framework, determine:

- the procedure for the acquisition and supervision of the status of recognized entities (Cabinet Regulation No. 374 of 15 June 2021 "Procedures for the Acquisition and Supervision of the Status of Recognized Entities") (hereinafter – Cabinet Regulation No. 374);
- UA flight regulations (Cabinet Regulation No. 429 of 29 June 2021 "Unmanned Aircraft Flights") (hereinafter – Cabinet Regulation No. 429);
- regulations on compulsory civil liability insurance for UA flights (Cabinet Regulation No. 447 of 29 June 2021 "Regulations regarding Compulsory Civil

Liability Insurance for Unmanned Aircraft Flights") (hereinafter – Cabinet Regulation No. 447);

- regulations of the register of UA, UAS operators, remote pilots and aircraft model clubs and associations (Cabinet Regulation No. 457 of 29 June 2021 "Regulations of the Register of Unmanned Aircraft, Unmanned Aircraft System Operators, Remote Pilots and Aircraft Model Clubs and Associations") (hereinafter – Cabinet Regulation No. 457);
- the procedure for certification and supervision of specific category UAS operators (Cabinet Regulation No. 437 of 29 June 2021 "Procedure for Certification and Supervision of Specific Category Unmanned Aircraft System Operators") (hereinafter – Cabinet Regulation No. 437);
- remote pilot qualification regulations (Cabinet Regulation No. 436 of 29 June 2021 "Remote Pilot Qualification Regulations") (hereinafter – Cabinet Regulation No. 436);
- UA flights within the framework of aircraft model clubs or associations (Cabinet Regulation No. 627 of 14 September 2021 "Regulations on Unmanned Aircraft Flights Organized by Aircraft Model Clubs or Associations") (hereinafter – Cabinet Regulation No. 627).

These regulations must also be considered in conjunction with the Cabinet Regulation No. 26 of 12 January 2016. "Procedures for Airspace Management, Structure of the Airspace and Procedures for Change Thereof" (hereinafter – the Cabinet of Ministers 26), as well as with the procedure for reporting occurrences in civil aviation (Cabinet Regulation No. 634 of 3 November 2015 "Procedures for Reporting Occurrences in Civil Aviation") (hereinafter – Cabinet Regulation No. 634).

When drafting legislation at the national level, it is important to take into account the fact that the EU regulation is changing, i.e. it is being amended, which affects the national regulation and the course of its development and the frequency of changes.

2.4 Policy planning documents

The Development Planning System Law stipulates that the Sustainable Development Strategy of Latvia (hereinafter – the SDSL) 2030 is the hierarchically highest long-term

development planning document within which the set State long-term development objectives, priorities and spatial development perspective are being implemented by pursuing the underlying development policies of industries and territories, for example, the National Development Plan, industry policy guidelines and short-term plans.

The SDSL was approved by the national parliament (Saeima) on 10 June 2010. The SDSL outlines the main long-term tasks of the State and the society towards a common goal – a balanced and sustainable development of Latvia.

The SDSL Priority 4 "Innovative and Eco-efficient Economy", which focuses on a culture of mass creativity and efficient entrepreneurship. Its lines of action "User-driven Innovation" and "Innovative Entrepreneurship" focus on adapting and creating new services and products that meet the needs of customers and consumers. The technological development of UAS is focused on the development of innovations and services, where UAS is used to provide operations in both the private and public sectors (for example, land surveying, site inspection and maintenance, security measures). There are several companies operating in Latvia that make a significant contribution to the development of both new products related to UAS and the products and services needed by customers and the companies themselves.

One of the goals of the SDSL Priority 6 "Spatial Development Perspective" is to strengthen the international competitiveness of Latvia and its regions by increasing the international role of Riga as a Northern European metropolis and other largest cities of the country. This priority also covers the development of air traffic, with particular emphasis on the development of airport infrastructure in order to promote the strategic role of Latvia and especially the RIX in the creation of a European level air hub. When analysing the SDSL, it can be concluded that the field of UAS is not considered as one of the directions of national economy and economic development.

The National Development Plan of Latvia for 2021–2027 (hereinafter – NDP2027) lays down the largest State budget investments in the development of Latvia and the improvement of people's life quality in Latvia over a period of seven years. This includes the national development priorities, objectives and investment directions, as well as the planned reforms and policy changes.

NDP2027 is more specific in the defined lines of action and their objectives. The objective of the line of action "Technological Environment and Services" stresses the importance of a sustainable transport system in the economy, also underlining the importance

of transport and logistics services in the competitiveness and economic growth creating preconditions for the development of other sectors and attraction of investments, leading to significant income from export services and thus having a positive impact on the overall development of the country.

It seems the Transport Policy Guidelines for 2021–2027 (hereinafter – TPG2027) are the policy document which should have the most direct views about the importance of UAS and the integrations thereof in the transport system and airspace of Latvia. TPG2027 explains that the development of UAS production has created new opportunities for the provision of new services and creates more and more new ways to use them, which may pose a threat to airspace users and population. Accordingly, in order to reduce the potential impact of UAS on aviation security and flight safety, while not hampering their use to meet different national economy needs, measures must be taken by 2027 to integrate them into the air traffic control system. In order to implement it, TPG2027 envisages the implementation of measure 2.3.4. "Integrating unmanned aircraft in the air traffic control system". When evaluating the defined connection of this measure with the tasks of NDP2027, it can be concluded that in the context of NDP2027, the UAS are seen as a technology, digital solutions and services (result 241 of NDP2027 line of action: - Providing a competitive and open regulatory framework for the future technologies (including introduction of digital solutions in the information exchange among both the entrepreneurs themselves and between State and local government authorities)) and not a participant of the airspace that has a significant impact on the safety and security of air traffic.

Taking into account the above, when evaluating the industry policy guidelines, it can be concluded that the National Industrial Policy Guidelines for 2021–2027 (NIP2027) and the Smart Specialization Strategy (RIS3) do not highlight UAS technologies and their use as a line of research or innovation development. In turn, the Regional Policy Guidelines for 2021–2027 define the concept of smart local government ecosystem, the aim of which is to create an environment in cities and the functional territories thereof for the development of smart solutions (products for the provision of new services or for the improvement of existing ones, including with a potential of export). For example, innovative mobility solutions – UA in the transport system for the transport of goods, use of e-mobility, etc. The planned result of the line of action is to increase the competitiveness of Latvian enterprises by promoting the creation and introduction to production of products and services with a high added value.

2.5 Requirements of legislation for State information technologies systems

The establishment of the information system of the UA management and monitoring system must take into account most of the requirements, which, among other things, provide that it must be connected/integrated with other State information systems. At the subsequent stages of project implementation, it is necessary to perform a detailed assessment of the applicable requirements depending on the planned structure of the UA monitoring and management system, the data to be stored and the interfaces to be developed. When determining the requirements for the information and communication technology infrastructure that will ensure the operation of the UA monitoring and management system, the requirements of regulatory enactments regarding information technologies must be taken into account: The framework of regulatory enactments in force opens up the possibility of creating convenient, available and easily accessible services.

3. Studies

In order to create a structured and analytical framework of regulatory enactments and a common governance framework for the development of UAS, stakeholders have conducted studies and organized meetings to determine the framework and steps to be taken in the development of the framework of regulatory framework and the organization of other related processes.

3.1 Study "Recommendations for the integration of unmanned aircraft in Latvia"

In 2018, the study "Recommendations for Unmanned Aircraft Integration in Latvia" was undertaken, the final results of which were published in May 2019. The main task of this study was to prepare a list of recommendations to support UAS operations. The study was conducted by organizing information sessions, analysing the information gathered and preparing recommendations.

The study was initiated and implemented by the CAA. The following public and private sector stakeholders participated in the study and provided recommendations: the Ministry of Transport, the Ministry of Justice, the Ministry of Defence, the Ministry of the Interior, the National Armed Forces (hereinafter – the NAF), the Customs Board of the State Revenue Service, the Prison Administration, the State Police, the State Fire and Rescue Service (hereinafter – the SFRS), LGS, RIX, the Latvian Association of Remotely Piloted Aircraft Systems (hereinafter – the LARPAS).

The study consists of five parts:

- general and basic rules;
- public information and awareness;
- financial support for law enforcement, military and security entities;
- UAS security;
- air navigation services, air traffic services (hereinafter – ATS) and communications.

The result of the study is a structured list of recommendations, opinions expressed by various institutions, identified shortcomings in the regulatory framework related to the field of UAS.

According to the authors, although most of the recommendations made have been taken into account in developing the current framework of regulatory enactments for UA, a number of recommendations, in particular those concerning the technologies to be used and their conditions of use, ease of use of services and comprehensibility of information, have not been implemented or have been partially implemented, for example, related to convenient conditions of operations beyond visual line of sight (hereinafter – BVLOS) or obtaining information online. It may be possible to implement some of the recommendations in the near future, for example, public involvement and awareness-raising measures. In turn, recommendations related to the conditions for the use of airspace restricted zones, for example, the coordination of UA flights with restricted zone owners or managers, should be implemented through the UAS geographical zones and the digitization of flight coordination processes. At the same time, a number of recommendations still remain relevant and shall also be implemented outside the scope of this Concept, for example, the mutual coordination between security authorities.

3.2 Eurocontrol "Riga Airspace Assessment"

On 1 December 2019, Eurocontrol published the "Riga Airspace Assessment" report[3]. This can serve as a basis for future airspace design and integration of UAS operations in the Riga Air Traffic Control Area (hereinafter – RIGA CTR) and the surrounding airspace.

Preparation of this report was initiated and coordinated by the CAA with the support of Eurocontrol. The following organizations actively participated in the development of the project: LGS, AS Air Baltic Corporation, RIX, the National Armed Forces, the State Border Guard, Freeport of Riga, AS Latvijas valsts meži, AS Sadales tīkli, VAS Elektroniskie sakari, local governments above territories of which RIGA CTR is (Riga, Jurmala, Olaine, Marupe, Kekava, Babite, Jelgava, Carnikava, Garkalne), the LARPAS, "Air Training group" Pilot School, SIA GM Helicopters, SIA Aviastars, "TMG" Pilot School, "ERIVA" Pilot School, aerodrome "Lidosta Spilve" and Riga City Municipal Police.

The main task was to get a complete picture of the volumes of airspace available for use. This was done through a detailed analysis of the manned aviation operations, the infrastructure available, the existing restrictions, the societal aspects and the associated risks.

A huge amount of data was collected and analysed to prepare requirements for the safe integration of UAS operations in airspace with general aviation. The study was the first major step on the path from airspace assessment to airspace design. Eurocontrol experts analysed how

different airspace users operate in RIGA CTR airspace. Air traffic controllers, pilots of commercial airlines, representatives of general aviation, UAS operators and other parties not involved in aviation were interviewed.

The analysis includes all manned aviation operations, air navigation information publications (hereinafter – AIP), all inbound and outbound flights and restricted flight airspace. These data were compiled to define the volumes of airspace in the RIGA CTR where safe UAS operations would be possible and which parts of the airspace should be restricted for various reasons, for example, flight safety, security, privacy and environmental considerations.

The report can continue to be used at the expert level to prepare requirements for the further development and implementation of U-space, for example, for creation of UAS geographical zones, U-space services, etc. This is necessary to ensure that the planned changes do not adversely affect current operations.

3.3 CANSO study

When preparing version 2.0 of the Drone Strategy, the International Civil Air Navigation Services Organisation (CANSO) commissioned a study on the use and development of UAS in Europe. The final report was presented to CANSO members on 24 February 2022.

The study was carried out by a number of consulting companies and universities, which allowed a wide range of respondents to be covered, for example, State authorities, air traffic control entities, the military entities, UAS operators, airports, international organizations, etc. A total of 198 surveys of organizations/agencies/associations, as well as 30 interviews were conducted in the study.

The study was conducted on the following topics:

- European UAS ecosystem, value chain and business models;
- regulatory enactments;
- technology building blocks;
- system resilience and UAS-violators;
- airspace options: U-space development and integration with air traffic control;
- development of air transport in the urban environment;
- Public support and addressing external issues;
- knowledge development, personnel training and competence building;

- response to the goals and planned actions of the EC.

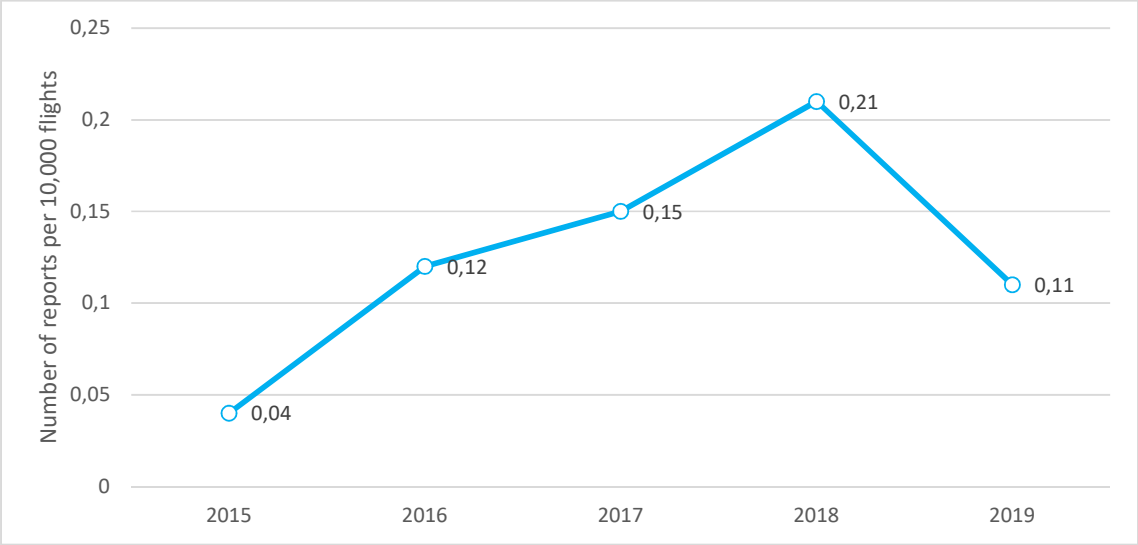
Some of the results of the study will be covered in Chapter 4.2.1 "Development forecast", but some of the most important conclusions are as follows:

- there are still unresolved issues in the field of UAS and the requirements are considered to be complex;
- a transitional period is needed to allow public authorities to prepare for the application of the provisions of the regulations;
- it is necessary to strengthen the capacity of public authorities that issue permits and to strengthen the management system in the field of UAS;
- technological solutions are needed to improve UAS operations;
- standards need to be developed to promote economic activity and interoperability;
- creation of universal civil-military equipment/systems could reduce costs for both parties by increasing production capacity;
- the majority of respondents (89 %) indicated that privacy should be a priority, and 85 % agreed that regulatory measures should ensure that UAS are compatible with EU privacy law;
- the majority of respondents (89 % agree or strongly agree) indicated that UAS services will have an impact on skills and that new learning offers adapted to smart mobility should be made available;
- participants in the study suggest that the EC set up an expert group to define and guide the knowledge development process.

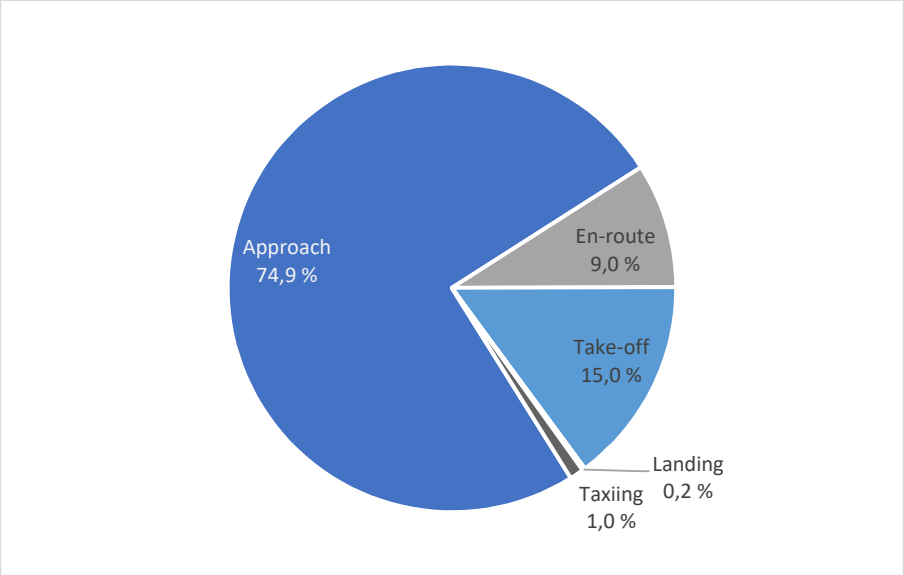
3.4 Issues to be addressed in the interaction between UAS and manned aviation

UAS flights undoubtedly also affect manned aircraft. The most dangerous stages for manned aircraft are take-off and landing. This means that UAS operations near aerodromes can be a real threat to human lives and valuable equipment. For these reasons, when creating the UA management and monitoring system, increased attention should be paid to UAS operations in the vicinity of aerodromes. There are cases registered worldwide when non-coordinated UA flights pose safety risks to manned aviation. These data are included in occurrence reports, which are not publicly available information.

In May 2021, Eurocontrol published the EVAIR bulletin (EUROCONTROL voluntary ATM incident reporting) No. 22 for calendar years 2015–2019. The collected data show that there is a tendency to increase the number of occurrence reports involving UAS (3.1).



3.1 Fig. **UAS related air traffic occurrence reports**[4]



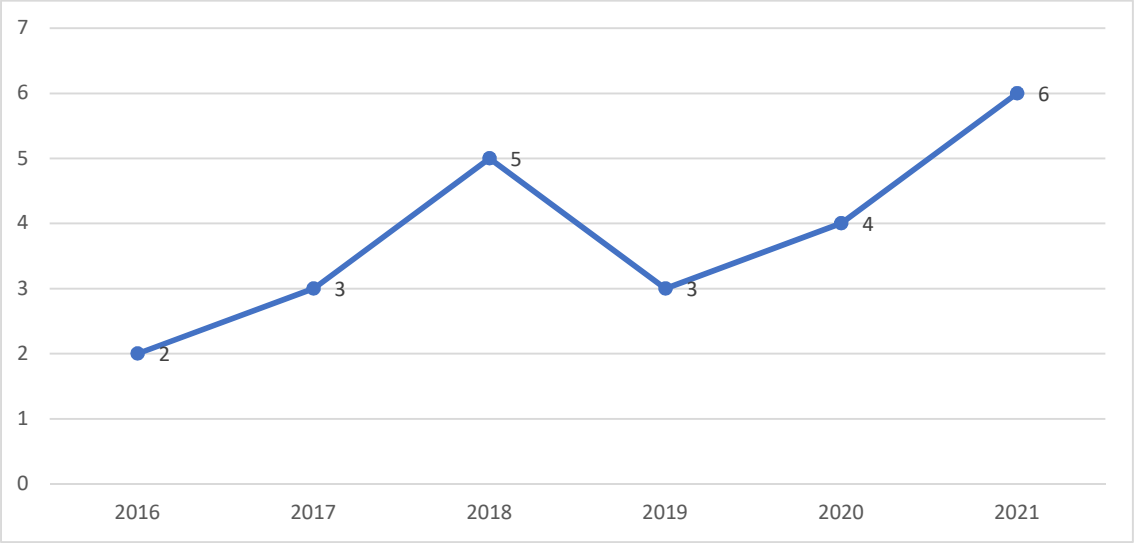
3.2 Fig. **Number of reports on observed UA in the vicinity of manned aircraft**

Latvia, as an EU Member State and part of the common European air navigation network, is facing a similar situation. Assessing the situation compared to manned aviation, in the author's opinion, the main reasons could be the following:

- no direct communication for data transfer between UAS operators and air traffic control (hereinafter – ATC);
- it is not possible to identify UAS using traditional radar-based systems;
- The flight path of UAS changes rapidly and is unpredictable;
- The number of UAS operations is growing very fast. It is not possible to provide traditional air traffic management (ATM) for this category of operations with traditional methods, as this causes overload of the air traffic management system and reduces both capacity and safety in general.

This means that in order to improve security and safety management in the vicinity of aerodromes and in contact with manned aviation, solutions and UAS signal receiving systems provided for this purpose need to be developed, establishing coordination and exchange of information with air traffic control to the extent necessary.

According to the information provided by the CAA, the number of occurrences in civil aviation in Latvia involving UA has increased in recent years (3.3).



3.3 Fig. **Number of occurrences in civil aviation in Latvia involving UA**

In assessing the impact of the UAS occurrences on manned aviation, a serious incident occurred on 2 May 2020, when control of UA weighing more than 25 kg was lost, should be noted. This UA flew on an unknown trajectory, resulting in the closure of part of the airspace and the RIX[5].

On 21 November 2021, the air traffic controller received a report from the pilot of the aircraft about UA taking off three kilometers from the airport in an area where such flights are not allowed, which resulted in a 30-minute suspension of air traffic to and from the RIX for safety reasons, delaying the landing of three aircraft and the take-off of four aircraft. [6]

Such incidents cause damage to the manned aviation industry, creating safety and security threats, as well as delaying the landing of aircraft, resulting in negative effects on the environment.

3.5 Survey on the field of UAS in Latvia

During the preparation of the Concept, an online survey was conducted to find out the respondents' views on the following topics in the field of UAS: current situation assessment, availability of information, digital services, aircraft model clubs and associations, State UA, access to data registers, UAS geographical zones, remote identification, privately built UA and their operations, extraordinary and emergency situations. UAS operators, remote pilots and other stakeholders in the field of UAS participated in the survey. In addition, interviews were conducted with stakeholders in the field of UAS to discuss the current situation and vision for development of the field of UAS. Representatives from Latvijas mobilais telefons SIA, Aviation Department of the Ministry of Transport, the CAA, VAS Latvijas valsts meži, the State Security Service (hereinafter – the SSS), the State Police, RIX, the Military Police, the State Border Guard, the National Armed Forces, UAV Factory SIA, Fly vision SIA, Metrum SIA, the LARPAS, DHL Logistics Latvia SIA, AS Augstsprieguma tīkls, Prison Administration, Riga Technical University, the State Fire and Rescue Service participated in the interviews.

As part of the preparation of the Concept, online meetings have taken place with leading developers of UAS operations support tools: Airmap, AltitudeAngel, DroneRadar, Frequentis, R-SYS/ERA, Unifly, whose products are widely used in at least one country, which serves as evidence that these companies have experience in developing UA monitoring and management

systems or their individual components. The products covered are user registration and accounting systems, UAS operations planning and management solutions.

The most important problems and concerns raised that should be solved in the development of the UA management and monitoring system are security and safety, remote pilot skills and knowledge, restrictions, information, control and monitoring, UAS signal receiving devices, application for flights, regulatory framework, browser, privacy, coordination, system (single IT solution), specific category, remote pilot culture, equality and others. Possible solutions to these problems and concerns and their impact are discussed in Section 4.1.6.

The assessment of the current situation shows that stakeholders in the field of UAS are interested in developing and strengthening the UAS management and monitoring system. The most important aspects of the field differ for each of the parties due to their role in the overall UA monitoring and management system. Namely, UAS users want more freedom to implement UAS operations (including a simple and fast process for coordination UAS operations), while authorities performing public administration functions and supervisory authorities in the field of UAS are interested in and need access to information on all UAS operations (including real-time and historical data) as well as additional information on the operators of these operations.

4. Description of the field of UAS

4.1 Current situation

4.1.1 Stakeholders in the field of UAS

During the study, it was found that many stakeholders have different roles depending on when and what functions they perform. For example, the UAS geographical zone manager may change its role when it starts using the UAS to perform its functions, in which case it becomes the UAS operator and/or remote pilot. Similar examples can be applied to many other situations. However, basic roles are specified in regulatory enactments.

Table 4.1

Stakeholders and their role in the field of UAS

Stakeholder	Role, function or interaction with UAS
Ministry of Transport	The Ministry of Transport is a direct public administration authority responsible for the development of transport sector policy, including in the field of UA management, development of policy planning documents and draft legal acts and, accordingly, forwarding them for review and approval to the Cabinet of Ministers and the Saeima, representation of State interests and cooperation with the EU and international organizations.
Other ministries	The line ministries are involved in their respective areas of competence in accordance with the above on the link with the policy planning documents, within the framework of civil-military cooperation, as well as ensuring national security functions.
CAA	The CAA, as a supervisory authority in the field of aviation safety and security, performs the tasks and ensures the processes required by the EU and national regulatory framework. The CAA ensures the implementation of the requirements of the EU regulations in the national regulatory enactments, educates and provides information to the public on the field of UAS, performs the safety monitoring of unmanned aircraft flights. According to Section 6 of the Law on Aviation, it also conducts administrative offence proceedings according to Section 125 of the Law on Aviation.
Military Police	The Military Police is a combat support unit that ensures the protection of the President, the protection of invited foreign officials and representatives of international organizations, accompanies military columns and guards military cargo, prevents and stops offences in military units and facilities to be guarded, conducts pre-trial investigations and ensures security at

Stakeholder	Role, function or interaction with UAS
	the venues of military events; as well as, in accordance with its competence, conducts administrative offence proceedings regarding offences in the field of UA in military facilities used by the National Armed Forces for the performance of tasks specified in the National Armed Forces Law and in airspace structure elements established for the needs of the National Armed Forces in accordance with Articles 6 and 125 of the Law on Aviation.
State Police	The State Police protects the interests of individuals, society and the State in cooperation with people and organizations, observing the principles of the rule of law and neutrality. The State Police ensures public order and takes responsibility for the internal security of the State, promotes the restoration of legal regulation in the field of violations of law, performs control over UA flights in connection with the observance of public order and security, as well as, in accordance with its competence, conducts administrative offence proceedings regarding offences in the field of civil aviation security and UA in accordance with Articles 6 and 125 of the Law on Aviation.
Municipal police	The municipal police are an authority established by the local government, which ensures public order. The responsibilities of the municipal police include: prevention of offences, response, in accordance with its competence, to applications regarding possible offences and events, control over compliance with binding regulations of local governments, for the violation of which administrative liability is provided, support for the State Police and the State Security Service in guaranteeing public safety and combating crime, etc., as well as ensuring administrative proceedings regarding offences in the field of UA in accordance with Article 125 of the Law on Aviation.
State Border Guard	The State Border Guard is a State authority, the main task of which is to guard the State borders of Latvia and which, in accordance with Article 6 of the Law on Aviation, performs control over UA flights in infrastructure facilities used for the needs of the State Border Guard and in the airspace structure elements established for the needs of the State Border Guard, as well as conducts administrative proceedings regarding offences in these facilities in accordance with Article 125 of the Law on Aviation.
CRPC	The CRPC is a supervisory authority that organizes and performs supervision of UAS and remote identification devices entering the EU market, as well as market supervision regarding UA systems and UA operators of third countries in accordance with Article 117^{11} of the Law on Aviation.

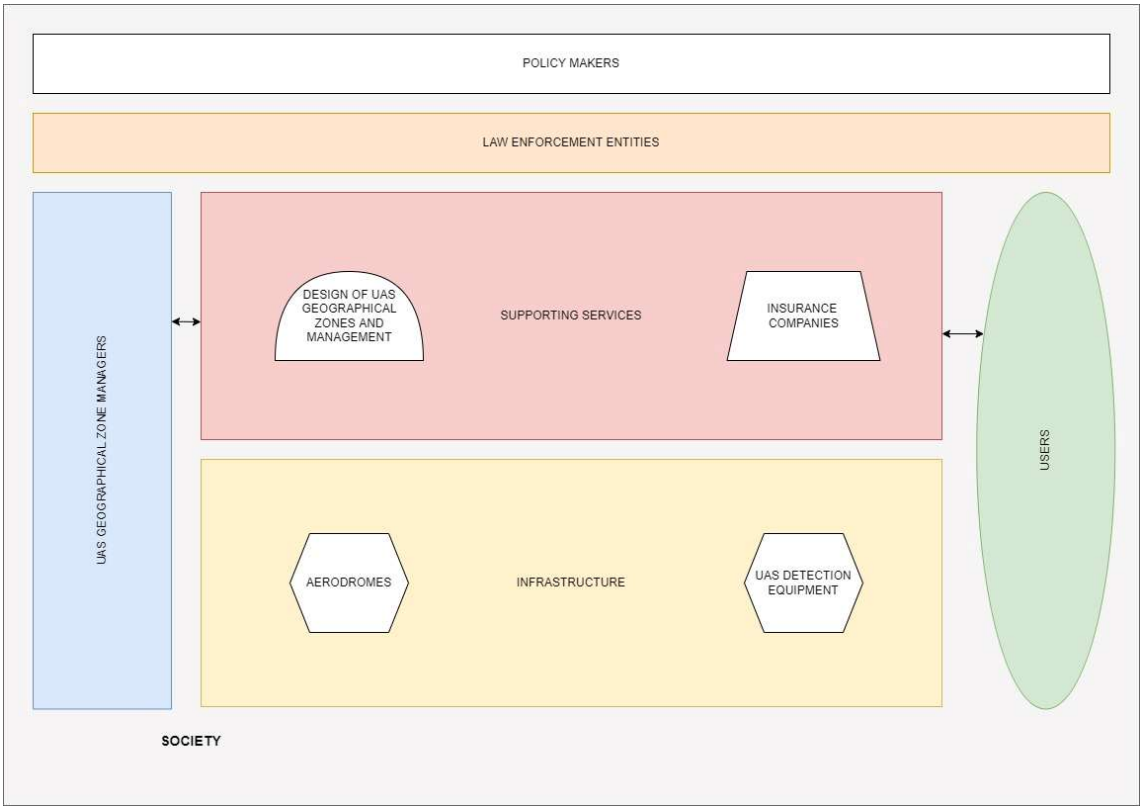
Stakeholder	Role, function or interaction with UAS
TAIIB	The Transport Accident and Incident Investigation Bureau (TAIIB) is a public administration authority under the supervision of the Ministry of Transport. The purpose of the Bureau is to implement the function of public administration in the field of investigation of civil aviation accidents and incidents, including those concerning UA, in the field of investigation of severe railway accidents and serious incidents, investigation of marine accidents and incidents in the field of maritime safety, develop security recommendations for the prevention of similar marine accidents in the future.
Air navigation service provider (ANSP)	The main task of LGS, which performs the functions of the ANSP in Latvia, is to provide safe and efficient air navigation services to all airspace users without discrimination. With regard to UAS operations, LGS focuses on UAS operations in controlled airspace, aerodromes (including airspace structure elements established above them) where ATC and air traffic information services (hereinafter – AFIS) are provided, as well as ensures the availability of Information that is necessary for unmanned aircraft flights in accordance with Section 117[6] of the Law on Aviation.
Aeronautical Information Service (AIS)	AIS provides aeronautical information services, for example, the AIP – (eAIP, including amendments and additions to the AIP, Aeronautical information circulars (AIC) and aeronautical charts), NOTAM, digital terrain and obstacle data sets are provided to the end user with the distribution service.
Airports and aerodromes	Aerodromes are certain areas of land or water that are organized for the arrival, departure and servicing of aircraft. It is essential to establish conditions and procedures for the interaction between UAS and manned aviation operations in the vicinity of aerodromes.
Manned aviation	Although this document deals primarily with UAS operations up to an altitude of 120 metres above the ground or water surface, manned aviation aircraft can also use this part of the airspace for take-off and landing, search and rescue operations, special aviation operations, military flights or in emergency situations, and it is essential to establish a structured and secure interaction between manned aviation and UA operations.
CAA-recognized entities	CAA-recognized entities are natural or legal persons who, in accordance with the procedures specified in regulatory enactments, have acquired the right to conduct theoretical training on the UA operation in a specific category, as well as to administer theoretical face-to-face exams and/or assess the acquisition of practical skills by remote pilots.
UAS operators	An UAS operator is any natural or legal person, which has one or more UA available and on behalf of which the flights are

Stakeholder	Role, function or interaction with UAS
	operated. The UAS operator assumes overall responsibility for the conduct of the flights. It also includes public authorities that are State UA operators or perform other law enforcement, military or security functions not mentioned in this section (for example, the State Security Service, the National Armed Forces).
Remote pilots	A remote pilot is a natural person who operates an UA or, in the case of an automatic flight, monitors its flight and is ready to intervene. The remote pilot is responsible for the safe conduct of the flight in accordance with the instructions and operating procedures (if any) of the UAS operator.
Aircraft model clubs and associations	Organizations aiming at the development of aircraft models as a hobby and a recognized sport.
UAS geographical zone managers	UAS geographical zone managers, owners or managers of the objects that need protection from UAS operations can define UAS geographical zones to restrict UAS operations above these objects or in their vicinity. This means that the manager of each UAS geographical zone decides for himself/herself on the amount of data required from the UAS operator to assess the issue of a permit for UAS operations, as well as on the way in which these data are received.
UAS manufacturers	Any natural or legal person who manufactures a product or arranges for this product to be developed or manufactured and places this product on the market under their name or trademark.
UAS distributors	Any natural or legal person in the supply chain, other than the manufacturer or the importer, who makes a product available on the market. “Making available on the market” means supplying a product for distribution, consumption or use on the Union market in the course of a commercial activity, whether for payment or free of charge.
Educational institutions	These are organizations that engage in the field of UAS through education and research processes. These can be training programmes that inform future professionals about the use of UAS in the sector concerned, as well as scientific research, pilot projects and demonstrations.
Associations	Associations bring together persons and organisations with common economic tasks. The association may promote cooperation between its members, as well as to represent their interests at national and/or international level. In the field of UAS, these are associations bringing together aviation stakeholders as well as UA operators and remote pilots.
Insurers	Merchants offering insurance services to parties involved in the field UAS, for example, UA owners or UAS operators and manufacturers.

Stakeholder	Role, function or interaction with UAS
Population	The population is persons not directly involved in UAS operations.

4.1.2 Interaction between stakeholders in the field of UAS

The previous section provides a general description of the stakeholders in the field of UAS. Taking into account that UAS operations can be implemented anywhere in Latvia, this means that there are many and different possibilities for direct and indirect interaction between the stakeholders. Taking into account the goals and focus of the Concept, this chapter looks at the most important interactions in the field of UAS, highlighting the interactions between the CAA, UAS operators, remote pilots and UAS geographical zone managers.



4.1 Fig. **Simplified scheme of stakeholders' interaction**

Interaction of persons with the CAA:

- the persons must apply to the CAA to register as a remote pilot, UAS operator;
- the persons must apply to the CAA to obtain or amend a recognized entity status;

- the persons must apply to the CAA to obtain, amend, renew or suspend an aircraft model club or association permits;
- UAS operators must apply to the CAA for a permit to operate in a specific category (operation permit, operation declaration approval, light UAS operator certificate (hereinafter – LUC));
- UAS operators intending to implement UAS operations in a specific category, if an operation permit has been given to them by the competent authority of another EU Member State, must apply to the CAA for confirmation that the risk mitigation measures are satisfactory for the operations to be carried out at the planned site;
- the person must apply to the CAA to register a UAS whose design is subject to certification;
- the persons must contact the CAA to report a significant accident involving persons or a commercial air transport or general aviation aircraft involved in the occurrence;
- the CAA and the persons subject to the monitoring programme, for example, UAS operators in a specific category, recognized entities, aircraft model clubs or associations, interact within the framework of the monitoring programme, which provides for scheduled and unscheduled inspections and audits;
- managers of airspace structure elements and the CAA for the establishment of such elements as well as for the coordination of UA coordination procedures;
- the CAA and persons in administrative offence proceedings;
- the CAA and other law enforcement authorities with jurisdiction over administrative offence proceedings, for example, in relation to access to remote pilot competence data or permits granted to a UAS operator for operation in a specific category.

In addition to the described interaction with the CAA, remote pilots and UAS operators interact in the field of UAS with:

- insurers in connection with general civil liability for losses that the UA could cause to the health, life, property of a third party, as well as to the environment;
- representatives of UAS geographical zone managers to coordinate UAS operations;
- officials and persons who have competence in the field of UAS specified in the regulatory enactments, if they request the termination of a UA flight;

- recognized entities to acquire the necessary knowledge and skills in the field of UAS.

Managers of both existing and planned UAS geographical zones set restriction and procedures for implementation of UAS operations. The procedure for evaluating applications for the implementation of UAS operations depends on the UAS geographical zone manager – this may include screening and verification of data on the applicant, risk assessment and other activities outside the scope of this Concept.

4.1.3 Categories of UAS operations

UA is an aircraft by definition. UA, like manned aircraft, differ in a number of parameters, so in order to maintain proportionality with regard to the applicable requirements, the regulatory framework (Regulation 2019/947) in force distinguishes between several categories of UAS operations, depending on the parameters of the UA and the operations to be implemented. The following categories of operations are distinguished: open category, specific category, certified category.

The open category includes relatively low-risk UAS operations, i.e. they are VLOS operations up to a height of 120 m from the nearest ground surface point, moreover, they are conducted at a safe distance from people (including not flying over human assembly points), maximum take-off mass of the UA does not exceed 25 kg and it is not used for the transport of dangerous goods and does not discard any materials. These are the most important restrictions, but some of them have exceptions or clarifications in Regulation 2019/945 and Regulation 2019/947. The implementation of UAS operations in the open category does not require an operation permit or declaration. Activities in the open category are divided into 3 subcategories (A1, A2, A3) with additional requirements and restrictions.

If at least one of the requirements of the open category is not met, then such UAS operations may be implemented in a specific category – the UAS operator must obtain an operational authorisation or approval of declaration from the CAA.

If the CAA, when reviewing the risk assessment within a specific category, determines that operation risks cannot be adequately mitigated without UAS and UAS operator certification and, where applicable, without remote pilot licensing, the operations applied for

may be implemented in a certified category. In accordance with the Implementing Regulation certified UAS operations means:

- performing UAS operations in connection with the transportation of people, flying over people's assembly points, transportation of dangerous goods with a certified UAS;
- UAS operations, in which risk mitigation measures within a specific category are not sufficient to ensure an acceptable level of risk.

4.1.4 Airspace structure

The Republic of Latvia provides air navigation services in the Riga Flight Information Region (hereinafter – FIR), which is an airspace marked in the "European Air Navigation Plan" (ICAO Doc. 7754) that extends upwards from the ground without an upper limit. This includes not only the airspace over the territory of the Republic of Latvia, but also large volumes over the high seas and neutral waters, as delegated by ICAO.

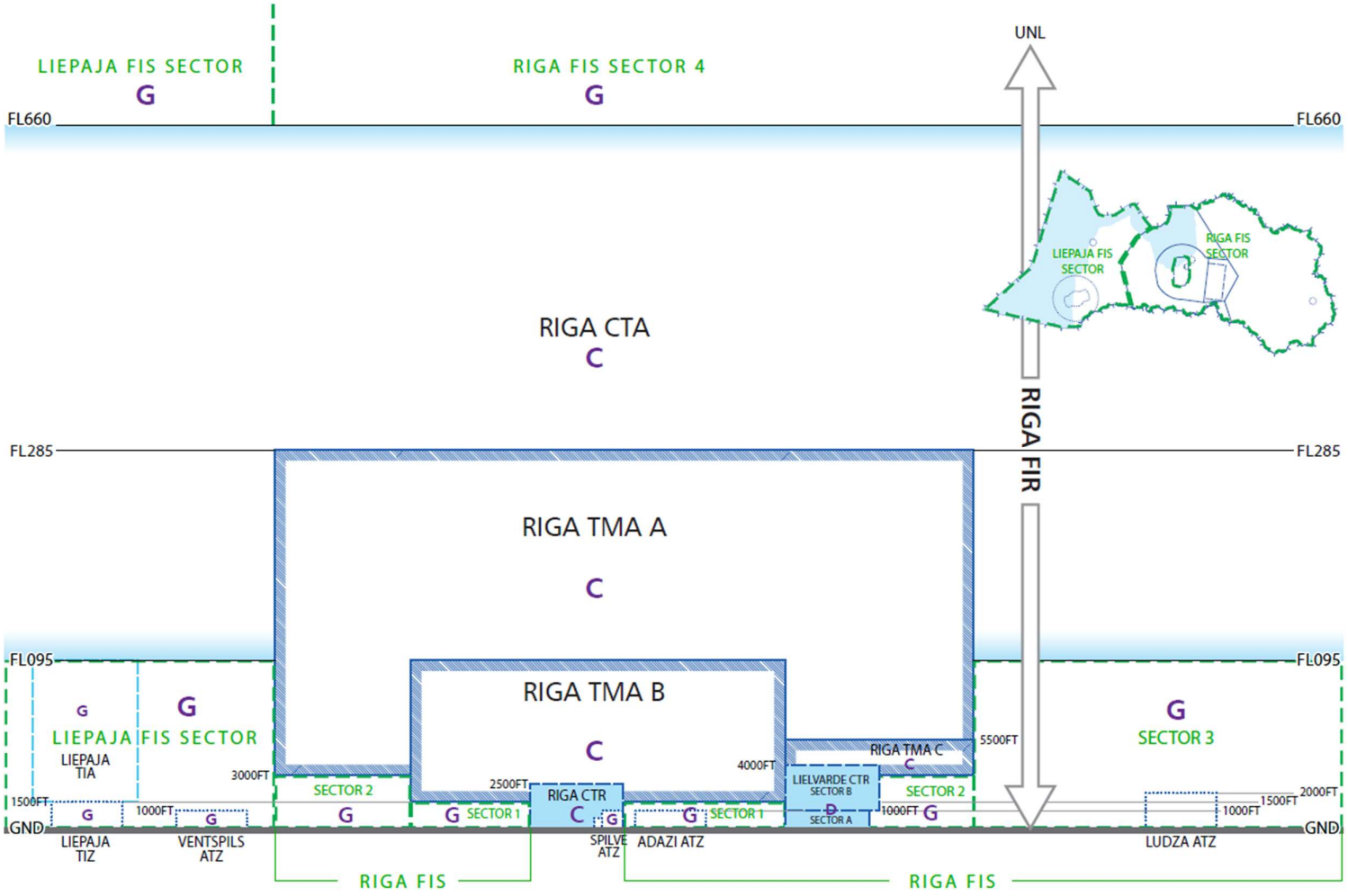
In accordance with Annex 11 to the ICAO Chicago Convention on International Civil Aviation "Air Traffic Services", airspace classes C, D and G have been established in the Riga FIR (Fig. 4.2). Further information on airspace classes, services provided in them and flight requirements is available in Section 11 (A). Class C controlled airspace is established from flight level (hereinafter – FL) FL095 to FL660. Class D controlled airspace was implemented to provide flights at a military aerodrome where a CTR has been established. The uncontrolled airspace extends from the ground (water) surface to FL095 (except for CTR and TMA) and above FL660. The following airspace structure elements have been created around RIX: RIGA CTR and RIGA TMA (Class C airspace).

There are aerodromes in Latvia that are intended for various purposes. Depending on the purpose of the aerodrome and the types of flights within it, an appropriate airspace element (TMA, CTR, TIZ or ATZ) with the appropriate airspace class can be created. At the time of preparation of this Concept, Riga FIR had 1 TMA, 2 CTR, 1 TIZ and 4 ATZ. Detailed information on the airspace structure can be found in the Latvian AIP.

In accordance with Annex 2 to the ICAO Chicago Convention on International Civil Aviation "Rules of the Air", the minimum flight altitude of aircraft outside populated areas is 500 ft (150 m) and not less than 1000 ft (300 m) above densely populated areas, except when taking off, landing or special aviation works are performed. This means that in the vicinity of

aerodromes, a manned aircraft is more likely to be at a low altitude, so restrictions on UA flights need to be introduced in these parts of the airspace. In addition, short-term zones can be created, for example, for air shows or low-altitude training flights. Flight Information Service (FIS) is provided for manned aviation in uncontrolled airspace. This means that the air traffic control service provider is obliged to provide the pilot with all available information, including on UAS operations, if this may affect flight safety.

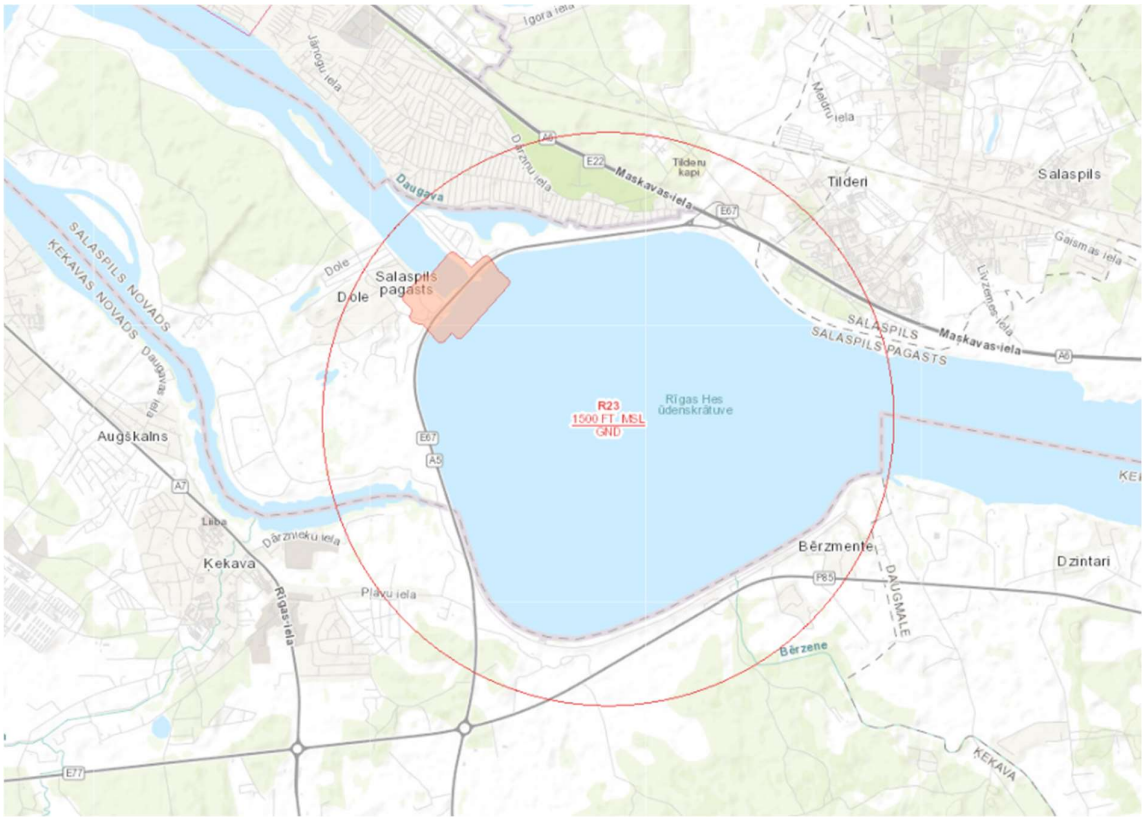
There are strict rules, restrictions and requirements for manned aviation in terms of equipment, pilot competence, etc., while in the field of UAS (according to the scope of this Concept) these requirements are much simpler, for example, remote pilots are not required to have English language skills, a medical certificate is not required, a certificate of airworthiness and other documents are not required for an UA. In some cases, it is sufficient for remote pilots to familiarize themselves with the materials prepared by the UAS manufacturer to operate the UA. Compliance of competence of remote pilots with the competence level of manned aviation pilots may be achieved in the category of certified UAS operations (which is outside the scope of this Concept). As both manned aircraft and UA may be located in the same airspace, solutions are needed to immediately inform remote pilots of applicable restrictions in a way that is easily accessible and comprehensible to them.



4.2 Fig. **Airspace structure of the Republic of Latvia in the vertical plane** [7]

4.1.5 UAS geographical zones

The airspace structure elements are created primarily for manned aviation needs to separate parts of the airspace with different classes, limits in the horizontal and vertical planes, to warn and protect airspace users from potentially hazardous activities. In some cases, airspace structural elements are created to protect critically important territories and objects, for example, hydroelectric power plants, from the threats posed by manned aircraft flights. Taking into account the parameters of the manned aircraft, for example, the maximum take-off mass that can reach 575 t (Airbus A380), the flight speed (most often the subsonic speed), relatively large airspace structure elements are created to protect crucial objects. The type, duration of operation and limits of the airspace structure element in the horizontal and vertical planes are determined on a case-by-case basis, taking into account the above considerations.



4.3 Fig. **UAS geographical zone and airspace structure element for determination of restrictions**[8]

UAS pose risks related to safety, security, privacy, and environmental impact due to their small size, performance, technical equipment, as well as wide availability on the market, but these risks are much lower than for manned aviation aircraft, so a separate solution is needed to restrict or control (manage) UAS operations over or near specific objects and areas. As a

much larger number of objects are exposed to the risks arising from UAS operations, the corresponding related restrictions must apply to UA, but not to manned aircraft – such a solution is the UAS geographical zones.

Article 15 of the Implementing Regulation states that UAS geographical zones may be defined for security, safety, privacy, environmental reasons and that this information must be publicly available in a common unique digital format that is widely used. When defining UAS geographical zones, it is possible in them to:

- prohibit specific or all UAS operations;
- require compliance with specific conditions for specific or all UAS operations;
- require prior operation permit for specific or all UAS operations;
- apply certain environmental standards to UAS operations;
- allow access only to certain UAS classes;
- allow access only to UAS that have specific technical equipment, for example, remote identification systems or geo-awareness systems.

At the time of developing the Concept, it is known that LGS provides a display of UA restrictions on the website https://airspace.lv/drones, i.e. in the Electronic Unmanned Aircraft Restrictions Viewer (hereinafter – eUARV) in order to support UAS operations. This resource displays information required for UA flight operations, including aeronautical information on airspace use (static and dynamic elements of the airspace structure that may affect UA flight operations during active operations). The set of information provided on the elements represented in the eUARV, which can in principle be interpreted as UAS geographical zones, is incomplete from the point of view of the data model specified in Chapter 8 of EUROCAE ED-269 "Minimum operational performance standard for geofencing" (ED-269), therefore these data cannot be made publicly available in a common unique digital format for the purpose of support of the geo-awareness function in accordance with the acceptable means to achieve compliance described in Article 15 of Regulation 2019/947 (AMC&GM Article 15(3) *Operational conditions for UAS geographical zones*).

Ensuring the availability of UAS geographical zones in a common unique digital format is an important prerequisite for the use of geo-awareness and geofencing functions in UAS operations, as these functions are implemented at the UAS level based on authoritative source data. The provision of UAS geographical zone data in accordance with the data model and

format specified in ED-269 facilitates more efficient and safer performance of UA flights in manual, semi-automatic and automatic modes.

Regulation 2019/947 stipulates that from 1 January 2024, UAS placed on the EU market, which are intended for use in the "open" category, must comply with the requirements of the regulatory framework that provide for their compliance with any of UAS classes specified in Regulation 2019/945. The Annexes to the Delegated Regulation state that Class C1, C2, C3, C5, C6 markings mean that the product has a built-in geo-awareness function that alerts remote pilots in advance about a possible breach of airspace boundaries so that they can take corrective action to remedy the breach; in turn, the C0 and C4 markings do not consider mandatory existence of such a function.

UAS operators will be able to continue to use UAS without class marking also after 1 January 2024, but it will be a subject to stricter restrictions. The totality of these facts allows to conclude that UAS with and without geo-awareness functions will be used in the airspace of the Republic of Latvia. This means that additional measures must be taken to inform remote pilots of the restrictions in force. These measures must include the existence of a UAS geographical zones visualization tool, as well as information campaigns and the addition of remote pilot training programmes on how to conduct UAS operations and comply with restrictions imposed in UAS geographical zones.

4.1.6 Summary of problems and conceptual solutions

4.1.6.1 General

The key topics most frequently highlighted in the section "3.5 Survey on the field of UAS in Latvia", identifying problems and concerns, as well as possible solutions, were: availability and visibility of information on the field of UAS and regulatory enactments in force, control and monitoring, security and safety, remote pilot culture, skills and knowledge, common system. These findings, as well as possible solutions and impacts, are summarized in Table 4.2.

Summarizing the views expressed during the survey and interviews, the following key aspects can be highlighted that should be taken into account when creating the new UA management and monitoring system:

1. based on a number of features, UAS operators and remote pilots, service providers indicate that very low-level UAS operations will continue to grow in the coming

years. There is also a growing interest in UAS BVLOS operations, which can contribute to the development of the UAS services market;

2. most services and processes must be available in digital form with a maximum degree of automation, using different equipment and systems. The system architecture must incorporate algorithms for processing the received data and managing the data flow;
3. information, including requirements of regulatory enactments, examples of application, must be available in one place, in an aggregated form, according to the needs and role of the User (stakeholder's representative), with maximum regard to the "one-stop shop principle". Also, periodic information campaigns for a wide audience are necessary to ensure public awareness and involvement;
4. there are concerns about the resources available to law enforcement authorities and the adequate implementation of functions in the field of UAS, which could be addressed by introducing a unified system with information on UAS operators, remote pilots, UA, UAS operations coordination, etc.;
5. by requiring UAS operators and remote pilots to register UAS operations in the UA management and monitoring system, the level of responsibility would be increased, and law enforcement authorities would be able to follow the current situation and make sure that the flights performed comply with regulatory requirements. Registration of planned flights would allow remote pilots to be identified and alerted when UAS geographical zones are created in the area of intended UAS operations, for example at the request of public authorities in response to external events;
6. the development of a network of UAS signal receiving equipment could provide the law enforcement authorities in the field of UAS with the information on observed UA flights (identification, UA location coordinates, flight parameters, etc.), which is necessary for the performance of their functions;
7. the UA management and monitoring system must be based on a solution that ensures accurate registration of UA and their users in an digital environment. This solution must be interoperable and compatible with other State information systems, thus ensuring a successful and rapid exchange of information.

Table 4.2

Assessment of problematic issues, possible solutions and their impact

Topic	Description of the problem	Possible solution	Impact of the possible solution
Viewer (www.airspace.lv/drones)	The resource is not easy to use on mobile or low-resolution devices.	Resource improvement/modernization.	Awareness of UAS operators and remote pilots about current airspace restrictions in the field of UAS is improving, including about dynamic restrictions. The number of unpermitted UAS operations in zones where there are respective restrictions is reduced.
	Not all restrictions, such as flight rules in the vicinity of high voltage lines, are displayed.	Flight rules may be expressed through the UAS geographical zones.	
Specific category	There is no clear procedure for obtaining permits to operate in a specific category.	Preparation of support (information) materials.	Awareness of UAS users about the regulatory framework in force and how to apply it is being promoted.
	There is a misconception that BVLOS operations are not possible.	Preparation of support (information) materials, information campaign.	
Application for flights	It is not possible to make sure that the observed UA flight is legal.	Implementation of UAS operations registration system. Data from other systems, for example, UAS operator and remote pilot registers, must be available in the system.	Equality is being promoted – all UAS operations are applied for.
	Identification of UAS user is not possible.		

Topic	Description of the problem	Possible solution	Impact of the possible solution
	There is no data on the UAS operations to be implemented, they are not coordinated – several UA flights may be operated in one area.		Awareness of UAS users and the public about UAS operations applied for is increasing (the amount of publicly available information is not stipulated in this Concept).
Coordination of UAS operations	The current procedure for coordination of UAS operations (with UAS geographical zone managers) differs according to the type, duration, technical solutions used.	Creation of a unified digital solution for the coordination of UAS operations.	The information is processed in a single system, and supervisory authorities will be provided with access to historical data.
UAS signal receiving devices	No data is available on performed UA flights.	Creation of UAS signals receiving network.	"Control and monitoring" is being improved.
	Identification of UAS user is not possible.	Register of UAS operators and remote pilots.	
Restrictions	The proportion of airspace with UA flight restrictions is increasing.	Coordinated action when establishing UAS geographical zones, including provision of recommendations and examples of good practice, such as requirements for UAS technical equipment.	Optimization of restrictions and conditions is being promoted.
	UAS users do not understand the justification for the creation of individual zones or restrictions, which, due to the long process of coordination of	Creation of a unified digital solution for the coordination of UAS operations. The solution must include information on the maximum time limits for examination of the application from each zone manager. There	The digitization of services provided in the field of UAS is being promoted; Awareness of UAS users about a number of topics

Topic	Description of the problem	Possible solution	Impact of the possible solution
	UAS operations, leads to the view that the restrictions are disproportionate.	must be explanatory information that the time limit for the examination depends on the significance of the related object and related regulatory enactments.	related to the field of UAS is being promoted; Equality is being promoted.
	Information on restrictions is difficult to understand.	Viewer modernization.	Awareness of UAS operators and remote pilots about current airspace restrictions in the field of UAS, including about dynamic restrictions, is being improved.
Regulatory framework	Regulatory framework is difficult to understand (respondents point to different interpretations).	Preparation of explanatory material.	Awareness of UAS users about the regulatory framework in force in the field of UAS is being promoted.
	The development and adaptation of the regulatory framework "lags" behind the development of the field of UAS.	Consultations and cooperation with stakeholders.	Policy makers are provided with information (recommendations) for amendment and development of relevant regulatory enactments.
Skills and knowledge	There are concerns about the competence – knowledge and skills of remote pilots.	Increasing the level of complexity of the checks of theoretical knowledge and practical skills.	The level of knowledge and skills of remote pilots is improved, which has a

Topic	Description of the problem	Possible solution	Impact of the possible solution
	There are concerns about the ability of remote pilots to correctly apply requirements of the regulatory enactment.	Preparation of explanatory material, including examples of good practice, standard action plans, etc.	positive effect on the "Remote pilot culture".
	Lack of support material for taking the A2 subcategory exam.	Preparation of explanatory (support) material and making it available to remote pilots in the open category.	
System	There is no unified digital system, in which all parties involved in the field of UAS can operate.	Creation of a unified digital solution.	The digitization of processes is being promoted; The principle of equality is being promoted; The competence of controlling and supervisory authorities in the field of UAS is strengthened.
Control and monitoring	UAS operations are short-time operations – law enforcement response time is longer, there is limited access to evidence for a UA flight.	Implementation of UAS operations registration system. Creation of a unified digital solution for the coordination of UAS operations. Creation of UAS signals receiving network.	"Security and safety" is being promoted. "Remote pilot culture" is being promoted.
Information	Information on UAS operations, examples of good practice must be available in an easy-to-understand way.	Preparation of informative materials.	Awareness of UAS users about the field of UAS is being promoted.

Topic	Description of the problem	Possible solution	Impact of the possible solution
	The amount of information provided to the user must be optimal – no more and no less than is necessary in the specific case.	The required amount of information must be available in the systems being developed. The information must be structured and shall be displayed for specific cases.	
Equality	Insufficient capacity of controlling and law enforcement authorities in the field of UAS contributes to the deliberate violation of the rules by some UAS operators. In this way, unequal attitude is created – there are UAS operators who follow the rules and there are those who knowingly violate them.	Implementation of UAS operations registration system. Creation of a unified digital solution for the coordination of UAS operations. Creation of UAS signals receiving network. Strengthening the capacity of control and law enforcement authorities.	The set of solutions facilitates that UAS operators operate in a unified system under the same conditions. "Equality", "Security and safety" are being improved, and a unified "System" is being developed.
Security and safety	UAS are readily available on the market – the buyer may not be aware of the procedures for implementing UAS operations.	Requirements for registration of all UAS in an unified system.	With the logic built into the system, the awareness of the users in the field of UAS is being promoted.
	The parameters and performance of UAS pose a threat to a number of fields, including manned aviation.	Establishment of an UAS signal receiving network, improvement of awareness of UAS operators and remote pilots, strengthening control and monitoring.	The set of solutions promotes a "Remote pilot culture" that has an impact on "Security and safety".
Privacy	UA may be equipped with a sensor capable of processing personal data, and, accordingly,	Preparation of support (information) materials, information campaign.	Awareness of UAS operators and remote pilots, as well as "Remote

Topic	Description of the problem	Possible solution	Impact of the possible solution
	the requirements of regulatory enactments regarding the protection of natural persons with regard to the processing of personal data must be complied with.		pilot culture" is being promoted.
Remote pilot culture	Despite the fact that remote pilots are somewhat aware of the rules in the field of UAS, the public is concerned about how they are complied with when "no one is watching".	Strengthening and improving the following topics: "Skills and knowledge", "Control and monitoring".	The set of solutions contributes to the improvement of the "Remote pilot culture".

4.1.6.2 Establishment and management of UAS geographical zones

The issues of the establishment and management of UAS geographical zones should be highlighted as problematic issues. Cabinet Regulation No. 429 stipulates that local governments, municipal police, persons related to the industrial accident risk objects, the Bank of Latvia, the Ministry of the Interior and its subordinate institutions, the Ministry of Defence, the NAF, the Prison Administration, the State Security Service, the Ministry of Transport and its subordinate institutions and capital companies, the Ministry of Economics and its subordinate institutions and capital companies, licensed electricity transmission and distribution system operators in which the State holds shares, the CAA and other persons may apply for the establishment and termination of work of the UAS geographical zones, as well as for changes to their conditions.

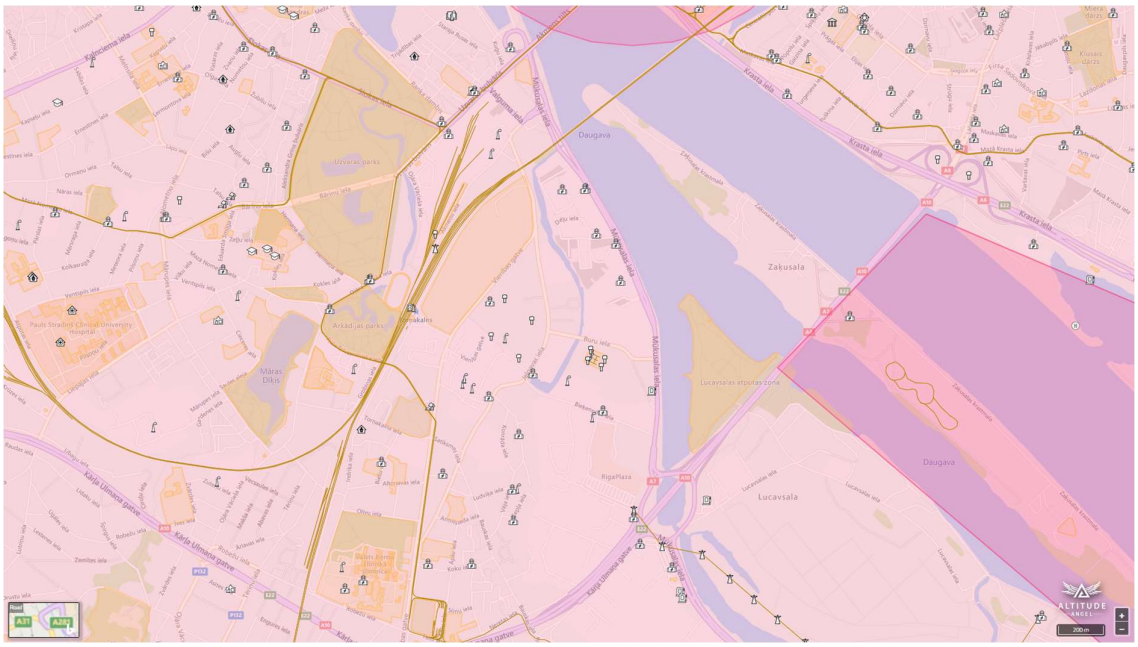
The list of persons entitled to propose the establishment or modification of UAS geographical zones is extensive, so the number of zones is expected to increase significantly in the future. The increase in the number of UAS geographical zones increases the likelihood that they will overlap and therefore procedures are needed to assess the planned restrictions and coordinate them with each other.

For example, AS Augstsprieguma tīkls, whose 100 % shareholder is the Ministry of Finance of the Republic of Latvia, operates a 1742.13 km long power transmission line with a nominal voltage of 330 kV, a 3870.78 km long power transmission line with a nominal voltage of 110 kV, 140 substations and 273 autotransformers, and transformers. This means that the company mentioned in this example has the right to create UAS geographical zones up to 5612 km long and 50 metres wide around the transmission lines and 413 zones around substations and transformers. This example clearly shows that the UAS geographical zones can cover quite large areas.

Fig. 4.4 uses pictograms to show such objects and territories (raw data from public sources), for example, pre-schools, playgrounds, parks, above which, for security, safety and privacy reasons, where the regulatory framework allows the UAS geographical zone establishment. Where these objects are relatively close to each other, it would be advisable, as far as practicable, to decide on the merging of the UAS geographical zones and/or the coordination of conditions.

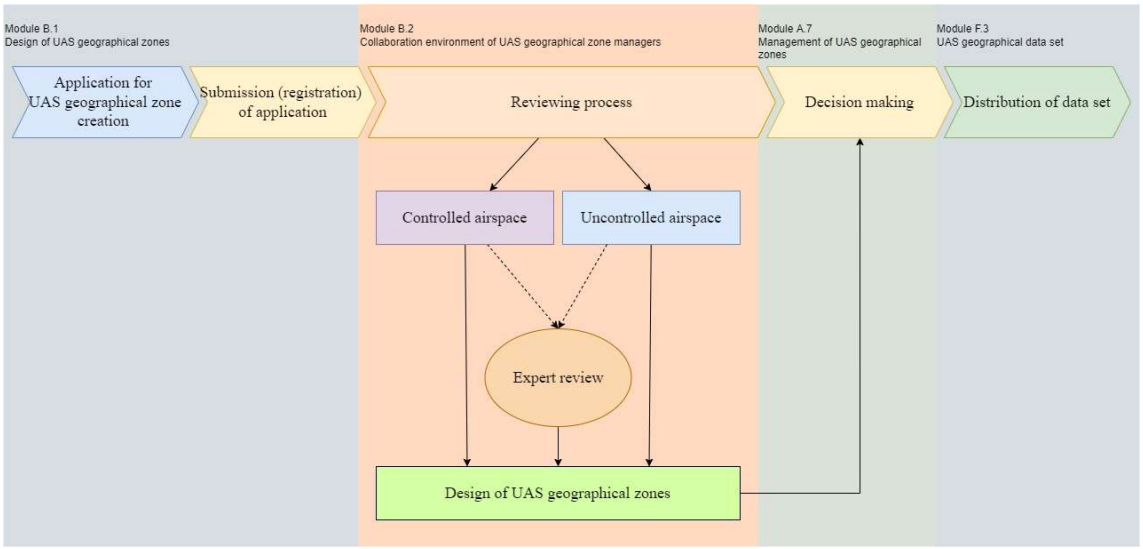
The successful operation of the establishment and management of UAS geographical zones requires the creation of a regulatory framework that provides the procedure for

prioritization when defining the UAS geographical zones, the procedure for their approval, the decision-making process for their establishment and other important issues that would allow defining the zones that are proportionate in terms of parameters, restrictions and conditions of use, similar to that mentioned in Cabinet Regulation No. 26 – the purpose of changing the airspace structure is to ensure equal opportunities for the use of airspace by all airspace users, as well as to increase the safety and efficiency of aircraft flights.



4.4 Fig. **Location of infrastructure, public recreation areas and other objects**[9]

At the time of development of this Concept, regulatory enactments, which would describe in detail the procedure for UAS geographical zone establishment, are not available – there are available the general conditions for defining – Cabinet Regulation No. 429, Part II. The process of establishing a UAS geographical zone can be simply divided into five main stages: application for the establishment of a UAS geographical zone, registration of the application, evaluation of the application, decision-making, dissemination of data. A simplified, schematic representation of the process of UAS geographical zone establishment is shown in Fig. 4.5.



4.5 Fig. **Stages of the UAS geographical zone establishment process**

The stages of the process of establishing of a UAS geographical zone consist of separate steps. In this Concept, there is considered that the CAA approves changes to the airspace structure. In order to ensure that the quality and integrity of the data to be processed is maintained throughout the process, a solution should be established that allows for the exchange of data between stakeholders only in electronic form. This solution must provide that the data on the UAS geographical zone applied for are available to the CAA for making a respective decision, while these decisions must be made available to the aeronautical information service provider, which will further publish and disseminate these data in the form of a digital data set.

Paragraph 43 of Cabinet Regulation No. 429 specifies that the initiators of the new UAS geographical zones and the managers of the already established UAS geographical zones are obliged to cooperate in order to prevent a conflict of zone conditions if the zones overlap. The regulatory framework does not specify the form in which this cooperation is to take place, how the priorities are set, which conditions are more important, as well as does not specify whether the assessment is performed and who performs the assessment of how defining the UAS geographical zones applied for, i.e. their mutual location and restrictions, will affect the part of the airspace allocated to UAS operations up to an altitude of 120 metres.

In order to ensure a comprehensive process for the UAS geographical zone establishment, an action plan must be provided, when the establishment of the zones is required within a very short period of time at the request of the operational services, for example, to protect those involved in firefighting or rescue operations and UAS.

It must be taken into account that the regulatory framework in force does not specify the time period within which the received applications must be processed, however in order to ensure public functions, various operational services, for example the SFRS, the State Police, the State Border Guard, the NAF, etc., may need to react quickly to events and propose the airspace restrictions on the use of a certain part of the airspace immediately or in a very short period of time (the establishment of a UAS geographical zone), so manual data transmission must be excluded from the data exchange process and the process must be automated as much as possible.

4.2 The future of the UAS

4.2.1 Industry needs and trends

This chapter describes the main trends in the use of UAS in various industries and possible directions for the development of UAS use in Latvia, Europe and the world, taking into account publicly available information, survey data and interviews conducted. This chapter summarizes data from the following sources: *Mordor Intelligence*[10], *Insider Intelligence* [11], SESAR.

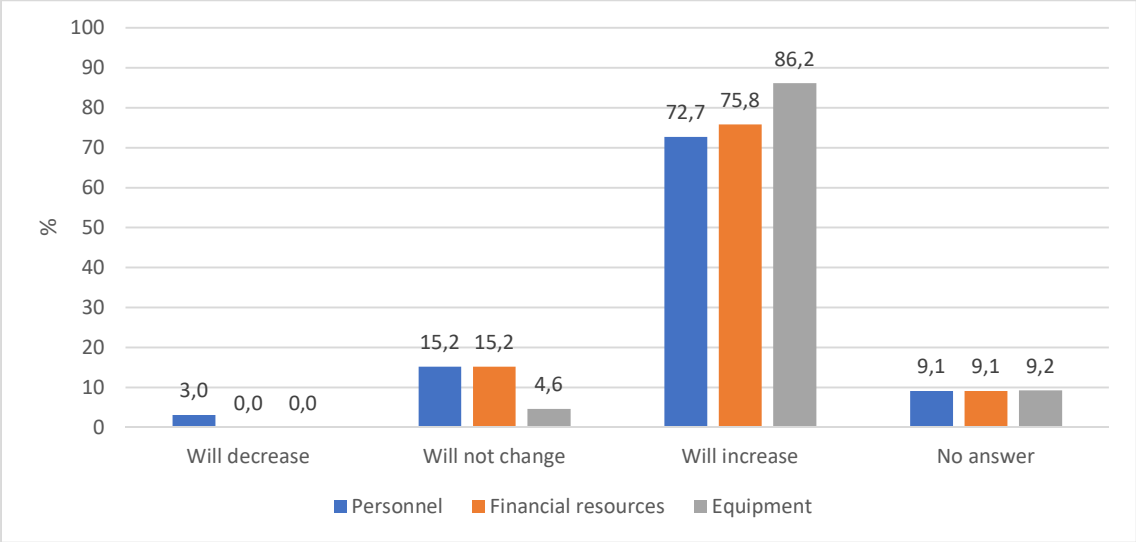
UAS field forecasts

UAS provided for commercial purposes are the fastest growing sector in the UAS market, but smaller UAS intended for entertainment and leisure activities are also becoming increasingly popular. In addition, competition between UAS providers reduces the price of such UAS, especially for higher-end models that allow you to take photos and stream live video. According to Mordor Intelligence data, the UAS market turnover (%) by sector of use worldwide in 2020 was: construction – 36 %, entertainment industry – 30 %, agriculture – 25 %, law enforcement – 15 %, energy – 4 %, other sectors – 11 %.

The use of UAS in Latvia will only expand, as various institutions are increasingly showing interest in UAS as a more efficient and cost-effective tool for performing various tasks. For example, in October 2021, VAS Latvijas Valsts meži had 75 UA (mostly DJI Mavic 2) and 170 remote pilots at its disposal. Some companies/institutions that are already actively using UAS set up structural units that deal directly with the development of UAS services both internally for the purposes of the company/institution and for commercial purposes. It is

important that Latvia not only imports but also exports UAS, as several Latvian companies successfully manufacture UAS or their components.

The respondents of the survey in Latvia were asked how, according to their estimate, the resources needed for the field of UAS will change in the future. Fig. 4.6 shows the results of the survey – more than 70 % of respondents expect that the human resources, financial resources and technical support required for the field of UAS will increase in the future.



4.6 Fig. **Forecast of resources required for the field of UAS**

UAS field growth

UAS are a fast-growing sector of aviation with great potential for new job creation and economic growth in the EU. The market value of UAS services is projected to reach $63.6 billion by 2025, and Insider Intelligence, one of the leading market analysts, has projected the value of UAS deliveries to reach $29 million by 2021.

The situation in Latvia is also developing in line with global and European trends. There are several companies successfully operating in the UAS services market that offer services related to UAS operations. The UAS industry is adapting to market needs and coming up with the respective solutions and products.

UAS market trends and forecasts

In the overall UAS market, UAS intended for use in providing economic activity have the greatest potential. In 2023, the total value of deliveries in the world is projected to reach 2.4 million US dollars with a compound annual growth rate (CAGR) of 66.8 %. UAS growth

will take place in five key fields: agriculture, construction and mining, insurance, telecommunications, including the media, and ensuring public order and security.

Latvian UAS manufacturers successfully operate not only in the Latvian market, but also internationally. UAS manufactured in Latvia are widely used by the NAF as well as in surveying large areas. When analysing the market forecasts, it is assumed that the sales markets for products will expand, and production volumes will increase accordingly. Manufacturers are already expressing the need for larger airspace volumes to test innovative products.

UAS in agriculture and forestry

The UN projects that the world's population will reach 9.7 billion by 2050, creating an increase in consumption of agricultural products by 69 % compared to 2010. The use of UAS in agriculture is in the form of surveying and fertilization of fields, monitoring of herds, monitoring of the amelioration system. Taking into account that the majority of farmers and agriculture companies that use UAS are owned by large agricultural corporations, the growth potential of UAS in agriculture is significant. According to the latest SESAR report, there are around 10,000 commercial UAS in use in Europe, and the number is projected to reach 200,000 by 2025 and 395,000 by 2035, of which 150,000 will operate in the agricultural sector.

In accordance with a CANSO study, 65 % of respondents in Europe believe that the use of UAS in the field of agriculture will develop rapidly. There is also interest in the use of UAS in the agricultural sector in Latvia, which is mainly in the form of inspection and monitoring of the condition of orchards and fields.

UAS are actively used to monitor forests and natural resources and implement protection measures. For example, VAS Latvijas Valsts meži use UAS for inspection of forests, amelioration systems and quarries. Trends also suggest that the use of UAS for such purposes will increase. Taking into account the specific nature of the areas surveyed in this sector (large areas, over-the-forest operations), there is a growing need for a convenient way to apply for and obtain permits for BVLOS flights in order to promote the use of UAS.

UAS in construction and mining

According to the PricewaterhouseCoopers' forecast, the use of UAS in construction and mining will become a global market worth $28.3 billion. Companies in this industry use UAS to make it easier to ensure compliance with many laws and regulations related to occupational safety. In some countries, construction companies are required by law to inspect their facilities regularly to make sure they are safe for workers. The use of UAS for these purposes allows

work to be completed in 15 minutes, which is a significant reduction compared to the "classical" approach, which takes several hours to complete.

In Europe (in accordance with a CANSO study), 45 % of respondents believe that the application of UAS in the field of construction will develop rapidly. in Latvia, UAS are used for mineral extraction monitoring, surveying, construction process monitoring and in other cases.

In energy, trade, supply and other commercial services

It is forecast that the share of UAS in economic activity will continue to grow and in 2035 up to 10,000 UAS will be used in the energy sector, more than 70,000 UAS – in e-commerce and supplies and more than 1,000 UAS – in mobility and transport. With the increase in the use of UAS in the private sector, their number will also increase in the public sector, where around 60,000 UAS will be used for public security and defence purposes.

In Europe (in accordance with a CANSO study), 55 % of respondents believe that the use of UAS in the supply of goods will develop rapidly. The same study shows that the fastest growing sector of UAS will be the use of UAS to inspect infrastructure (buildings, structures, power lines, etc.), 85 % of respondents have noted this.

In Latvia, UAS are widely used to inspect power line and telecommunication towers. This trend will continue, given the cost-effectiveness of using UAS compared to traditional methods of inspecting hard-to-reach infrastructure. UAS are also actively used in mapping, photogrammetry, photography and advertising creation.

UAS in law enforcement authorities and rescue services

Police around the world currently use UAS in different situations, including surveillance of large open areas, resolving hostage situations, tracking of armed suspects and investigation of the threat of explosives, thus reducing the threat to personnel in high-risk situations and environment. The use of UAS for these purposes is a viable alternative to helicopters, which are expensive to operate.

In Latvia, several authorities and services use UAS in the performance of their functions, for example, the State Security Service, the SFRS. The State Security Service uses UA in its missions, for protection of facilities and prevention of illegal activities. The State Fire and Rescue Service uses UAS in forest firefighting operations (identification of the burning area, determination of safer access or access routes) and implementation of rescue operations

(observation of fishermen in winter, monitoring of ice condition, warning people about dangers using the loudspeaker attached to the UA).

UAS insurance

The global UAS insurance market is expected to reach $1.13 billion in 2021 with an annual growth rate of 6.1 %. Growth is driven by the increase in UAS operations during the COVID-19 pandemic, as well as by the gradual recovery of commercial activities. This market is expected to reach a value of $1.41 billion in 2025 with an annual growth rate of 5.9 %. The assessed market includes the sale of UAS insurance policies, which cover the risks related to accidental damage or harm to property during UAS operations, as well as damage caused to UA itself during operations.

Insurance companies in Latvia are ready to offer UAS insurance, but in some cases are unable to compete with Western companies due to the price and less flexible offer – for example, of the single policy of the UA fleet. However, insurance services are available and some large UAS users have insured their UAS with Latvian insurance companies, although the majority also choose the services of foreign insurers. In general, this type of insurance should develop, because with the development of the use of UAS, it will be necessary to insure not only the UAS itself, but also the goods to be transported and civil liability.

4.2.2 U-space

As the number of UAS operations increases, including in those parts of the airspace where UAS operations will take place in the vicinity of manned aircraft, it is planned to introduce rules and procedures that rely on process automation and digitization for the safe and efficient integration of UAS into airspace. To implement this approach, a framework called U-space is proposed, including for support for UAS operations and connection to air traffic control services.

The introduction of U-space could be one of the solutions to facilitate BVLOS flights, namely to ensure, through the services provided by the USSP, that the risks of UA colliding with another airspace user are mitigated. The development of the U-space framework envisages achieving a level of full integration with manned aviation in the long term. In the initial stages of U-space, UA remain “invisible” or poorly visible to manned aviation (due to their small size and equipment, UAS is difficult to spot with standard tools used in aviation, UA flights take place at low altitude, etc.), so they are mutually separated by dynamic airspace configuration

change This approach applies to those UA and aircraft that have been provided with air traffic services in those parts of the controlled airspace where U-space airspace has been established.

4.2.3 U-space airspace

Regulation 2019/947 provides that Member States may define UAS geographical zones for safety, security, privacy or environmental reasons, in which UAS operations are restricted or prohibited. Member States may decide to what extent their airspace is open or restricted to UAS operations; accordingly, Member States will be responsible for defining UAS geographical zones in which they are only allowed with the support of U-space services, as provided for in Regulation 2021/664. These UAS geographical zones are U-space airspaces. The creation of U-space airspace must be based on an airspace risk assessment, taking into account safety, security, privacy and environmental considerations. Each U-space airspace must have a specific common information services (hereinafter – CIS) provider, as well as U-space services providers (hereinafter – USSP) that provide relevant services to users.

4.2.3.1 Common information services (CIS)

The CIS are an integral part of each U-space airspace, making the following information available:

- horizontal and vertical limits of the UAS geographical zone defined as U-space airspace,
- UAS performance requirements,
- U-space service performance requirements,
- applicable operation conditions and airspace restrictions,
- identification of active certified U-space service providers, contact information, provided services and limitations,
- adjacent U-space airspaces,
- UAS geographical zones in U-space airspace,
- static and dynamic airspace restrictions.

Air traffic service providers, respective authorities, U-space service providers and UAS operators will need to have access to data processed by the CIS.

4.2.3.2 U-space service providers (USSP)

A U-space service provider may be a natural or legal person, who has obtained a certificate for the provision of U-space services in a specific U-space airspace. The USSP take the necessary measures to ensure the exchange of information between the stakeholders in order to facilitate secure and interoperable operations in the respective U-space airspace.

The USSP will need to provide at least 4 mandatory services:

- network identification service,
- geo-awareness service,
- UAS flight authorisation service,
- traffic information service.

Taking into account the airspace risk assessment, the State may require the provision of additional services in the U-space airspace. For example, weather information service, conformance monitoring service.

4.2.3.2.1 Network identification service

The purpose of the network identification service is to provide authorized users with information about the remote identification of the UAS. This information must include the following information in accordance with Article 8 of Regulation 2021/664:

- UAS operator registration number,
- the unique serial number of the UA (or the unique serial number of the add-on),
- UA geographical position,
- UA's altitude above mean sea level and its height above the surface or take-off point,
- the route course,
- the ground speed of the UA,
- information on the geographical position of the remote pilot or the take-off point of the UA,
- the emergency status of the UAS,
- message generation time.

4.2.3.2.2 Geo-awareness service

The geo-awareness service must provide UAS operators with information on the operating conditions and constraints applicable to the U-space airspace, including temporary

restrictions and UAS geographical zones. The set of geo-awareness information prepared has the following characteristic parameters in accordance with Article 9 of Regulation 2021/664:

- time of update,
- version number,
- valid time.

4.2.3.2.3 UAS flight authorisation service

In accordance with Article 10 of Regulation 2021/664, the UAS flight authorisation service is the process within which the UAS operator applies to the USSP for a UA flight authorisation. The USSP will need to review the request received, estimate it, taking into account the permanent and temporary limitations on the U-space airspace, other flight authorisations to avoid crossings (conflicts) in space and time.

4.2.3.2.4 Traffic information service

The traffic information service provides UAS operators with information on air traffic in the proximity of the implementation of UAS operations. This information includes data on potential (planned) air traffic that are shared by the other USSP and the relevant air traffic service providers. This service is informative – it is the responsibility of the UAS operator to take action to avoid any collision hazard.

4.2.3.2.5 Weather information service

The weather information service is an additional service that must be provided if required by the U-space airspace risk assessment. This service provides the UAS operator with reliable weather forecast and actual information before or during the flight from trusted sources. The information package includes information on wind direction, speed, height of the lowest broken or overcast cloud layer, visibility in metres and kilometres, air temperature, dew point, precipitation rates, atmospheric pressure with geographical location of its applicability, as well as data on the location, time of observations or the valid times and locations of the forecast.

4.2.3.2.6 Conformance monitoring service

The conformance monitoring service is an auxiliary service if required by the U-space airspace risk assessment. The task of this service is to compare (analyse) data and identify

discrepancies in accordance with Article 13 of Regulation 2021/664. The USSP must make this information available to other USSPs operating in the same U-space, relevant air traffic service providers, as well as notify other UAS operators.

4.2.3.3 U-space development stages

The U-space model described in Volume 1 of the U-space operation concept[12] (hereinafter – the CORUS concept) envisages the gradual implementation of services with the development and strengthening of relevant solutions and technologies. The implementation of the services is divided into 4 stages from the implementation of the foundation services to the full integration of UAS with manned aviation. Table 4.3 provides an overview of the U-space services that will be developed at each stage.

Stage U1: U-space foundation services: e-registration, remote identification and geo-awareness (geo-fencing), which are used in all subsequent phases. U-space implementation is not possible without these services.

The e-registration provides for a series of digital registers containing information on UAS operators, certified UAS, moreover, some of these data must be available for exchange with the repository (hereinafter – the Repository) referred to in Article 74 of Regulation 2018/1139. The data on the UAS operator contain information on the permits granted for the operation in the specific category, the unique number of the UAS operator, which is used in the U-space system to identify it.

Remote identification is systems (or solutions) that provide the transmission of information about UA, so it can be obtained without direct physical access. Remote identification can be provided with UA's built-in systems or with remote identification additional devices. The information to be transmitted includes a number of parameters, for example, the UAS operator registration number, UA's unique physical serial number, UA's geographical location, etc. UAS operations will be surveyed and their compliance will be monitored, using these parameters in the U-space system.

Geo-awareness is a function that alerts remote pilots of a possible violation of airspace boundaries. Data on airspace restrictions are required for the correct and full operation of this function. In the case of the geo-awareness function, these are data sets for UAS geographical zones that are made publicly available in a common unique digital format. In the context of U-space, the U-space airspace, i.e. the part of the airspace in which UAS operations are permitted

if all the specified mandatory U-space services are used, is represented as one of the UAS geographical zones.

Stage U2: U-space's initial services provide management of UA operations. This may include flight planning, flight approval, surveillance and tracking, information on dynamic changes in airspace, as well as procedures for cooperation with ANSP.

Stage U3: U-space's advanced services will provide more sophisticated performance of UAS operations in densely populated areas or high-traffic areas of the airspace. These services may include capacity management, action and work plan for conflict detection. Future technological developments, for example, automated "detect-and-avoid" functions, combined with secure and reliable means of communication, are expected to increase the intensity of UAS operations.

Stage U4: Full deployment of U-space services that provides for the creation of integrated interfaces with manned aviation, including implementation of UAS operations in controlled airspace. At this stage, the key feature of U-space services will be the automation and data exchange between the U-space environment and manned aviation that provides for the creation of appropriate equipment, standards and solutions in the future. As these solutions are not yet available, the functionality of Stage U4 will be further refined as the industry evolves.

4.2.3.4 U-space architecture

Volume 2 of the CORUS[13] concept provides recommendations for the U-space architecture – it is recommended to adhere to the following principles:

- service-oriented architecture – a service-oriented approach is used to ensure that solutions are built on the basis of a set of services with common features;
- modular structure – processes and services are divided into smaller units, which provide data input and output. These modules can perform certain tasks and can be replaced or reused;
- safety-focused – the solution must take into account safety considerations, both for the stakeholders and for the environment that may be affected by U-space services;
- open architecture – it is based on standard data exchange protocols, thus providing system expansion capabilities;
- standard-based – defined and open data exchange protocols must be used as far as practicable;

- technology agnostic – the description of the architecture, i.e. system must be prepared without specifying the programming languages or equipment.

Table 4.3

Availability of U-Space services by phases

	U-Space phase U1		**U-Space phase U2**		**U-Space phase U3**
Identification and Tracking	Registration	e-identification	Tracking and Position reporting	Surveillance data exchange	
	Registration assistance				
Airspace Management	Geo-awareness	Drone Aeronautical Information Management	Geo-fence provision (incl. Dynamic GeoFencing)		
Mission Management		Operation plan preparation/	Operation plan processing	Risk Analysis Assistance	Dynamic Capacity Management
Conflict Management		Strategic Conflict Resolution			Tactical Conflict Resolution
Emergency Management		Emergency Management	Incident / Accident reporting		
Monitoring	Monitoring	Traffic Information	Navigation infrastructure monitoring	Communication infrastructure monitoring	Digital Logbook
					Legal Recording
Environment	Weather Information	Geospatial information	Electromagnetic interference information	Navigation coverage information	Communication coverage information
		Population density map			
Interface with ATC		Procedural interface with ATC			Collaborative interface with ATC

5. UA management and monitoring system

In this Concept, "UA management and monitoring system" means a set of methods, processes, resources and solutions that facilitate the implementation of secure UAS operations in the airspace of the Republic of Latvia, including coordination with manned aviation. One of the primary goals of the system is to improve the processes that allow UAS users, CAA and other stakeholders to achieve the fulfilment of the requirements specified in the regulatory framework in a convenient, easy-to-understand and digital manner, as well as to promote additional security in the airspace. The subject of management and monitoring is the persons who carry out UAS operations or provide services in this field. The monitors are the authorities that implement the public function in monitoring of the field of UAS. These authorities are the CAA, the State Police, the municipal police, the Military Police, the State Border Guard, the CRPC.

5.1 Breakdown of competences in the UA management and monitoring system

The Law on Aviation specifies the competence and powers of institutions and authorities in the field of UAS, which can be divided into three categories: market supervision, flight safety monitoring, competence in the administrative offence proceedings in the field of UAS. Accordingly, the stakeholders and authorities have the following division of roles:

- the CRPC performs market supervision;
- the CAA monitors flight safety;
- the administrative offence proceedings are performed by the State Police, the municipal police, the Military Police (at military facilities used by the National Armed Forces and in airspace structure elements created for their needs), the State Border Guard (at the facilities used by it and airspace structure elements created for its needs), the CAA.

Table 5.1 summarizes the competence of the authorities in administrative offence proceedings depending on the nature of the offence. The presented division of competencies shows that the Military Police, the State Police, the municipal police, the State Border Guard need access to the registers maintained by the CAA, for example, to make sure that the UAS operator has made registration. Data holders in the field of UAS can vary, so a reliable and efficient flow of information between authorities is needed. The data exchange (acquisition

from several sources) will provide an opportunity to verify the compliance of the performed UAS operations with other regulatory requirements, as well as to obtain historical data, if such are required within the framework of the administrative offence proceedings.

Table 5.1

Breakdown of competence in administrative offence cases

Nature of the offence	Military Police	State Police	Municipal police	State Border Guard	CAA
Use of unmarked or unidentifiable UA [1].	●	●	●	●	
Management of UA, performance of observer duties or monitoring under the influence of alcohol (blood alcohol concentration greater than 0.2 per mille) [2].		●	●	●	
Conduction of a BVLOS flight without appropriate authorisation [3].	●	●	●	●	
Operation of the UA flight without compulsory civil liability insurance [4].	●	●	●	●	
Operation of UA flights without registration of a UAS operator, remote pilot or aircraft model club [5].	●	●	●	●	
Operation of the flight with a UA, maximum take-off mass of which exceeds that specified in regulatory enactments or which does not comply with the UAS class or UA category [6].	●	●	●	●	
Operation of UA flights without regard to the distance to the persons not involved in the flight and to the places where people gather, if no operation authorisation has been received [7].		●	●		
Conduction of non-coordinated of an UA flight in the vicinity of the following facilities: public order and safety, civil protection, industrial accident risk facilities, Prison Administration facilities, the Bank of Latvia [8].		●	●		
Conduction of non-coordinated of an UA flight in the vicinity of State border security facilities [8].				●	
Operation of the UA closer than the distance from military objects specified in regulatory	●				

Nature of the offence	Military Police	State Police	Municipal police	State Border Guard	CAA
enactments without coordination with the NAF [9].					
Operation of the UA closer than the distance from military objects, where the presence of the Military Police is not ensured, specified in regulatory enactments without coordination with the NAF [9].	●	⭘	⭘		
Operation of the UA flight closer than the distance from the venue of a public event, meeting, procession or picket specified in the regulatory enactments without coordination with the person responsible for organizing the event [10].		●	●		
For the issuance of a permit to operate a flight with the UA closer than the distance from the venue of a public event, meeting, procession or picket specified in regulatory enactments without coordination with the local government or without informing the public about the UA flight [11].		●	●		
Organization of an aircraft model club or association work without permit [12].		⭘	⭘		●
For operation of the flight with an UA in an element of the airspace structure without permit or coordination or in the vicinity of a certified aerodrome, not observing the flight distance from the aerodrome or the permissible flight altitude, as well as in the airspace of the Republic of Latvia, not observing the permissible flight altitude [14].		⭘	⭘		●
Designations: ● – conducts full administrative offence proceedings; ⭘ – conducts administrative offence proceedings until the consideration of the administrative offence case; [n], where n is a number, is a reference to Section 124^1 (n) of the Law on Aviation.					

5.2 Goals, objectives and key performance indicators for 5 years

This Concept takes into account not only safety, but also security, privacy and environmental objectives, which set the desired level of safety.

5.2.1 Target level of safety

Article 11 of Regulation 2019/947 states that the operational risk assessment offers a target level of safety equivalent to the safety level in manned aviation, in view of the specific characteristics of UAS operation. The set of solutions in the UA management and monitoring system must contribute to the implementation of the target level of safety. Part B of the Annex provides an overview of the risks arising from UAS operations as well as their mitigation measures.

Prior to the preparation of this document, no defined unified target level of safety was available for UAS operations, therefore the considerations set out below are based on the assumption that it is similar to that used for manned aircraft.

The term “manned aircraft” covers both light single-seater aircraft and heavy aircraft. These aircraft differ significantly in terms of technical and performance parameters, technical equipment, so the safety target level is defined separately for large aircraft and general aviation aircraft.

The assumed safety target level for the number of accidents for large aircraft is $1x10^{-6}$ per flight hour (which is close to the actual accident rate of $4.8x10^{-6}$ per flight hour), while for general aviation aircraft it is $1x10^{-4}$ per flight hour (i.e. is similar to the actual accident rate of 1.79×10^{-4} per flight hour).

To ensure that the target safety level of UAS for the number of accidents is equivalent to the safety level of the manned aviation, its value must be set to $1x10^{-4}$ per flight hour, which means that the probability of 1 accident is not more than once per 10 000 flight hours.

5.2.2 Safety, security, privacy and environmental protection goals, objectives and key performance indicators

The safety, security, privacy and environmental protection goals, objectives and key performance indicators included in this section apply to the UA management and monitoring system for a period of 5 years. In line with best practice, safety objectives and key performance

indicators must be reviewed once a year to reflect the actual situation. The same approach applies to security, privacy and environmental protection purposes.

One of the existing problems with safety key performance indicators is that there is currently no information available on which safety key performance indicators for UAS operations are used – supervisory authorities do not inform and publicly report which safety key performance indicators they use, nor are these values defined in the regulatory framework. It is recommended that each service offered in the field of UAS be designed and operated in accordance with defined safety objectives and key performance indicators. A common approach to the definition, characterization and use of safety key performance indicators will benefit all stakeholders in UAS operations.

Some of the safety objectives and/or key performance indicators may be relevant to achieve a number of goals. Each key performance indicator must be manageable and influential by the specific responsible organization. Depending on the availability of data, the list of indicators may be extended.

This Concept offers the safety, security, privacy and environmental protection goals, objectives and key performance indicators, as well as the necessary solutions to achieve them. The following goals are highlighted:

- **safety goal No. 1.** – To support the development of UAS operations in the RIGA CTR without lowering the established level of flight safety (Table 5.2);
- **safety goal No. 2.** – To improve the safety of UAS operations in the airspace of the Republic of Latvia (Table 5.3);
- **environmental protection goal No. 1.** – To improve environmental protection in the vicinity of the RIX and the LPX (Table 5.4);
- **environmental protection goal No. 2.** – To improve environmental protection in the airspace of the Republic of Latvia (Table 5.5);
- **security goal** – To improve security protection during UAS operations in the airspace of the Republic of Latvia (Table 5.6);
- **privacy goal** – Protection of privacy during UAS operations in the airspace of the Republic of Latvia (Table 5.7).

Note: The column “Means of achieving the target level” of tables 5.2 to 5.7 indicates the means required to achieve the target level, as well as references to the solutions described in Chapter 6 (if any).

Table 5.2

Safety goal No. 1 Promotion of safe UAS operations within the RIGA CTR

Designation	Safety objective (SO)	Key performance indicators	Necessary tools and data	Means of achieving the target level
SO1.1	Reduce the number of unauthorized UA flights within the RIGA CTR	Reduce by 10 % per year.	Airspace boundaries (limits), UAS detection devices, list of matched flights, algorithms for data processing.	C.1. Application for UAS operations. C.2. Coordination of UAS operations. F.1. UAS signal receiving equipment.
SO1.2	Authorized UAS operations in the RIGA CTR.	Increase by 2 % per year.	Solutions for registration of (application for) UAS operations	C.1. Application for UAS operations. C.2. Coordination of UAS operations.
SO1.3	A moderate or significant increase in the number of UAS operations must not increase the workload on air traffic control operations.	Comparison with the corresponding period of the previous year.	A solution that addresses most of the issues related to UAS operations. Reaching out to air traffic controllers only when it is critically necessary to ensure the safety of manned aviation.	C.2. Coordination of UAS operations. E U-space.
SO1.4	Educate the public to reduce the misuse of UAS in the vicinity of aerodromes	Implement one information safety campaign every year.	Information campaigns.	Including information under Block A.

Designation	Safety objective (SO)	Key performance indicators	Necessary tools and data	Means of achieving the target level
SO1.5	Raise awareness of extraordinary situations (critical deviations from normal operations) by promoting both voluntary and mandatory reporting of UAS operations	Comparison with the corresponding period of the previous year.	Tool for reporting occurrences in the field of UAS.	A.10 Reporting occurrences in the field of UAS. Including information under Block A.
SO1.6	Reduce the number of emergency situations (UAS operations out of control).	Comparison with the corresponding period of the previous year.	UA registration, information campaigns.	Data on UAS to be operated and information on non-compliant products.
SO1.7	Applications for UAS operations are processed during the intended period of time.	At least 95 % of flight permit requests are processed during the intended period.	UAS operations application system, algorithms for data processing.	C.1. Application for UAS operations. C.2. Coordination of UAS operations.

Table 5.3

Safety goal No. 2 Improving the safety of UAS operations in the airspace of the Republic of Latvia

Designation	Safety objective (SO)	Key performance indicators	Necessary tools and data	Means of achieving the target level
SO2.1	Remote pilots are informed of the rules and procedures for the safe UAS operation.	At least 95 % of the remote pilots are informed of the applicable rules and procedures for the UAS operation. At least one information campaign is implemented every year.	Information campaigns, training and competence assessment processes.	Information under block A. A.1. Registration. A.2. Qualification. C.1. Application for UAS operations. C.2. Coordination of UAS operations.
SO2.2	Procedures between UAS operators and other persons are defined, approved and followed.	The number of incidents due to non-compliance with procedures is decreasing. Comparison with the corresponding period of the previous year.	Occurrence registration system, number of occurrences	C.1. Application for UAS operations. C.2. Coordination of UAS operations. E U-space.
SO2.3	Mean time between failures (MTBF) for critical system components for safety.	The system operation is restored within 1 hour.	Existence of sustainable solutions, regular inspections.	Appropriate technical solutions.
SO2.4	Prevention of financial damage and injury to people as a result of UAS operations.	Comparison with the corresponding period of the previous year.	Occurrence registration system, number of cases.	Occurrence registration and methodology.
SO2.5	The same as SO1.5.	The same as SO1.5.	The same as SO1.5.	The same as SO1.5.
SO2.6	The same as SO1.6.	The same as SO1.6.	The same as SO1.6.	The same as SO1.6.

Table 5.4

Environmental protection goal No. 1. Improving environmental protection in the vicinity of RIX and LPX

Designation	Environmental protection objective (EO)	Key performance indicators	Necessary tools and data	Means of achieving the target level
EO1	Reduce the negative impact of UAS operations on airport operations, such as flight delays.	Comparison with the corresponding period of the previous year.	Such cases Occurrence registration system.	Occurrence registration system.

Table 5.5

Environmental protection goal No. 2. Improvement of environmental protection in the airspace of the Republic of Latvia

Designation	Environmental protection objective (EO)	Key performance indicators	Necessary tools and data	Means of achieving the target level
EO2	Support the use of UA instead of environmentally unfriendly solutions.	Comparison with the corresponding period of the previous year.	Information campaigns, cooperation with industry.	Technological development.

Table 5.6

Security objective. Improve security during UAS operations in the airspace of the Republic of Latvia

Designation	Safety objective	Key performance indicators	Necessary tools and data	Means of achieving the target level
SE1	Implementation of UA incident management at aerodromes.	The number of aerodromes, where an incident management system has been developed and implemented to reduce the risks of unauthorized use of UA, has been increased.	Incident management system, information on implemented systems.	Incident management system.
SE2	Implementation of measures to reduce security risks.	Implement a remote identification system to improve UAS visibility.	Remote identification system, information about implemented systems.	F.1. UAS signal receiving equipment.

Table 5.7

Privacy objective

Designation	Privacy objective (PO)	Key performance indicators	Necessary tools and data	Means of achieving the target level
PO1	Raise awareness of privacy and data protection.	Conduct one information campaign on privacy and data protection issues every year.	Information campaigns.	Information under block A.
PO2	Implementation of measures to reduce privacy risks.	Implement a remote identification system to improve UAS visibility.	Information campaigns, UAS geographical zones.	F.1. UAS signal receiving equipment.

5.2.3 Monitoring objectives

Monitoring objectives are designed to monitor progress achieved in a specific area. Monitoring objectives can be defined for separate aerodromes, airspace parts or the entire airspace of the Republic of Latvia. This Concept offers the following monitoring objectives, i.e. parameters to be monitored:

- the number of deviations from the intended flight path (or the number of operations outside the declared flight geography) to ensure that UAS operations are consistent with the planned flight paths and/or flight geography;
- the number of deviations from the requirements specified for UAS geographical zones to ensure that UAS operators and remote pilots comply with the requirements in force at the horizontal and vertical limits of the CTR;
- the number of unauthorized UA flights in the UAS operations limited zone of the RIGA CTR aerodrome, LIEPAJA TIZ aerodrome – these parameters are necessary to improve flight safety and security in the vicinity of aerodromes;
- the number of approved or agreed UAS operations in the RIGA CTR and LIEPAJA TIZ to follow the trends for further development of the system and obtain real data to determine the level of safety.

The selected monitoring tasks provide information on progress statistics and allow the assessment of the fulfilment of many safety objectives. The data that will be obtained during the monitoring will allow determining the numerical value of offences and their dynamics. The data obtained can be used to adjust safety goals.

No standardized safety objectives or indicators have yet been defined at European level. The safety goals and objectives proposed in the chapter are measurable and each has its own key performance indicators.

6. Conceptual model of UA monitoring and management system

6.1 Introduction

The survey on the field of UAS in Latvia (see 3.5) revealed that UAS users want to see a unified and easy-to-use solution that provides not only services, but also up-to-date and useful information to UAS users on the regulatory framework in this field in force (including explanations), applicable restrictions, procedures. In turn, representatives of the supervisory authorities indicated that they need information on UAS operators, remote pilots, UAS operations performed, including historical data, in order to perform public functions.

The section "Description of the field of UAS" (see 4) provided a description of the roles of the stakeholders in the field of UAS, highlighted the problematic issues and summarized the stakeholders' views on possible solutions. The proposed solutions cover many fields, for example, the regulatory framework, the technologies to be used or implemented, the implementation of e-services in the field of UAS, which are the responsibility of several stakeholders. This means that the creation of a unified universal solution is complex, time-consuming and difficult to finance in terms of implementation and maintenance. Taking into account the need expressed by stakeholders for a solution that provides access to information from a number of information sources, including national information systems, the Conceptual model of the UA monitoring and management system (hereinafter – the Conceptual model) is based on a set of digital systems services and procedures that will be connected to data providers, ensuring reciprocal data exchange.

The Conceptual model takes into account the wishes and needs of the parties involved, the requirements of the regulatory framework, as well as the development forecasts of the field of UAS, therefore, mandatory services, potential opportunities and additional services are considered.

Taking into account the nature of the functions and the deadlines for their implementation specified in the regulatory framework, the data sets to be processed, as well as the possible managers, the Conceptual model consists of six functional blocks. These blocks (Table 6.1) are:

- Block A – CAA functions;
- Block B – Design of UAS geographical zones;

- Block C – Application for UAS operations and coordination of UAS operations with UAS geographical zone managers;
- Block D – Central data exchange point (CDEP);
- Block E – U-space;
- Block F – Other systems and extensions.

Table 6.1

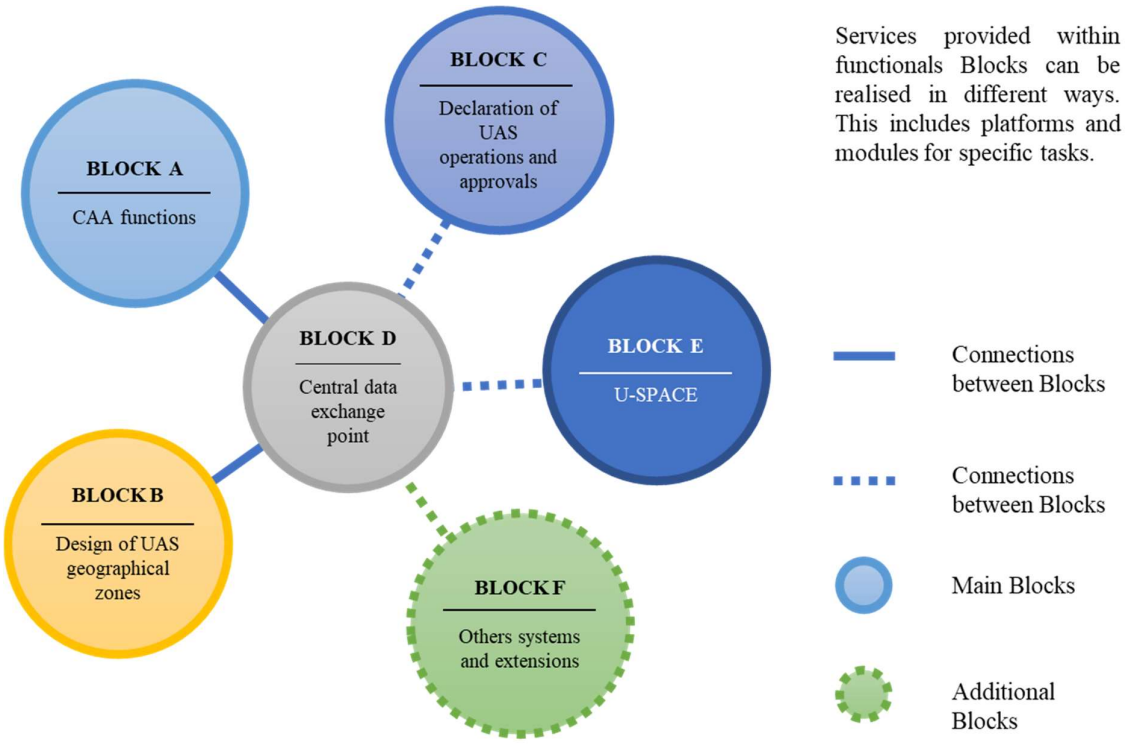
Functional blocks, their description and implementation priority

Block	Name	Short description	Implementation priority
A	**CAA functions**	The block summarizes the CAA functions in the field of UAS, for example, registration of UAS operators, management of remote pilots' qualification records, management of operation permits, implementation of monitoring programme, management of UAS geographical zones, etc.	Priority No. 1 The data to be processed in the block are required to ensure the operation of Block B, Block C, Block E and Block F (or their modules). The data in Block A will avoid repeated data requests in other Blocks and ensure the management of the functions specified in the regulatory framework.
B	**Design of UAS geographical zones**	A set of solutions to prepare an application for the defining a UAS geographical zone, to process it, to coordinate it with other stakeholders (if necessary), to prepare an application to the CAA.	Priority No. 2 It is a tool, i.e. collaboration platform for UAS geographical zone applicants. The number of applications, processing of which requires the digital tool, is expected to increase rapidly.
C	**Application for UAS operations and coordination of UAS operations with UAS geographical zone managers**	Digital environment for application for UAS operations (outside U-space airspace), as well as coordination of UAS operations with UAS geographical zone managers.	Priority No. 3 The block is essential for the performance of monitoring and control functions.
D	**Central data exchange point**	A set of solutions that ensures data exchange between blocks of the Conceptual model.	Priority No. 4 An infrastructure block that provides easy access to information as the number

Block	Name	Short description	Implementation priority
			of active blocks increases. Its establishment is not mandatory from the point of view of the regulatory framework, however it is essential for the stable operation and sustainable development of the system.
E	**U-space**	U-space environment and services.	No priority set. The implementation of the block depends on the creation of U-space airspace, as well as significant changes are needed in the national regulatory framework, which would determine the implementation of U-space.
F	**Other systems and extensions.**	Block F represents all other systems in the field of UAS that can complement and extend the Conceptual model.	Priorities depend on functions. The function of publishing data of UAS geographical zones, which is specified in the regulatory framework, as well as the function of visualization of geographical zones, which is not mandatory from the point of view of the regulatory framework, shall be considered a priority.

The Concept does not specify exactly how the functional blocks must be implemented – the Concept provides a vision for the sustainable design and functions of the UA management and monitoring system, taking into account the needs of stakeholders. In the proposed Conceptual model, functional blocks "aggregate" similar or related services. This means that several technical solutions can be used within the block. For example, the relevant service providers for each of the U-space airspaces created will be under Block E (i.e. U-space). A similar principle is included in Block F (i.e. Other systems) – the block framework shows how to include additional systems (solutions, services) in the UA management and monitoring

system, but it does not nominate a block manager, i.e. a person to coordinate its development or determine which additional systems must be incorporated or included in it.



6.1 Fig. **Interconnection of blocks in the Conceptual model**

According to the functions to be performed, the modules can be divided into business modules (for the provision of services related to the field of UAS) and auxiliary modules (for the provision of operation of the respective solution). The application of this approach allows for the gradual implementation, maintenance of the modules (services), including the performance of improvement works, without significantly affecting the operation of other modules, unless their operation is directly interdependent.

Due to the fact that UA monitoring and management system performs specific tasks, for example the management of operation authorisations, it is assumed that complex solutions available on the market may not be ready to perform these tasks in full, so the missing modules must be created. In such cases interfaces for exchanging data with other modules must be built in.

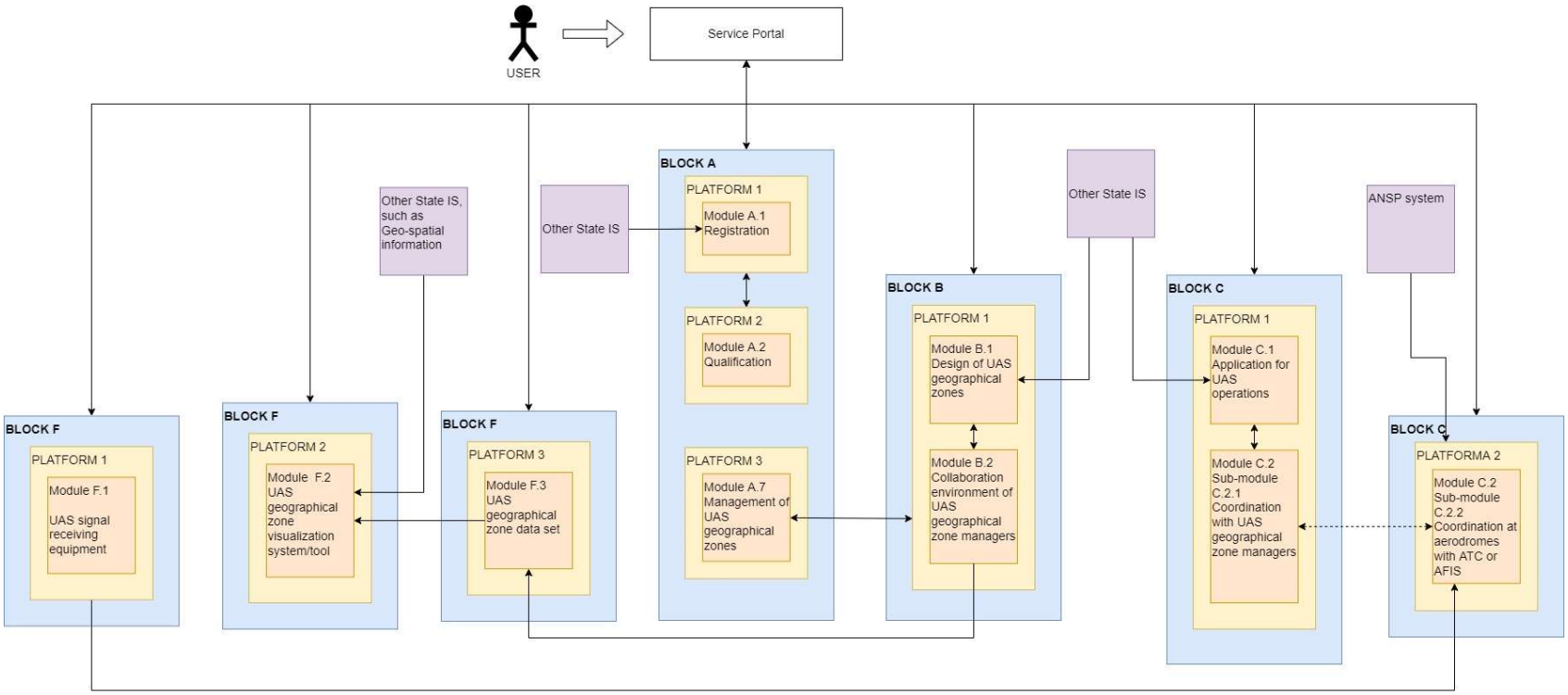
Segregation into functional blocks makes it possible to structure and manage the issues to be addressed in the field of UAS, but it does not ensure that these services are available to

the end user (regardless of their role in the UA monitoring and management system) in one place, i.e. on one platform. It is recommended to implement the "One-stop shop principle".

Compliance with the "one-stop shop principle" can be achieved by introducing a Service portal (hereinafter – the Portal), where users can access services provided in the UA management and monitoring system. Conceptual model consists of multiple blocks (including platforms and modules) with different managers and services provided, so it is desirable to provide solutions that allow the user to access services by performing a single authentication during the connection session.

Figure 6.2 shows the implementation of the "one-stop shop principle" in the UA management and monitoring system model. The following terms are used below:

- a module is a set of functions for the performance of a specific task (including the provision of a service);
- a platform is an IT solution within a functional block. The platform may consist of one or more modules, which may be interconnected;
- a functional block, i.e. block is a conceptual unit of the model, which denotes a set of tasks and solutions (platforms) in a certain field. The block can consist of several platforms (i.e. different IT solutions), which can have different managers;
- a portal is a list of available services in the field of UAS in Latvia, as well as a unified authentication solution for receiving services on different platforms within the model.



6.2 Fig. **Implementation of the "One-stop shop principle" in the Conceptual model**

6.2 Monitoring objectives in the Conceptual model

In the section "Monitoring objectives" (see 5.2.3) the following monitoring objectives, i.e. parameters to be monitored were set:

1. the number of deviations from the planned flight path (or operations outside the declared flight geography),
2. the number of deviations from the requirements for UAS geographical zones,
3. the number of unauthorized flights of UA in the UAS operations limited zone of RIGA CTR aerodrome, LIEPAJA TIZ aerodrome,
4. the number of approved or agreed UAS operations in RIGA CTR and LIEPAJA TIZ.

Table 6.2

Solutions required to perform monitoring tasks

	Solutions and resources					
Monitoring objective	UAS operations application system	UAS operations coordination systems	UAS signal receiving equipment	UAS geographical zones	UA register	Procedures (algorithms)
Deviation from the planned flight trajectory (or operations outside the flight geography applied for)	●	●	●	⊙	⊙	●
The number of deviations from the requirements for UAS geographical zones	⊙	⊙	●	●	●	●
The number of unauthorized flights of UA in the UAS operations limited zone of RIGA CTR and LIEPAJA TIZ	●	●	●	●	⊙	●
The number of approved or agreed UAS operations in RIGA CTR and LIEPAJA TIZ	●	●		●	⊙	●
Designations: ● – a solution (resource) is needed; ⊙ – a solution (resource) is desirable, but not mandatory.						

Monitoring of the proposed parameters requires both technical tools and appropriate procedures (Table 6.2), which provide numerical values for the parameters:

- UAS operations application system – a digital environment in which UAS operators can register planned UAS operations;
- UAS operations coordination system – a digital environment in which UAS geographical zone managers review UAS operations applications and provide their decision;
- UAS signal receiving equipment – a set of solutions that identifies UA in the air;
- UA register – a digital register in which information on at least the unique serial number of UA and its owner or user is available;
- procedures (algorithms) – a set of relevant actions and algorithms that provides analytical and statistical information when processing input data, for example, detects deviations from target levels.

6.3 Conceptual model functional blocks and modules

The division of the Conceptual model into modules promotes flexible planning and use of resources, implementing only those modules that are necessary at the relevant stage of development of the field of UAS. This approach allows the use (combination) of platforms and modules from different suppliers (developers) within one block.

Table 6.3 provides an overview of the functional blocks and business modules in them. This chapter describes the operation of the modules and the tasks to be performed. This document will look in more detail at modules of Blocks A and B, which serve as data sources for other functional blocks. Implementation of the Blocks A and B is required to meet the requirements of the regulatory framework.

The Concept deals with the provision of services in the digital environment, therefore the closed parts of the Portal, functional blocks, their platforms and modules, which are intended for administrative activities, are not considered in detail. In the general case, it is assumed that these users have access to functions that allow them to manage the records, access them, as well as perform additional actions that are necessary to ensure correct operation of the system in general.

Table 6.3

Overview of functional blocks and business modules

Module	Name	Responsible or coordinating party
Block A: **CAA functions**		
Module A.1	Registration	CAA
Module A.2	Qualification	CAA
Module A.2.1	Training	CAA
Module A.2.2	Examinations	CAA
Module A.2.3	Certifications and certificates	CAA
Module A.3	Declarations, permits and certificates for operation in a specific category	CAA
Module A.3.1	Operation permits	CAA
Module A.3.2	Approval of declaration of operation	CAA
Module A.3.3	Light UAS operator certificate (LUC)	CAA
Module A.3.4	Cross-border operations	CAA
Module A.4	Access to the EASA repository	CAA
Module A.5	Monitoring programme	CAA
Module A.6	Solution for fast data verification	CAA
Module A.7	Management of UAS geographical zones	CAA
Module A.8	Reporting occurrences in the field of UAS	CAA
Module A.9	Information on the field of UAS	CAA
Block B: **Design of UAS geographical zones**		
Module B.1	Design of UAS geographical zones	LGS*
Module B.2	Collaboration environment of UAS geographical zone managers	LGS*
Block C: **Declaration of UAS operations and coordination of UAS operations with UAS geographical zone managers**		
Module C.1	Declaration of UAS operations	The CAA or others
Module C.2	Authorisation of UAS operations	The CAA or others

Module	Name	Responsible or coordinating party
Module C.2.1	Authorisation of UAS operations with UAS geographical zone managers	CAA
Module C.2.2	Authorisation of UAS operations at aerodromes with ATC or AFIS	LGS*, the CAA or others (RIX, LPX)
Module C.2.3	Other solutions	Various
Block D: **Central data exchange point**		
Module D.1	Central data exchange point and transaction recording	CAA
Module D.2	Backup data copy storage	CAA
Block E: **U-space**		
The detailed structure of Block E is outside the scope of this Concept		Various
Block F: **Other systems and extensions.**		
Module F.1	UAS signal receiving equipment	others (for example, the CAA, RIX)
Module F.2	UAS geographical zone visualization system/tool	LGS and others
Module F.3	UAS geographical zone data set	LGS
Module F.4	Service portal	Shared
…	…	…
Module F.N	Other systems	Various
Designations: * – marked functions may be performed by LGS if additional funding is available, taking into account the limitations of funding sources		

6.3.1 Block A: CAA functions

Section 0 has addressed the interaction between stakeholders in the field of UAS and highlighted the role of the CAA in many processes. These processes are mainly related to registration, operation authorisation, monitoring programme, etc. The functions and tasks to be implemented by the CAA in the field of UAS are combined in Block A, the data from which will be used by other functional blocks.

The CAA is the competent authority responsible for the following matters in accordance with Article 18 of Regulation 2019/947:

- UAS operator certificate management;
- management of certifications and remote pilot competence certificates, including issuing licences to remote pilots operating in the category of certified UAS operations;
- implementation of a monitoring programme for UAS operators that have submitted a declaration or have an operation permit or a LUC certificate, as well as for aircraft model clubs and associations that have a permit referred to in Article 16;
- providing information and guidance to UAS operators with the aim of promoting the safety of UAS operations;
- implementation of a system for the detection and examine incidents of non-compliance, which are caused by UAS operators performing operations in the "open" or "specific" category of operations and which are reported in accordance with Article 19 (2) of Regulation 2019/947;
- maintenance of registration systems, the functionality of which allows the registration of UAS, the design of which must be certified, as well as UAS operators, the operation of which may present a risk to security, safety, privacy and the protection of personal data or the environment.

In turn, national law in the field of UAS stipulates that the CAA:

- performs approval of recognized entities and amendment of certificate conditions, assessment of operations in accordance with the monitoring cycle;
- is the competent authority for the implementation and supervision of operation of the UAS geographical zones in the Republic of Latvia;
- is responsible for online training of remote pilots, issuance of certificates for passing the theoretical online exam, for the face-to-face theoretical knowledge exam of remote pilots, for issuance of the certificate of competence of remote pilots and for management of the issued certificates (extension, limitation, revocation and suspension), etc.;
- is responsible for the issuance and management (extension, limitation, revocation and suspension) of specific category UA operation permits, light unmanned aircraft system operator certificates (LUC), for checking the compliance of declarations for

UAS operations in a specific category, for monitoring of UAS operators of a specific category;

- is responsible for the establishment, maintenance and availability of the register of UA, UAS operators, remote pilots and aircraft model clubs and associations.

This functional block provides services to a wide range of users (Table 6.4), which means that the platform must have a built-in solution that allows managing user access and rights to perform actions in modules and sub-modules.

The Conceptual model envisages that the services within the framework of Block A will form the basis of the UAS monitoring and management system: UAS users will register (provide data about themselves to the extent required in accordance with the requirements for State information systems), apply for in and receive services in the field of UAS. Given the functionality of other blocks, for example, the services included in Block C for registration of UAS operations and implementation of approval with UAS geographical zone managers, it is expected that data from Block A will be used in them.

This means that Block A must have built-in solutions that will allow UAS operations to be performed by any natural or legal person that meets the requirements specified by law. In other words, the Block must have solutions for registering, electronically identifying and servicing potential users (i.e. residents) from Latvia, other EU Member States, as well as third countries. Wide range of potential users means that persons may have various means of authentication, as well as data on citizens of other countries may not be available in the State information system of the Republic of Latvia, therefore, there must be built-in or planned solutions for dealing with such cases.

Table 6.4

Overview of user groups of business modules in Block A

	Functional block A business modules	A.1	A.2	A.3	A.4	A.5	A.6	A.7	A.9	A.10
		Registration	Qualification	Permits for operations in a specific category	EASA repository	Monitoring programme	Solution for fast data verification	Management of UAS geographical zones	Reporting occurrences in the field of UAS	Information
Unregistered	Unregistered user or unauthenticated user								●	●
Unregistered	Unregistered user from an institution that has rights specified in regulatory enactments in the field of UAS				⊙		⊙		⊙	●
Registered	User that authenticates on the platform for the first time.	●								●
Registered	UAS operator	●		●		●			●	●
Registered	Remote pilot	●	●						●	●
Registered	Person, in whose name the certified UA registration is made	●				⊙			●	●
Registered	Legal representative or authorized person of an aircraft model club or association	●				●			●	●

Functional block A business modules	A.1	A.2	A.3	A.4	A.5	A.6	A.7	A.9	A.10
	Registration	Qualification	Permits for operations in a specific category	EASA repository	Monitoring programme	Solution for fast data verification	Management of UAS geographical zones	Reporting occurrences in the field of UAS	Information
Legal representative or authorized person of CIS	●				⊙			●	●
Legal representative or authorized person of the U-space service provider	●				⊙			●	●
Legal representative or authorized person of the recognized entity	●	●			●			●	●
UAS geographical zone manager (legal representative or authorized person)							●		●
CAA employee who has access and/or rights to act in the respective module	●	●	●	●	●	●	●	●	●

Symbols used in the table:
● – access is required
⊙ – access depends on available functions

6.3.1.1 Registration

Article 14 of Regulation 2019/947 provides guidance on the registration of UAS operators and certified UAS. The requirements of Regulation 2019/947 stipulate that the registration system must be digital and allow other Member States to access and exchange information through the Repository referred to in Article 74 of Regulation 2018/1139. The regulation framework in the field of UAS stipulates that data on UAS operators and UAS whose design must be certified must be available for exchange.

In its turn, Cabinet Regulation No. 457 determines how the CAA ensures the procedure for the establishment, maintenance, availability, interoperability and operation of the register of UA, UAS operators, remote pilots and unmanned aircraft model clubs and associations (hereinafter – the Register). National law envisages that additional data on subjects are processed in the Register in addition to the data referred to in Regulation 2019/947.

The main task of the module is to provide Customers with the opportunity to report or apply for their role (in cases where the application involves manual review of the submitted data and decision-making, for example, obtaining the status of a recognized entity) in the field of UAS with simple tools. Taking into account that the amount of information to be entered differs depending on the Customer's role in the field of UAS, the "Registration" module is divided into 8 sub-modules: Registration of UAS operators, registration of certified UA, registration of UA, registration of remote pilots, registration of aircraft model clubs and associations, registration of a recognized entity, registration of a common information services provider, registration of U-space service providers.

6.3.1.1.1 Registration of UAS operators

The sub-module "Registration of UAS operators" is intended for the registration of UAS operators and the management of these records. The minimum amount of data that must be available regarding UAS operators is summarized in Table 6.5. The basic process of registration of UAS operators must be available in the form of digital service regardless of the time of day, and it must take place in automatic mode.

Unique registration numbers are assigned to identify UAS operators.

According to the requirements of Article 14 (5) of Regulation 2019/947, a UAS user is obliged to register as a UAS operator in the cases:

- if the maximum take-off mass of the UA is equal to or exceeds 250 grams (or if the energy released as a result of impact exceeds 80 J),
- if the UA is equipped with a photo/video sensor able to capture personal data,
- if UAS operations are conducted in a specific category.

Table 6.5

Overview of data processed in the Register on an UAS operator

Persons	Requirements of Regulation 2019/947 related to data entry and exchange	Additional data to be processed in the register referred to in Clause 9 of Cabinet Regulation No. 457 (not exchanged with the Repository)
For natural persons	Full name, surname, date of birth.	Personal identity number assigned in the Republic of Latvia or identification code assigned abroad. If the identification code is not available, the details of the identity document must be entered: • its type, • number, • date of issue, • expiration date, • name of the issuing country; address of the declared place of residence; official electronic address (if any is created).
For legal persons	Name, registration number.	Legal address, official electronic address (if any is created), country of registration, the name, surname and data of the responsible manager or authorized person which are required from natural persons.
For all persons	Unique registration number of the UAS operator (it is automatically assigned during registration).	Additional data are not required.
	UAS operator's e-mail address and telephone number; UAS insurance policy number	

Persons	Requirements of Regulation 2019/947 related to data entry and exchange	Additional data to be processed in the register referred to in Clause 9 of Cabinet Regulation No. 457 (not exchanged with the Repository)
	(if applicable); A statement by the legal person that all employees involved in UAS operations are competent to perform their duties, that the remote pilots have the appropriate level of competence; operation permits and LUCs held as well as operation declarations with approval.	

6.3.1.1.2 Registration of certified unmanned aircraft

The task of the sub-module "Registration of certified unmanned aircraft" is to ensure the fulfilment of the requirements specified in Article 14 (3) of Regulation 2019/947 by offering users a digital service on how to enter data on certified UAS in the registration system. The fields summarized in

Table 6.6 must be available for entering and exchanging information.

Note: As UA, whose construction is to be certified, are assigned a registration mark in accordance with ICAO Annex 7, they must be registered in the Register of Civil Aviation Aircraft of the Republic of Latvia in accordance with regulatory documents on civil aviation aircraft registration and procedures for placing a national mark and registration mark on aircraft.

Table 6.6

An overview of the data that are processes in the Register of certified UAS

Persons	Requirements of Regulation 2019/947 related to data entry and exchange	Additional data to be processed in the register referred to in Clause 9 of Cabinet Regulation No. 457 (not exchanged with the Repository)
Details of the person in whose name UA is registered:		
For natural persons	Full name, surname;	Additional data are not required.
For legal persons	name;	

Persons	Requirements of Regulation 2019/947 related to data entry and exchange	Additional data to be processed in the register referred to in Clause 9 of Cabinet Regulation No. 457 (not exchanged with the Repository)
For all persons	registration mark (it is assigned by the CAA in accordance with ICAO Annex 7);	
	address; e-mail address; telephone number.	
Details of the UAS whose design must be certified:		
For all persons	The name of the manufacturer; the designation given by the manufacturer; UA serial number.	

6.3.1.1.3 Unmanned aircraft registration

The main task of this sub-module is to register UA in the possession and ownership or use of the UAS operator that are operated in the open and specific category, as well as to register remote identification devices.

To ensure the correct operation of the module, including the completeness of the data, it would be necessary to provide lists of data with predefined values, for example, UAS manufacturers, models, their technical parameters.

The basic process of UA registration must be available in the form of digital service regardless of the time of day and it must take place in automatic mode. In cases where data are entered that are not available in the lists of predefined values, a manual check of the data and/or a list of values with new parameters is required, which means longer service provision. **Error! Reference source not found.** provides an overview of the amount of data that can be processed in the Register. At the time of preparation of the Concept, regulatory enactments at the national level allow for the processing of these data in the Register, but this is not a mandatory requirement for UAS operators to register UA.

The proposed Conceptual model envisages that the data from this sub-module will be widely used in UA monitoring and management system. These data will be used in several functional blocks as machine-readable input data sets with UA parameters (performance, equipment). Some of the possible examples of use:

- warning to UAS operators or remote pilots about inappropriate qualification (if UA parameters require a different level of qualification) or about the need for insurance;
- facilitating the process of obtaining permits for operation in a specific category;
- providing UAS geographical zone managers with full information about intended UAS operations, etc.

Table 6.7

Overview of the data on UA to be stored in the Register

Persons	Requirements of Regulation 2019/947 related to data entry	Additional data to be processed in the Register referred to in Clause 9 of Cabinet Regulation No.457
Data on the UA owner:		
For natural persons	Data are not required.	Data set for a natural person according to Clause 4.2.1.1;
For legal persons		data set for a legal person according to Clause 4.2.1.1
Data on UA:		
For all persons	Data are not required.	manufacturer; model; serial number, type; maximum take-off mass; maximum flight speed; electronic identification device; other technical parameters for the identification and characterization of UA

The importance of these data in the fulfilment of CRPC tasks related to the field of UAS – in the supervision of products available on the market – should be emphasized separately, – according to its level of competence, products may be recalled or banned for use. The Conceptual model envisages that the CRPC will be able to select data by UA parameters (for example, manufacturer, model, equipment, etc.) and prohibit or restrict the use of these products. A detailed action and cooperation plan between the CRPC and the CAA (as data and module holder) is outside the scope of this Concept.

6.3.1.1.4 Remote pilot registration

The "Remote pilot registration" sub-module provides users of the "Registration" module with a solution for registering as a remote pilot. Primarily, these records are needed to link data about a person and his/her qualification. A person must register on the CAA service portal in order to start the process of obtaining a document certifying remote pilot qualification, which follows from the national regulatory documents in force. The data processed in the Register have been summarized in Table 6.8.

Table 6.8

Overview of remote pilot data that are processed in the Register

Persons	Requirements of Regulation 2019/947 related to data entry	Additional data to be processed in the Register referred to in Clause 9 of Cabinet Regulation No.457
For natural persons	Data are not required.	Name, surname; personal identity number assigned in the Republic of Latvia and date of birth (if the personal identity number is not available, then the identification code assigned abroad, nationality, data on the identity document: • its type, • number, • date of issue, • expiration date, • name of the issuing country); address of the declared place of residence; official electronic address (if any has been created for the person); e-mail address; telephone number; qualification certifications and certificates issued.

6.3.1.1.5 Registration of aircraft model clubs and associations

The sub-module "Registration of aircraft model clubs and associations" is a set of solutions that allows the legal representatives of the respective organizations to digitally submit

data to the CAA (Table 6.9) on the registration of an aircraft model club and association and apply for changes. This process requires manual data processing, so it means a longer service provision.

Table 6.9

An overview of the data that are processed in the register on aircraft model clubs and associations

Persons	Requirements of Regulation 2019/947 related to data entry	Additional data to be processed in the register referred to in Clause 9 of Cabinet Regulation No.457
For legal persons	The amount of data required is not stipulated.	Name; registration number; legal address; official electronic address (if such has been established for the person); e-mail address; telephone number; insurance policy number; UA operation places; UA operation permits held; list of members.

With regard to the list of members of aircraft model clubs and associations, it is necessary to provide members with possibility to manage the data on membership in the association or club in their own profile in the "Registration" module. A representative of an aircraft model club or association would need to approve users who have identified themselves as members.

6.3.1.1.6 Recognized entity registration

In order to ensure the full-fledged operation of the UA management and monitoring system model and the traceability of the data, a solution for the registration of recognized entities is needed. This solution must include a set of solutions that ensure the submission of applications for obtaining the status of recognized entities, the submission of applications for changes, as well as the review and management of these applications by the CAA.

When deciding on granting the status of a recognized entity, the CAA notes the relevant authorisations for this organization, i.e. what examinations it is entitled to take, what training it

may provide. This data can become automatically available in the modules "Training" and "Exams" and will be used to implement the monitoring programme (module "Monitoring programme", see 6.3.1.5).

6.3.1.1.7 Registration of common information services (CIS) provider

In order to implement the monitoring programme, as well as to manage the issued certificates, it is necessary to provide for the registration of CIS providers in the future.

6.3.1.1.8 Registration of U-space service provider (USSP)

In order to implement the monitoring programme, as well as to manage the issued certificates, it is necessary to provide for the possibility of registering U-space service providers in the future.

6.3.1.2 Qualification

The task of the "Qualification" module is to provide management of records that confirm the qualifications and skills of remote pilots in the field of UAS. This module consists of three sub-modules – "Training", "Exams", "Certifications and certificates", which provide a sequential overview of the process from the start of training to the passing of the exam and obtaining the relevant certification or certificate.

Cabinet Regulation No. 457 stipulates that data on remote pilots must include information on the qualification certifications and certificates issued to them. It follows that:

- the entity issuing these documents must have access to the Register to make the relevant entries;
- the remote pilot must have access to information on the qualification certifications and certificates obtained in the form of a report;
- the UAS operator must have access to information in the form of a report on the qualifications of the remote pilots acting on its behalf (use the UAS operator registration number).

It follows from the above that the module "Qualification" provides many sub-processes that are related to the flow of information and accounting.

6.3.1.2.1 Training

The "Training" sub-module provides a digital environment for online training of remote pilots of sub-category A1 and A3 of open category. Section 12 of Cabinet Regulation 436 specifies that the CAA provides the above training on its service portal (note: at the time of writing of the Concept, it was implemented with the help of http://uas.caa.lv).

It should be added that there are also other types of training, for example, theoretical training in a specific category if it is required by the safety assessment, or practical training. These types of training will be provided by CAA-recognized entities, which will have appropriate authorisations from the CAA. This document does not cover the IT solutions used by the CAA-recognized entities to implement the training process.

6.3.1.2.2 Examinations

The main task of the "Examinations" sub-module is to ensure the course of the remote pilot examination process. This task execution requires a number of sub-modules and auxiliary functions that provide support for the examination process, from the maintenance of the bank of exam questions to the preparation and issuance of the relevant document certifying qualification.

Regulation 2019/947 sets out the requirements for remote pilot qualification depending on in which subcategories of the open category UAS operations are performed. Additional requirements for remote pilot competence may be set in the specific category for UAS operations, so a wide range of configuration options must be built into this module.

Due to the fact that regulatory enactments are changed relatively often, the Conceptual model envisages that the requirements regarding the content of exams (number of questions, topics, proportional distribution of questions by topics) may vary. This means that the sub-module must incorporate (provide) configuration options, for example, creation of new examination types (with custom question categories, total number of questions, proportions of topics), management of rights for examination administration with recognized entities, replenishment and management of the bank of questions, question category management.

Types of exams

Depending on the category and subcategory in which the remote pilot intends to perform UAS operations, requirements are set for his/her theoretical knowledge and practical skills in the field of UAS and their supporting documents (certifications and remote pilot competence

certificates) issued by the CAA or a recognized entity. These documents are obtained after successful completion of the exam.

The types of exams differ by the way they are conducted (online, face-to-face), by their type (theoretical knowledge examination, practical skills check), by category and subcategory (open category (A1, A2, A3) and specific category). This means that the solution must have built-in functionality that allows recognized entities to conduct sessions of exams in accordance with the authorisations granted to them by the CAA.

Schedule of exams

Solutions must stipulate that information on expected sessions of exams must be publicly available. Online examinations (as services) must be available for passing 24 hours a day, which means no prior application is required (number of places is unlimited). However, in the case of face-to-face exams (face-to-face examination of theoretical knowledge or check of practical skills), recognized entities and the CAA must announce the type and category of the examination session, the place, date and time of the examination. Remote pilots need functions that will allow them to apply for the announced examination sessions. The organizer of the relevant examination session would need to approve the applicants (the Concept does not address the formal relationship between the recognized entity and the applicant).

Digital environment for exams

Common digital environment for passing theoretical knowledge exams can be used to ensure the rapid exchange of results. Namely, in the case of an online exam, the user takes it remotely, while the face-to-face exam takes place in person at the CAA or in the venue of recognised entity. With regard to the theoretical knowledge exam, the same digital environment may be used, which, according to the exam category or subcategory, uses questions from the bank of exam questions on such topics and in such proportions as required by regulatory framework.

Bank of examination questions

Taking into account the requirements of Regulation 2019/947 regarding question categories, as well as Cabinet Regulation No. 374 stipulating that exam questions must be approved by the CAA, then the examination digital environment must have a set of functions that allows creating and managing question topics, entering questions (with multiple choice answers), assigning them the appropriate categories, and, if necessary, obtaining approval from the CAA for their use in the examination process.

It is recommended to implement functionality, which collects data (statistics) about frequent mistakes and generates reports. These data can be analysed with the aim of improvement of the examination process by reviewing the wording of the questions and the training programmes, as well as by drawing the attention of recognized entities in the form of recommendations to those topics which present the greatest difficulties for applicants.

6.3.1.2.3 Certifications and certificates

The aim of the sub-module is to provide a range of solutions for processing the results of the exams, i.e. a certification or certificate of competence is created in case of successful passing the examination. Although digital environment for examination is not used in the case of practical skills exams, there must be solution for the practical skills assessor to enter the data on the remote pilot and the result of the check in the "Qualification" module.

6.3.1.3 Declarations, permits and certificates for operation in a specific category

Regulation 2019/947 provides that the competent authority may allow the UAS operations in a specific category by issuing the approval of the declaration of operation, the operations authorisation. In turn, holders of a light UAS operator certificate (LUC) may operate in this category without operation authorisation and declaration approval if such rights are specified in the certificate.

The main tasks of the module "Declarations, permits and certificates for operation in a specific category" are to provide users with a set of tools and solutions that

- Facilitates digital processing of applications for permits for operations in specific category;
- allows the CAA to receive, review respective applications and inform applicants of decisions made, as well as to manage those decisions.

Due to the variety of permits as well as due to the different data sets, this module is divided into 4 sub-modules: Operation authorisations, operation declaration approvals, LUC, cross-border operations. The processes in these sub-modules are similar, therefore the following sections provide a summary of the minimum amount of data to be processed, which is specified in the regulatory framework. AMC&GM are regularly supplemented and clarified, so it is recommended that these modules provide extensive configuration options for the data to be processed and the automation of the data processing.

6.3.1.3.1 Operation permits

Table 6.10

Data to be included in the application for an operation authorisation

Persons	UAS.SPEC.030 of Part B of the Annex to Regulation 2019/947
For legal persons	• the risk assessment referred to in Article 11 of Regulation 2019/947; • UAS operator registration number; • name and surname of the responsible manager.
For natural persons	• name and surname of the UAS operator.
For all persons	• operation risk assessment; • a list of risk mitigation measures proposed by the UAS operator with sufficient information to enable the CAA to assess the suitability of the risk mitigation measures to address the risks; • an operation manual, if it is necessary, taking into account the risk and complexity of the operation; • confirmation that appropriate insurance cover will be provided prior to the commencement of UAS operations, if it is required by EU or national law.

6.3.1.3.2 Approval of declaration of operation

Table 6.11

Data to be included in the declaration of operation

Persons	UAS.SPEC.020 of Part B of the Annex to Regulation 2019/947
For legal persons	• administrative information about the UAS operator.
For natural persons	
For all persons	• a statement that the operation meets the operation requirement specified in Sub-paragraph 1 and the standard scenario specified in addition to Annex 1; • the commitment of the UAS operator to implement the appropriate risk mitigation measures necessary for the security of the operation, including instructions related to the operation, the design of the UA and the competence of the employees involved; • confirmation by the UAS operator that appropriate insurance cover will be provided for each flight that will be performed in

	accordance with the declaration, if required by EU or national law.

6.3.1.3.3 Light UAS operator certificate (LUC)

Table 6.12

Data to be included in the application for the light UAS operator certificate

Persons	UAS.LUC.010 of Part C of the Annex to Regulation 2019/947
For natural persons	• a description of the UAS operator management system, including its organizational structure and security management system; • name and surname of the responsible employee(s) of the UAS operator, as well the person responsible for permission of UAS operations; • a statement that the applicant has verified all information submitted to the CAA and found it to comply with the applicable requirements.

6.3.1.3.4 Cross-border operations (permits from another country)

UAS operators who plan to perform UAS operations within the "specific" category in Latvia, but have an operation permit or approval of the operation declaration issued by the competent authority of another Member State must apply to the CAA by submitting the documents listed in Table 6.13, a copy of the operation permit, as well as information about operational environment of the planned UAS operations.

Table 6.13

Information to be provided to the CAA in case of cross-border operations

Persons	Article 13 of Regulation 2019/947
For all persons	• a copy of the operation permit; • planned operation places, updated risk mitigation measures, taking into account the characteristics of the planned UAS operation space, for example, density of population, climatic conditions, etc.

6.3.1.4 Access to the EASA repository

The module "Access to the EASA repository" ensures the interoperability of the registration system and the exchange of data with the Repository. It is desirable to make the module and its functionality available to CAA and TAIIB investigators.

In regards to operation of this module, it is important to note some important things:

- a limited number of data-fields about UAS operators and UA whose design must be certified is provided for data exchange (see 6.3.1.1.1 and 0);
- data search is only possible by UAS operator registration number and certified UA registration number or mark.

6.3.1.5 Monitoring programme

This module implements the management of the monitoring programme – it may include functionality to establish a monitoring programme, sending appropriate notifications to users, creating unscheduled audits based on performed actions or events, for example, the change of the responsible manager of the recognized entity.

The monitoring programme consists of scheduled and unscheduled (as necessary) audits based on a risk assessment. The following persons are subject to the monitoring programme in the field of UAS: UAS operators with an issued permit for operation in a specific category, aircraft model clubs and associations, CAA-recognized entities. Article 18 (c) of Regulation 2021/664 provides that competent authorities will be required to implement a monitoring programme over USSPs and CIS providers in the context of U-space.

The future development of the field of UAS may lead to other persons being subject to the monitoring programme, so the development of solutions should include the possibility of further modification and adaptation in accordance with the needs of UAS industry.

6.3.1.6 Solution for fast data verification

The module "Solution for fast data verification" is intended to facilitate the work of authorities with competence in the field of UAS monitoring, i.e. the CAA, the Military Police, the State Police, municipal police, the State Border Guard, as well as those officials and persons who have the right to request the remote pilot or UAS operator to terminate UAS operations in accordance with procedures specified by law in case of reasonable doubts about the legality of UAS operations.

The Conceptual model envisages a gradual development of the whole system, so this module serves as an initial solution until the authorities with competence in the field of UAS monitoring develop or establish solutions for displaying information in their IT systems.

It is important to note that the amount of available data on UAS operators and remote pilots can vary significantly. For example, data on a remote pilot may not be available if he/she operates a UA, for which regulatory framework does not provide for the requirement to pass a theoretical knowledge exam, as well as in cases where a UAS operator has permit for operation in a specific category, which was issued by a competent authority in another Member State (the requirement to register in Latvia may be incorporated in the Cabinet regulation, but it must be provided that the UAS operator number is not re-assigned to the UAS operator, as well as procedure must be provided for the processing of other data, such as data of insurance policy, data of remote pilot qualification).

6.3.1.7 Management of UAS geographical zones

In accordance with Clause 12 of Cabinet Regulation No. 26, the structure of the airspace of the Republic of Latvia is changed by the CAA. The UAS geographical zones are located in the common airspace of the Republic of Latvia, and they may also affect the operation of the airspace structure elements established until the first created UAS geographical zones. When establishing new UAS geographical zones, it may be necessary to change previous decisions on existing airspace structure elements.

Cabinet Regulation No. 429 also stipulates that the airspace structure elements created in the airspace of the Republic of Latvia in accordance with the regulatory enactments regulating the airspace management procedure, the airspace structure, and the procedure for its change at an altitude of up to 120 m from the water or land surface are transformed into UAS geographical zones.

The main task of this module is to manage the changes in the UAS geographical zones – namely, to inform the relevant CAA employees about the changes applied for in order to further make a decision, to provide an overview of the application review process. The operation and functions of this module is an intermediate step between the process of the UAS geographical zones establishment (see Section 4.1.6.2 and 6.3.2 for more details) and the preparation and further dissemination process of the data set of established/approved UAS geographical zones described in Section 6.3.6.3.

Information on the processed application for the UAS geographical zone establishment comes to this module for final review and decision-making in accordance with the CAA's competence. The overall process initiating, processing, approving and further disseminating data of the UAS geographical zones may involve different responsible authorities. This module must provide full information and binding data about the overall process, whether it must have adequate connections to the associated modules to provide access to information and data in digital form in the CAA's decision-making process.

The operation of the module envisages that the data on the UAS geographical zone applied for and the initial assessment performed become available in this module (the data set that was available and taken into account in the assessment is provided), as well as a link to the visualization in the Block B environment is provided.

Note: If it is provided for that in certain cases in the future, decisions on changes to airspace structure elements and/or in UAS geographical zones may be made by another institution without the involvement of the CAA, then such module or access to it must be provided to relevant institutions.

6.3.1.8 Reporting occurrences in the field of UAS

The task of this module is to provide remote pilots with a tool to report major occurrences when human casualties are involved or a manned aircraft is involved in the occurrence to the CAA's Safety Statistics Division. Additional functionality of the module may include a convenient tool for voluntary reporting of occurrences that may have an impact on overall security. On the CAA side, this module must ensure management of the received messages.

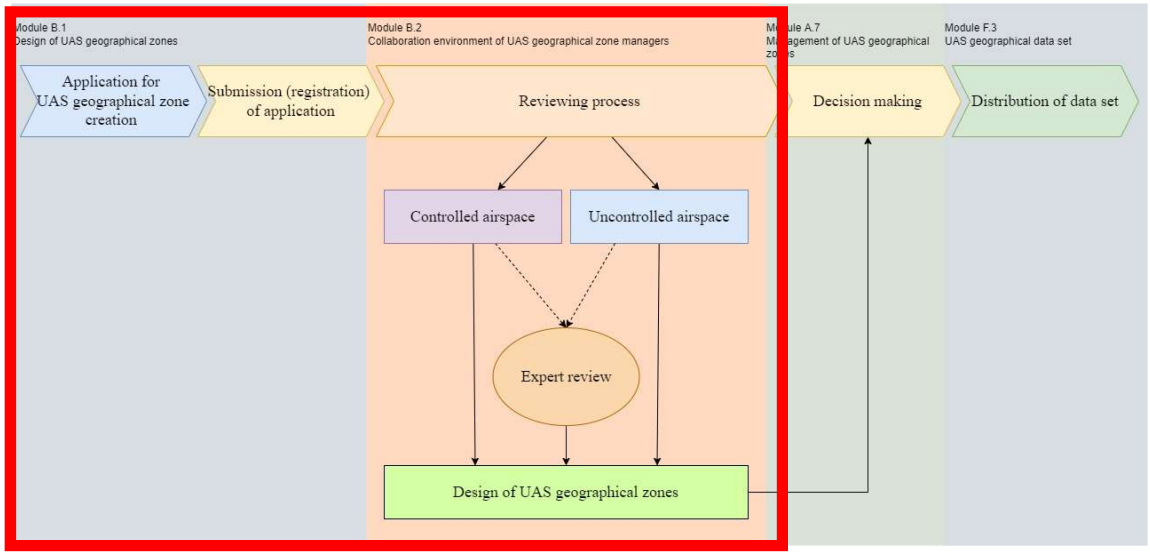
6.3.1.9 Information on the field of UAS

The main task of the module is to provide an e-environment or e-resource, which publishes important and useful information for the UAS community regarding regulatory enactments, examples of good practice, etc. One of the implementation examples is the portal http://uas.caa.lv.

6.3.2 Block B: Design of UAS geographical zones

The functionality of Block B includes the receipt, review and assessment of applications for establishing or changing UAS geographical zones, taking into account changes in existing and planned airspace, ensuring effective access to the restriction of the airspace use, performance of necessary coordination with other managers of airspace structure elements, maintenance of communication with all stakeholders.

The process of the UAS geographical zone establishment consists of several stages, the stages that are implemented in Block B are marked in Fig. 6.3, which includes all the activities with the application for establishment until the decision is made. Block B contains 2 business modules: UAS geographical zone design environment and UAS geographical zone managers' collaboration environment.



6.3 Fig. **Stages of the UAS geographical zone establishment process in Block B**

6.3.2.1 Design environment of UAS geographical zones

The module "UAS geographical zones design environment" contains tools for UAS geographical zone managers to prepare an application for establishing, modifying or deleting a UAS geographical zone. For the purpose of UAS geographical zone design there should be collected data about the existing airspace structure, existing and planned UAS geographical zones, data from State geospatial information systems.

It is important to envisage the integration of this module with State information systems, such as:

- Real estate State cadastre information system;
- State address register information system;
- State register of specially protected nature territories;
- database of micro-reserves of specially protected species and biotopes;
- etc.

The technical solution should provide a convenient and intuitive interface for the UAS geographical zone originator to ensure the digitization of data and information already at an early stage of the process, using the following approaches:

- origination (drawing) of spatial information/data related to the UAS geographical zone on the map or based on existing data from other State information systems mentioned above;
- adding additional attributes to the UAS geographical zone in the form of a Standard Input Form (SIF);
- UAS geographical zone related data/information upload function (for cases where data/information has already been prepared and digitized on the UAS originator side).

The design environment for UAS geographical zones must ensure the automatic transmission of data using electronic means in order to preserve and maintain data integrity as specified in the acceptable means of compliance for Article 15 of Regulation 2019/947 (AMC2 Article 15(1) Operational conditions for UAS geographical zones). The transmission of these data shall be performed in order to carry out the tasks described in 6.3.1.7, 6.3.6.2 and 6.3.2.3 of the Concept.

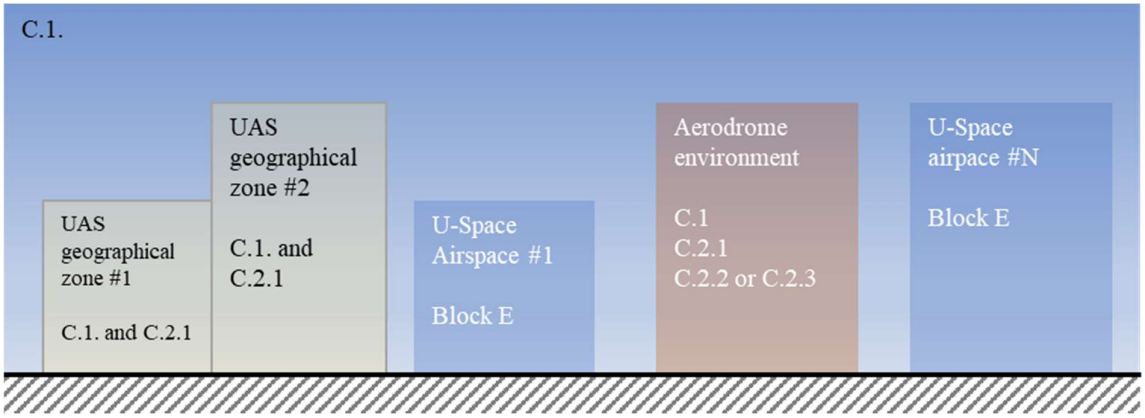
6.3.2.2 Collaboration environment of UAS geographical zone managers

The main task of this module is to provide persons involved in the process of establishing UAS geographical zones with a set of digital tools that promote and facilitate cooperation between them. Changes in the number of UAS geographical zones will affect other zones as a result of the establishment, modification or deletion. The set of tools must ensure efficient and convenient cooperation specified in Paragraph 43 of Cabinet Regulation 429 in the UAS geographical zone establishment. One of the basic principles of the module is the

registration of any kind of coordination, opinions and intermediate decisions made in a unified environment and timely informing of the stakeholders. The unified collaborative environment will facilitate a more transparent, comprehensible flow of information, which is more secure from a traceability point of view.

6.3.3 Block C: Declaration of UAS operations and coordination with UAS geographical zone managers

Block C contains two functional modules: Declaration of UAS operations and Approval of UAS operations. These modules are not mandatory from a legal framework point of view, but their implementation is desirable due to problems and solutions described in Section 4.1.6. The main problematic issues related to this Block are: the fact that UAS can be purchased by anyone; the detection of offences in this field is difficult due to the short duration of the flights; the network of UAS signal receiving equipment connected to the Register is not available.



6.4 Fig. **Use of solutions depending on where the UA flight takes place**

The Conceptual model assumes that several solutions can be used for coordination and management of UAS operations, which are grouped in several modules and blocks:

- Block E will service the UAS operations to be implemented in the UAS geographical zones defined as U-space airspaces;
- in the aerodrome environment, if solutions other than U-space are envisaged, applications for UAS operations will be processed in Module C.1 and/or C.2 sub-modules;
- in the UAS geographical zones – in modules C.2.1 and C.2.2;
- in all other airspace at low level airspace – in Module C.1 (Fig. 6.4).

6.3.3.1 Declaration of UAS operations

The regulatory framework in force does not provide for the requirement to register UA flights, but the introduction of such a requirement and a respective system would strengthen the monitoring of UAS operations, with the aim to achieve the situation – if an UA is in the air, then this operation is registered, so additional information about it is available. It is possible that this approach would not be fully applicable to UAS operations that are conducted by State UA as well as military UA.

The main user of this module is the remote pilot or UAS operator, who registers the planned UAS operations on the platform, providing information about himself/herself and the parameters of the planned UA flight (the amount of data required for the correct operation of this module will depend on what additional functions will be available, as well as on the information that law enforcement authorities will need). The Conceptual model assumes that this module will provide information on UA technical and performance parameters from the Block A modules, which are related to registration services.

The functionality of the module "Declaration of UAS operations" is much simpler in comparison to the set of services provided by U-space service providers referred to in Regulation 2021/664, i.e. UAS operations are applied for, i.e. UAS operations are being only registered (declared) in this module, there is no provision of services of deconfliction with other airspace users in real time.

The module is based on automatic data processing – applications for UAS operations must be approved if no conflicts with other applications are detected. Additional functionality may be developed in accordance with user preferences and needs, for example, notifications to stakeholders of conflicting applications. The proposed Conceptual model assumes that the airspace structure may be changed, i.e. parts of the airspace where different approaches of registration of UAS operations are applied (for example, declaration of UAS operations or use of U-space services) may be changed, therefore, the use of a common approach of data structure will be useful in case of transition from one solution to another. In addition, if a transition to U-space takes place, the providers of these services, as well as the air traffic service providers will have to agree to ensure proper coordination and data exchange.

6.3.3.2 Authorisation of UAS operations and their coordination with UAS geographical zone managers

In the study carried out, the stakeholders in UAS operations indicated that the current procedure for authorisation of UAS operations in the UAS geographical zones is cumbersome. The survey and interviews revealed that the stakeholders of the solution see a system or platform where UAS operators and remote pilots can apply for UAS operations, while managers of the relevant UAS geographical zones can receive notifications of planned operations and make online authorisation.

The functionality of the "Authorisation of UAS operations" module is close to that of the "Declaration for UAS operations" module, but this module provides for interaction between applicants (UAS operators) and UAS geographical zone managers in a single solution.

Special type of authorisation and coordination of UAS operations applies to UAS operations in the vicinity of aerodromes – in an environment with significantly higher risks due to air traffic. Although Cabinet Regulation No. 429 imposes an obligation on certified aerodromes to define UAS geographical zones in the airspace provided for the aerodrome air traffic, as well as a general requirement for UAS operators to coordinate UAS operations with an ANSP or aerodrome representative, it will be relatively difficult to ensure safe operation with existing procedure in the long term, taking into account the projected increase in manned aviation and UAS operations.

The Conceptual model assumes that Block C can have several modules "Authorisation of UAS operations" as solutions for different operational environments:

- coordination of UAS operations with UAS geographical zone managers;
- coordination of UAS operations in an aerodrome environment where ATC services or AFIS are provided;
- other solutions.

6.3.3.2.1 Authorisation of UAS operations with UAS geographical zone managers

This type of sub-module is provided for coordination of UAS operations in most of the UAS geographical zones – the managers of the respective UAS geographical zones will receive information about the applicant, UA and its technical parameters, description of planned operations for review of the application. UAS geographical zone managers will notify of their decision through the module.

6.3.3.2.2 Authorisation of UAS operations at aerodromes (ATC, AFIS)

Existing procedures provide that UAS operations in the vicinity of IFR aerodromes must be authorised and coordinated with an ANSP. The current solution of UAS operations are implemented through an ANSP coordinator (hereinafter – the coordinator) located at the venue. UAS operations are subordinated between manned flights, i.e. the daily plan (arrival and departure) is analysed in order to find suitable time intervals. The above procedure stipulates that only one coordination can take place at a time, which, in connection with manned aviation flights, significantly restricts the availability (or rational use) of this service to UAS operators.

In the long run, such an approach will not be able to satisfy the growing interest of UAS users in UAS operations in the vicinity of IFR aerodromes. The solution to this problem could be the development of new technological solutions and procedures that would allow the automation or digitization of coordination procedures related to UAS operations. One of the potential solutions could be UA traffic management systems that have a connection or integration with the air traffic service provider's systems.

6.3.3.2.3 Other solutions

It cannot be excluded that with the development of the field of UAS, UA will increasingly be used for routine activities, for example, territory surveys, small parcel deliveries, etc. in a particular area, for example, in a port between terminals or offices. It is possible that in such cases, merchants (or UAS merchants) will use separate UA traffic management platforms for these purposes.

It is likely that in these cases too, this relatively "occupied" part of the airspace will be defined as a UAS geographical zone with appropriate restrictions and procedures for external users to coordinate UAS operations in this area. The types of coordination can vary and depend to a large extent on the availability of functional blocks and modules, the need for data on external systems, for example remote pilot skills, for a particular system operator.

This category also includes the coordination of UAS operations in the VFR aerodrome environment, where air traffic may be irregular or highly seasonal – in these cases procedures may be used as possible solutions.

6.3.4 Block D: Central data exchange point (CDEP)

The central data exchange point performs a technical function – it ensures the exchange of data and the availability of data between blocks, i.e. it receives a request for information, addresses the respective block and gives a response to the initial applicant. The primary user of this functional block is the manager of the functional blocks (or their platforms) who is responsible for making its service (or set of services) available to end users.

One of the CDEP integral processes is the provision and management of connections between functional blocks. In order to implement this process, the CDEP manager needs to agree with the stakeholders (managers of functional blocks, platforms and modules) on data exchange protocols, as well as guidelines, procedures on how to request access to information, i.e. create a permanent or temporary data exchange connection.

Given the significance of the CDEP in the data exchange between functional blocks, as well as the need for round-the-clock technical support, it (or part of its provided services) can be improved and certified as a single common information service (CIS) for the needs of the U-space in accordance with Regulation 2021/664.

6.3.4.1 Central data exchange point and transaction recording

The main task of this module is to ensure the exchange of data between functional blocks, as well as to record the performed actions (transactions). It is expected that the exact description of the module will become available when the work on the implementation of the other functional blocks is started.

6.3.4.2 Backup data copy storage

Depending on the development of the field of UAS as well as the availability of functional blocks, it is envisaged that in order to ensure continuity of services, part of the data required from other blocks may be stored in block D, as illustrated by the module “Backup data copy storage”. This Concept does not stipulate how often data must be updated, what is the amount of data to be stored, what are the technical requirements.

6.3.5 Block E: U-space

Within the Conceptual model, the functional Block E represents U-space, i.e. shows how it will be connected to other blocks. Block E in the Conceptual model represents all

U-space airspaces that will be created in the airspace of the Republic of Latvia. A more detailed description of U-space is provided in Section 4.2.3.

The operation of Block E will require the use of data from other functional blocks and their modules. Section 2.2 described the U-space basic elements that will be provided according to this Conceptual model as follows:

- registration – data from Block A,
- geo-awareness – data from Module F.3.
- remote identification – a set of solutions that will have to be provided by the USSP. In addition to the infrastructure established by the USSP, data from Module F.1 may be shared.

6.3.6 Block F: External systems

UA management and monitoring system model includes a vision of how other companies and organizations will actively develop their systems and services in the field of UAS, as well as propose their own solutions that will require access to the data on the platforms. It is for this purpose that the model incorporates a functional block F, which in the general case denotes any additional solution implemented if it is not part of other blocks.

6.3.6.1 UAS signal receiving equipment

UAS signal receiving equipment is only capable of receiving data transmitted by the UAS. The received data are likely to contain only information on identifiers, flight characteristics and parameters – the UAS does not transmit information on the remote pilot, his/her level of competence, the UAS operator and the permits obtained. Additional information from other sources may be required to provide a complete picture of the observed (detected) UAS operations. Additional information may be requested from the registers in Block A (Registration, authorisations to operate in a specific category), from the registers in Block C (Authorisations of UAS operations, Declaration of UAS operations), if they are implemented.

With regard to the choice of UAS signal receiving equipment, it must be taken into account that in accordance with the requirements of Regulation 2019/947, UAS placed on the market after 1 January 2024 must bear the class mark as confirmation that the manufacturer guarantees the compliance of the specific product. It is important to add that some classes do

not have a mandatory remote identification function, which means that there will be UA and systems that:

- do not have Class C marking (models purchased before the above date),
- do not have Class C marking, but have a remote identification additional device attached,
- do not have Class C marking (self-built models),
- have Class C0 or C4 marking (remote identification is not compulsory),
- have Class C1, C2, C3, C5, C6 marking,
- are State UA and military UA (remote identification may be disabled),
- are equipped with an automatic signal transmitter, which enables the air traffic control system to continuously locate it during flight, for example, an ADS-B transmitter.

This means that before purchasing UAS signal receiving equipment, a general assessment must be made of the purposes for which the data from this equipment will be used, which UA need to be identified or spotted. The purchase and further maintenance of such equipment requires financial investment. In order to optimize resources, it is recommended that the stakeholders in the field of UA monitoring cooperate with each other in the purchase and deployment of such equipment in order to avoid significant overlap of "surveillance" areas, as well as to provide surveillance data for other Stakeholders. The range of solutions available on the market is quite wide – they differ by receiver capabilities, availability of additional functions and solutions, so it is recommended to diversify the purchased devices, thus increasing the ability to surveil as wide a range of UA.

Data display from UAS signal receiving equipment

The objective of this module is to display data from the UAS signal receiving equipment described in Section 6.3.6.1. The module must visualize the UAS geographical zones and the received UAS signals on the map. In addition to the functionality, it is necessary to include the verification of the received identifiers in the relevant sub-modules of the "Registration" module, as well as the accounting of detected offences in automatic mode by creating an "event log".

6.3.6.2 UAS geographical zone visualization system/tool

As a transitional solution, the regulatory framework of the Republic of Latvia provides that the information required for operation of UA flights, including aeronautical information on

the use of airspace, must be provided to users in a separate, comprehensible, electronically accessible manner. A system – eUARV has already been created for this purpose.

In accordance with the EASA guidance material for Article 15 (3) of Regulation 2019/947 provides that Member States may choose whether visualisation of UAS geographical zones is also provided in addition to the UAS geographical data set. If this is provided, the consistency of such visualization with that specified in Chapter VIII of ED-269 must also be achieved. Member States must also ensure consistency with the relevant data published in the aeronautical information publication in cases where the UAS geographical zone has an impact on manned aviation.

The existence of such an additional service and system provides support to UAS operators and remote pilots by informing them of airspace restrictions in force and conditions of use. The Conceptual model envisages that similar functions will be performed within the functional blocks C and E.

6.3.6.3 UAS geographical zone data set

Information on the UAS geographical zones, including their period of validity, must be made publicly available in a common unique digital format (in accordance with Article 15 of Regulation 2019/947). In accordance with the acceptable means of compliance and guidance material prepared by the EASA, information on UAS geographical zones will need to be made available in the form of a data set in accordance with Chapter VIII "UAS geographical zone data model" of and Appendix 2 to ED-269 published in June 2020.

Table 6.14

Relation of UAS geographical zones data set update cycles to the nature of restriction by their duration

Data type	Update cycle
Permanent airspace	Based on AIRAC cycle
Temporary short-time airspace	Several times a day
Urgent temporary short-time airspace	On demand

The digital data set must be made available for download to all users without registration, maintaining its integrity. The digital data set must meet data quality criteria and the timeliness of data must be ensured in accordance with AMC&GM.

6.3.6.4 Service portal

The “Service portal” is a support solution that will facilitate the implementation of the “one-stop shop principle” in the UA management and monitoring system model, providing a list of available services in the field of UAS. This Portal may include a unified authentication solution for receiving services across different platforms within the model.

6.3.6.5 Other systems

Another example is UA fleet management systems that UAS operators can use to ensure economic activities. These systems may include information on the UAS operator’s remote pilots, their level of competence, the performed coordination of operations in the UAS geographical zones, the UAS mission planning services, etc. Due to the fact that the field of UAS is in the active development stage (new services and solutions are being developed, for example, lists of current projects and solutions: in the GUTMA[14] or UTM directory[15], SESAR JU[16]), as well as the fact that there are currently no internationally recognized data exchange protocols in this field, many solution developers are offering their products with significantly different functionality of additional modules. The lack of unified data exchange protocols does not allow claiming that these solutions are or will be interoperable.

6.4 Horizontal functions

This section mostly covers the additional modules and functions required to ensure the operation of the platforms within functional blocks – from user authentication to SMS reminders and notifications. The list of additional modules may be supplemented in the future, taking into account that user habits and needs may change over time, and the key functions are covered in this document (the implementation of the functions depends on the specific functional block).

Payment processing

Payment processing is a set of solutions that processes payments for services provided in the UA management and monitoring system. The Conceptual model envisages the introduction of several new services, which can also be paid services. The scope of this Concept does not analyse which of the services will be paid services, therefore the essence of payment processing in Block A is described below – these services are stipulated in the national law.

The procedure (i.e. approach) described below may, as far as practicable, also apply to services provided in other functional blocks.

Part of the services provided in Block A is paid services in accordance with the regulatory enactment on the CAA price list of public paid services. Revenue from provided paid services is credited to CAA accounts with the Treasury. The initial impact assessment found that half of respondents would prefer to pay online when asked about their preferred payment methods, so it is recommended to include in this module the possibility for users to pay for the services received within a functional block A via an integrated plug-in, for example, the VISS payment module.

The payment processing process must take into account the fact that the range of services and the range of their recipients is quite wide, as well as the payment methods may differ, so this module must be developed to be adaptable to any user, service and payment method:

- the recipient of the service can be: a private person, a legal person, an authorized person;
- by payment frequency: at the time of receiving the service, recurring payment (annual fee);
- by type of payment: online payment, bank transfer, on-site payment in cash or by payment card.

The payment processing module must be able to identify the end user of the service (regardless of who makes the payment), the service, the amount of the service. For data traceability, the module must record, i.e. contain data on both online and on-site payments.

In the case of on-site payments, a solution must be provided for the CAA employee to manually enter the information on the payment made, regardless of which on-site payment method is chosen. In case of recurring payments, this module must allow the user to select the preferred payment method: online payment, bank transfer payment. on-site payment. In the case of both legal and natural persons, there must be functionality that allows specifying the payer's details.

Multilingual support

Multilingual support must be provided during the development stage of digital solutions, including the possibility to choose the language (at least the human-machine

interface) in which the services are provided and received. This functionality is required in the general case, as the recipient of the services may be from another country.

Administration panel

The administration panel is a collection of several functions that must ensure the management and operation of the implemented solution. This includes configuration settings, management of modules, extensions and plug-ins, notifications to users about interruptions in the operation of the solution, etc.

Electronic identification of a person

The regulatory documents in force on the register in the field of UAS managed by the CAA prescribe that the Register is a State information system. The operating principles incorporated in the Law on State Information Systems prohibit the collection and entry in the State information system databases of information that is available about the data subject in the integrated State information system. Taking into account that many services will be provided electronically in Block A, for example, registration of UAS operators, then they are subject to regulatory documents on public administration e-services, which oblige the service holder to determine the necessary means of electronic identification of a person.

With regard to other functional blocks, the choice of the means of electronic identification of a person depends on the risk analysis in accordance with the annex to the regulatory document on public administration e-services. This requirement shall apply to those solutions that are defined as national information systems.

User profiles and roles

Given that services will be requested and provided in functional blocks, functions are required to manage users and provide or restrict access to records or modules, depending on the role of those users. This includes functions such as assigning roles, defining access rights to information, as well as defining the set of actions allowed for a group of users or an individual user.

Additional configuration options of the system

The additional configuration options of the system provide for the existence of several additional functions to facilitate and maintain the operation of the platform with minimal changes. These functions include (but are not limited to) platform scalability, API or other connection management between modules, platforms, etc.

Newsletters, system messages, reminders in the form of SMS, e-mail

During the study, the representatives of stakeholders in the field of UAS have expressed support for the digitization of services, as well as for receiving reminders about the approaching expiration date of certifications and certificates, about current events in the field of UAS, for example, changes in regulatory enactments. It is important to note that in case of informing users about important changes, additional explanation about their nature, impact, application must be available.

The ways of informing users can be different – by e-mails, SMS, notifications in the application (if it will be available). The amount of information and the way it is delivered to the user depends on which modules will have this functionality enabled, as well as on the settings, for example, the frequency of sending messages on expiration date of documents certifying the competence of a remote pilot.

Recording system for activities performed

The objective of the "Recording system for activities performed" module is to keep records of the provision of services. The requirement for the implementation of such a module follows from the regulatory framework for public administration e-services.

Management of uploaded documents

Depending on the requirements of the regulatory framework regarding the data to be submitted in the case of certain services or processes, it is necessary to process the documents prepared by third parties, which the applicant must attach to the application. This additional extension should make it possible to obtain the most important information from the uploaded files in the form of structured data, for example, the minimum liability limit of the insurance policy for one insured event or period, the expiration date of the power of attorney or the agreement.

It is also necessary to provide for functions that allow assigning an attribute to the uploaded file, which characterizes it by type, for example, an insurance policy, an agreement for the use of premises by recognized organizations, etc., as well as other data that may be useful within the overall process. Additional functions can include version accounting, document status (active, inactive), additional description (excerpt), document number, etc.

Document layout and templates

The functionality of the module "Document layout and templates" enables the system administrator to manage and define document templates that will be used by other modules in the provision of services, creating a relevant document according to the specified sample, for

example, preparation of a certificate after a successfully passed theoretical knowledge examination (sub-module “Exams”), preparation of an invoice for payment from the extension “Payment processing”.

Data exchange interface

The Conceptual model envisages the exchange of information between functional blocks, therefore the platforms must have embedded solutions that ensure the exchange of data using open and secure data exchange protocols.

6.5 Compatibility description

The UA management and monitoring system model provides that solutions for the performance of certain tasks are grouped (combined) in functional blocks. The Concept does not evaluate or describe how exactly or on what technological basis each of the blocks will be created, but one of the principles is emphasized – functional blocks must be able to ensure data exchange. Data exchange issues are partly addressed by the CDEP, providing that descriptions with available data will be prepared as well as available data exchange methods will be described.

The conducted survey (see 3.5. Survey on the field of UAS in Latvia) had revealed that specialized digital solutions, which allow quick obtaining information from a reliable source about US, its users and coordination performed, had not been developed for stakeholders involved in UA monitoring. The Conceptual model envisages that at the first stages of the implementation of the Concept, a module “Solution for fast data verification” (see 6.3.1.6) will be created, which will provide access to a small part of the data available to the CAA. This module will serve as a temporary solution pending the implementation of other functional blocks and the development of services, including the development of other systems (Block F) and the provision of data exchange with Block D.

Therefore, the further sustainable development of the field would require a more active participation of stakeholders in the development of the UA monitoring and management system. These activities include planning work, improvement of cooperation processes, configuration of solutions, etc.

Fig. 6.2 (Section 6.1) shows the “one-stop shop principle”, which identifies and illustrates potential connections with other external data generators and registries, for example, the Latvian Geospatial Information Agency (LGIA). To ensure compatibility of blocks, one of

the possible solutions is the application programming interfaces[17], i.e APIs – a set of predefined classes, procedures, functions, structures and constants, which is presented as an add-on (libraries, services) that can be used for external software products.

Some of the benefits of using the API[18]:

- Improved collaboration;
- Easier innovation;
- Data monetization;
- Added security.

Information from external information sources, for example, data on a legal person, data on an insurance policy, is required to ensure the operation of the Conceptual model. The verification of such data may include built-in application programming interfaces (hereinafter – API) or other solutions that allow the input data to be verified and compared with an external data source. Enabling such a function is desirable, but there may be a number of obstacles to its implementation, given that the user, as a legal person, can be registered in another country or can purchase an insurance policy from a company registered abroad – there are currently no requirements for the mandatory use of API in such and similar cases.

6.6 Strengths and weaknesses

This chapter discusses the strengths and weaknesses of the Conceptual model to be implemented. The prepared report is based on a number of assumptions that may be refined over time regarding the services to be implemented, functional blocks, etc.

Strengths

- The Conceptual model envisages that data exchange protocols to be agreed between the parties involved will be used for the data exchange between the functional blocks. This means that descriptions and documentation will be prepared for these protocols, which will facilitate the introduction of new services;
- Block D (CDEP) may store copies of data from other Blocks – as an option, to the extent necessary to ensure the continuity of operation of the entire system;
- if the amount of data provided from any module changes, these issues are primarily addressed by the Block D manager;

- flexible system from a management point of view – APIs can be configured according to the required amount of data;
- for the purpose of the monitoring programme, the CAA may define what data must be available to Blocks – automatic situation assessment;
- more convenient preconditions for new service providers to get involved, data access can be handled through the manager of Block D;
- the successful operation (including development) of the whole system would require a single Manager to ensure the quality and integrity of the data.

Weaknesses

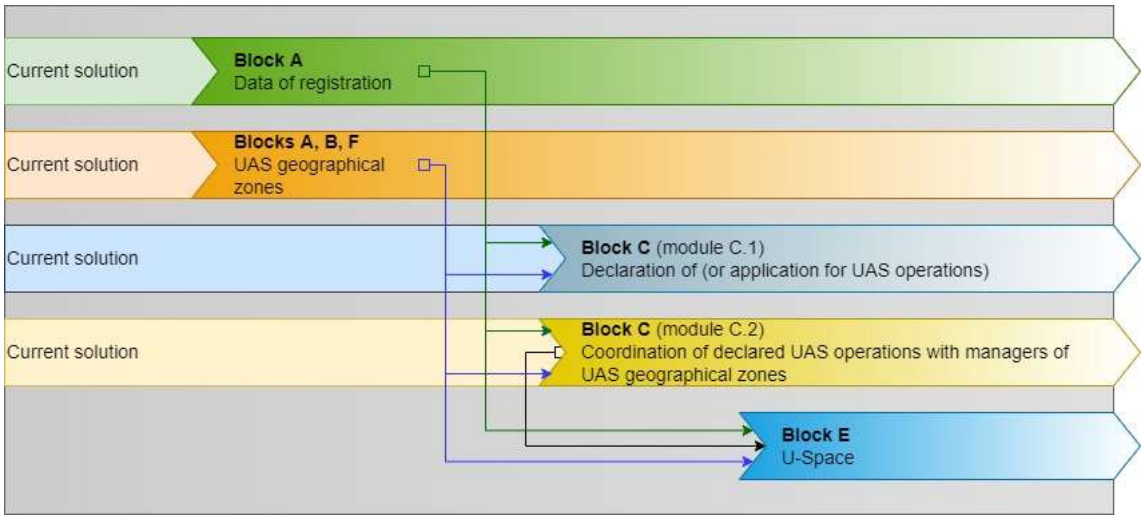
- when connecting a new block, platform or module, it is necessary to define what data will be available to others;
- if one of the blocks, platforms or modules limits the amount of data (information fields) provided, then the others are not access this information through Block D;
- the implementation of the solution proposed in the Conceptual model will require more investment at the initial implementation stage;
- in case of "disconnection" of Block D, the provision of services using data from this block will be significantly disrupted. In order to minimize the impact of these disruptions on the whole system, procedures (service provision contingency plan) for the exchange of data in other ways are needed.

7. Development of the Conceptual model

7.1 Problematic issues and priority topics

Research has shed light on a number of problems in the field of UAS (see Chapter 3). Many of them have in common the availability of structured and user-specific information, as well as the lack of common digital tools.

This Concept prioritises the creation of a common digital environment where stakeholders can provide and receive services. The Concept proposes a Conceptual model of the UA management and monitoring system, in which services are divided between several functional blocks, which are managed by different managers. The system is based on data processing about UAS operations, which also includes obtaining additional information from several blocks. Stakeholders with monitoring competence in the field of UAS have mentioned that they often need detailed information on the identity and competence of the UAS operator and that these data are widely used throughout the UA monitoring and management system. Therefore, the first priority is the establishment of a sustainable monitoring and management system for the UA system, based on the digitization of services provided by the CAA in the field of UAS (i.e. the implementation of Block A).



7.1 Fig. **Interdependence of blocks**

A set of solutions for the defining and management of UAS geographical zones has been specified as the next priority These solutions include tools and procedures for processing applications for defining UAS geographical zones, the decision-making process, data

dissemination, and visualization. These solutions must be digital and compatible with other systems.

To strengthen the capacity of the controlling authorities, the third priority is a set of solutions that will allow UAS operators and remote pilots to apply for UAS operations, as well as to agree these operations with UAS geographical zone managers.

The issue of funding for each of the blocks and modules is relevant in all the considered priorities. This issue needs to be seen in the context of the performance of public functions.

7.2 Action plan and content guidelines for the further sustainable development of the field of UA

The parties involved implement UA monitoring and management in the field of market monitoring, flight safety monitoring, administrative offence proceedings. Sustainable development of the field requires coordinated cooperation between stakeholders, which can take the form of meetings of industry representatives with legislators, discussions, working groups and consultations.

The Section 6.1 offered the order of priority of the implementation of functional blocks according to the importance of the block in the whole Conceptual model. These priorities, together with the necessary activities for the establishment of the UA management and monitoring system, are taken as a basis for the preparation of the action plan. The Conceptual model envisages that the newly developed system is designed as an open system – the functional blocks can be expanded with new modules.

The Conceptual model foresees a gradual deployment of the UA monitoring and management system, starting with the functions of the functional Block A, i.e. the CAA, which are supplemented by the modules in the functional Block F. The further deployment of the UA management and monitoring system depends on the involvement of other stakeholders.

The annual activities provide for a review of safety objectives and key performance indicators to reflect the actual situation, information campaigns, the establishment, review and updating of procedures according to development and needs of the field of UAS.

The implementation of each new functional block is important for the development of the UA management and monitoring system. The new blocks expand the range of available services, thus the implementation plan offers the following basic activities: discussions with stakeholders, development of regulatory enactments and/or their amendments (including the

decision on the allocation of funding), preparation of necessary solutions, commissioning, periodic modernization.

Table 7.1

Timetable

Year	2022				2023				2024			
Quarter	I	II	III	IV	I	II	III	IV	I	II	III	IV
Block A	D	D	G	S	S	S	S	x	x	x	x	x
Block B	D	D	G	G	S	S	S	S	x	x	x	x
Block C	D	D	D	G	G	S	S	x	x	x	x	x
Block D		D	D	D	G	S	S	x	x	x	x	x
Block E					D	D	D	G	G	G	G	x
Block F	O	O	O	O	O	O	O	O	O	O	O	O
F.2	O	O	O	O	O	S	S	x	x	x	x	x
F.3			O	O	O	S	S	x	x	x	x	x

Designations: D – discussions, G – amendments to regulatory enactments, S – development of a solution, O – partial commissioning, x – operation.

Note: The designations used in the quarters describe the main activity during the period in question. In practice, the activities can be carried out partly in parallel.

Blocks A, D and partly C and F include the activities foreseen in Cohesion Fund project No. 6.1.2.0/20/I/001 “Establishment of an unmanned aircraft management and monitoring system”. The functionality of Block B (as well as F.2 and F.3) is essential for the operation of the whole Conceptual model (Table 6.1).

Table 7.2

Action plan

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
1.	Annual review of the target level of safety tasks, determination of key performance indicators.	CAA	CAA.	Annual activity.	The activity is implemented every year during the 1st quarter.
2.	Information campaign on the field of UAS	CAA	CAA.	Annual activity.	The activity is implemented every year during the 2nd quarter.
3.	Evaluation "Evaluation of the growth of authorized UA flights in the air traffic control zone of Riga International Airport"	CAA	CAA, LGS, RIX.	31 December 2028.	Cyclical activities with the final result: an increase by 10 % in 2028 compared to 2020.
	Block A				
1.	Implementation of Block A.	CAA	CAA.	31 December 2023.	
	Block B				
1.	Discussions with stakeholders on the UAS geographical zone management issues	CAA	Stakeholders who have the right specified in regulatory ratifications to	Until the end of the 2nd quarter of 2022.	

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
			apply for the defining UAS geographical zones.		
2.	Amendments to the Cabinet regulations on UAS geographical zone management issues	CAA	The CAA and the Ministry of Transport	Until the end of the 4th quarter of 2022.	Must be implemented in conjunction with activity No.3.
3.	Delegation for the implementation of Block B	Cabinet of Ministers		Until the end of the 4th quarter of 2022.	
4.	Development or procurement of a specialized IT solution	The CAA, LGS*	The CAA, LGS*, IT solution developer/supplier.	Until the end of the 4th quarter of 2023.	
5.	Implementation of a specialized IT solution	The CAA, LGS*	The CAA, LGS*, IT solution developer/supplier.	4th quarter of 2023.	
6.	Commissioning and integration of Block B (establishment of data exchange connections with other functional blocks)	The CAA, LGS*	The CAA, LGS*, IT solution developer/supplier.	31 December 2023.	
7.	Periodic improvement works of Block B.	The CAA, LGS*	The CAA, LGS*, IT solution developer/supplier.	Periodic activity.	As required

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
	Block C				
1.	Discussions with stakeholders on the need to register UAS operations	CAA	Representatives of the LARPAS, the Military Police, the State Police, the municipal police, the State Border Guard, the CAA, LGS, aerodromes, representatives of UAS geographical zone managers, NGO representatives, UAS users and others.	Until the end of the 3rd quarter of 2022.	
2.	Discussions with stakeholders on additional services available in Block C.	CAA	Representatives of the LARPAS, the Military Police, the State Police, the municipal police, the State Border Guard, the CAA, LGS, aerodromes, representatives of UAS geographical	Until the end of the 3rd quarter of 2022.	

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
			zone managers, NGO representatives, UAS users and others.		
3.	Amendments to the Cabinet regulations on Block C	CAA	The CAA and the Ministry of Transport	Until the end of the 1st quarter of 2023.	Must be implemented in conjunction with activity No.4.
4.	Delegation for the implementation of Block C.	Cabinet of Ministers		Until the end of the 1st quarter of 2023.	
5.	Development or procurement of a specialized IT solution	CAA	The CAA, IT solution developer/supplier.	Until the end of the 3rd quarter of 2023.	
6.	Implementation of a specialized IT solution	CAA	The CAA, IT solution developer/supplier.	Until the end of the 4th quarter of 2023.	
7.	Commissioning and integration of Block C (establishing data exchange connections with other functional blocks)	CAA	The CAA, IT solution developer/supplier.	31 December 2023.	

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
8.	Periodical improvement works of Block C.	CAA	The CAA, IT solution developer/supplier.	Periodic activity.	As required.
	Block D				
1.	Discussions with stakeholders on the design of Block D.	CAA	Stakeholders – Block managers and new service developers.	Until the end of the 4th quarter of 2022.	
2.	Amendments to the Cabinet regulations on the implementation of Block D.	CAA	The CAA and the Ministry of Transport	Until the end of the 1st quarter of 2023.	Must be implemented in conjunction with activity No.3.
3.	Delegation for the implementation of Block D	Cabinet of Ministers		Until the end of the 1st quarter of 2023.	
4.	Development or procurement of a specialized IT solution	CAA	The CAA, IT solution developer/supplier, block managers.	Until the end of the 3rd quarter of 2023.	
5.	Implementation of a specialized IT solution	CAA	The CAA, IT solution developer/supplier, block managers.	Until the end of the 3rd quarter of 2023.	

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
6.	Commissioning and integration of Block D (establishing data exchange connections with other functional blocks)	CAA	The CAA, IT solution developer/supplier, block managers.	31 December 2023.	
7.	Periodical improvement works of Block D.	CAA	The CAA, IT solution developer/supplier, block managers.	Periodic activity.	when required.
	Block E				
1.	Discussions with stakeholders on U-space	CAA	Representatives of the CAA, LGS, aerodromes, service developers, UAS users, the LARPAS and others.	Until the end of the 3rd quarter of 2023.	The deadline may be extended.
2.	Analysis of the situation regarding the requirements for U-space	CAA	Representatives of the CAA, LGS, aerodromes, service developers, UAS users, the LARPAS and others.	Until the end of the 3rd quarter of 2023	The deadline may be extended.
3.	Defining certification requirements in connection with U-space.	CAA	The CAA and the Ministry of Transport	Until the end of the 3rd	Must be implemented in

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
				quarter of 2024.	conjunction with activity No.4.
4.	Preparation of amendments to the Law on Aviation	CAA	The CAA and the Ministry of Transport	Until the end of the 3rd quarter of 2024.	
5.	Development of Cabinet regulations and preparation of amendments	CAA	The CAA and the Ministry of Transport	Until the end of the 3rd quarter of 2024.	
6.	Preparation of methodology/guidelines for the process of creation of U-space airspace	CAA	CAA.	Until the end of the 3rd quarter of 2024.	The deadline may be extended.
7.	Improvement of Block A (implementation of U-space related modules)	CAA	The CAA, IT solution developer/supplier, block managers.	Until the end of the 3rd quarter of 2024.	
8.	Block interconnection configuration	CAA	Other stakeholders according to delegation.	Until the end of the 3rd quarter of 2024.	
	Block F				
1.	UAS signal receiving equipment	CAA	The CAA and other authorities and organizations	Until the end of the 3rd	This activity will be continued after the completion of

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
			that have UAS signal receiving equipment at their disposal, as well as those that need to use information from this equipment.	quarter of 2023.	Cohesion Fund project No. 6.1.2.0/20/I/001.
2.	Discussion with stakeholders on the cooperation on the establishment of a UAS signal receiving equipment network	CAA	The CAA and other authorities and organizations that have UAS signal receiving equipment at their disposal, as well as those that need to use information from these equipment.	Until the end of the 3rd quarter of 2023.	
3.	Implementation of cooperation mechanisms (coordination of activities in the field of UAS signal receiving equipment)	CAA	The CAA and other authorities and organizations that have UAS signal receiving equipment at their disposal, as well as those that need to use information	Until the end of the 3rd quarter of 2023.	

No.	Activity	Responsible person	Involved parties	Deadline for implementation or expiry	Comment
			from this equipment.		
4.	Strategic planning for UAS signal receiving equipment network extension	CAA	The CAA and other authorities and organizations that have UAS signal receiving equipment at their disposal, as well as those that need to use information from this equipment.	No deadline has been set.	
5.	Expansion of the UAS signal receiving equipment network or change of its configuration	CAA	The CAA and other authorities and organizations that have UAS signal receiving equipment at their disposal, as well as those that need to use information from this equipment.	No deadline has been set.	

8. Financial model

Considering the existing EU regulatory framework, there is currently no comprehensive financial model defined for EU Member States that covers all elements of UAS Traffic Management (UTM) and sets out the principles for its funding. Legislation on specific aspects of UAS management is under development and, accordingly, financial issues are being analysed and addressed on a case-by-case basis.

At present, the UTM in Latvia is carried out to the extent determined by the EU regulatory framework regarding the minimum requirements to be implemented in the field of UAS.CAA has been implementing the set of functions specified in Regulation 2019/947 and other regulatory enactments in cooperation with other involved institutions and companies, for which competence in the UAS management has been determined in accordance with regulatory enactments: the State Police, the Military Police, the municipal police, the State Border Guard, the TAIIB, the CRPC (see Section 4.1.1). Accordingly, the set of services available to UAS operators and pilots derives from the regulatory requirements for compliance with registration, declaration, permit and certification requirements, competence provision and assessment of recognized entities.

The financial model of the existing system includes two types of possible incoming cashflows to the CAA: service fee and penalties for breaches of the regulatory requirements. Fees related to UA systems are charged by the CAA in accordance with the public paid services price list[19], while penalties for breaches of the applicable sections are listed in the Law on Aviation. However, the fines for the breaches for which the decision has taken effect are paid into the general budget and do not generate direct financial revenue for the CAA or other persons involved in the UAS management, thus they are not directed to the maintenance and development of the UA monitoring and management system. In accordance with Cabinet Regulation No. 429[20], all service fees specified in the price list are received by the CAA, except for the fee for costs related to the provision of information required for UAS flights. In accordance with Paragraph 49 of Cabinet Regulation No. 429, 25 % of the total registration fee charged is due to LGS for making available the information required for unmanned aircraft flights. The most typical service to be paid for is as follows: a UAS user must register as a UAS operator if he/she owns a UAS with a maximum take-off mass of more than 249 g and/or equipped with a data sensor. The UAS operator number is activated for

one year and must be renewed annually. The annual fee is EUR 5 per UAS operator and is charged by the CAA, respectively 25 % of the revenue from the registration is transferred to LGS after the end of the reporting year. However, due to the small number of UAS operators as well as the amount of payment (the fee is not differentiated according to the number of UA used by the operator or other parameters), the revenue from the annual fee paid by the UAS operators does not cover the corresponding costs. Thus, the parties involved must perform the functions specified in the Law on Aviation within the framework of the underlying functions and budget resources, as no funding has been allocated from the State budget resources specifically for the performance of the functions of monitoring and control of UAS operations.

In addition to the requirements specified in the regulatory framework (see Chapter 2), the UA monitoring and management system modelled on the basis of this Concept offers to address the needs, main identified problems and concerns identified in the stakeholder surveys and interviews (see sections 3.5 and 4.1.6), including both - increasing the convenience of users in receiving services and recording their activities, and strengthening monitoring and control functions. Accordingly, the users of the system would include the owners, pilots and operators of UA, as well as all other stakeholders referred to in Section 4.1.1, especially those performing monitoring and control functions as well as conducting administrative proceedings in cases of offences.

Analysing the financing possibilities for the UA monitoring and management system, the principles of financing transport and mobility infrastructure within the EU and their justification were examined, as well as the experience of other countries that have already implemented such systems with wider functionalities than the current system in Latvia. From the perspective of EU transport and mobility policy, transport infrastructure is mainly considered to be part of public infrastructure (infrastructure accessible to all on equal terms) financed from public resources (mainly EU or national tax revenues), with the aim of achieving the objectives of the common EU transport and mobility policy (on EU transport policy), thus helping the European economy to develop a modern infrastructure network, in which faster and safer travelling is possible, supporting sustainable and digital solutions.[21] Adherence to the "user-pays" principle with regard to negative externalities is also emphasized[22]. The application of this principle is also considered as a possible source of additional funding that may be available sooner than public funding or partially replacing it[23]. At the same time, the involvement of the private sector in the development and financing of transport

infrastructure has been actively promoted over the last decade. Particularly notable is the so-called Juncker Plan in 2016, which structured the availability of existing EU funding in conjunction with institutional banking instruments and the attraction of private sector funding[24]. It can be concluded that, transport infrastructure systems, which are accessible to all on equal terms and the essential aim of creation of which is ensuring safety and security for the public, should be financed primarily from public sources; users can participate in the maintenance of such systems, in particular to compensate for negative externalities. The involvement of private sector investment becomes economically viable if additional services and opportunities are created that users can use in addition to the primary functionalities, considering the willingness of users to pay more for such functionality.

Regarding UA, in its Communication on a Sustainable and Smart Mobility Strategy[25], the EC (publishing a new Drone Strategy 2.0[26] (see Section 2.2)) stated that the goal for 2022 is to create a new, sustainable service and transport offer through digitalisation and automation, while ensuring interoperability of civil and military technologies. As already mentioned above, common funding principles within the EU have not been defined, nor have mechanisms or limited areas for public funding intervention been identified, however the involvement of private sector in developing solutions and creation of pilot projects for the use of UA is encouraged, especially in the urban environment within the framework of already existing funding instruments[27] – the European Investment Plan[28], Horizon 2020[29] and the Connecting Europe Facility[30]. Public funding or funding from institutional banks[31] is mentioned as the main source of funding for projects in the field of UA. At the same time, this initiative aims to summarize market demand within the EU Member States for the development of UAS systems and services, and these results will be considered when defining the areas to be supported in the programmes of the EU's multi-annual budget for 2021–2027, including the CEF. It should be noted that possible funding within the CEF for the field of UA is currently considered only through the lens of U-space or the urban environment[32]. Therefore, in the context of the implementation of this Concept, it can be assumed that the inflow of additional funding for the development of the system would be possible by developing the U-space concept, which could not only create opportunities for attracting public funding, but also complement the range of paid services through which users can participate in the development and maintenance of the system, thus creating an incentive for the private sector representatives to become

involved. It should be mentioned that currently the development and implementation of U-space in Latvia is hindered by the lack of funding for this purpose and the insufficient "free" resources of the budget of the involved institutions.

Looking at the transport policy priorities, it is recognized that the potential impact on safety, security and emissions in the field of transport mobility is increasing with the development of technologies, automation and digital solutions[33]. The most important externality in the field of UA can be the threat to safety and security, because (intentionally or unintentionally) improper use of UA can have significant negative consequences[34]. This was also identified as a most important concern by the public and other stakeholders in the survey and interviews (see the assessment of the situation in Chapter 3.5). Thus, this is one of the most important arguments why the State with public funding is involved in the UA management and monitoring system and why it is justified to create a partial "user-pays" financing system. Regarding user fees, their proportionality and the creation of a positive incentive can be exemplified by the principles analysed in road transport charges, as there are major similarities in the design of the system and in the behaviour of users. The EC mentions user fees or charges as the most effective mechanisms by which a user can participate in financing the mitigation of potential negative externalities[35]. From an economic theory point of view, these charges should cover or partially cover the costs of maintaining the system[36], while varying according to the duration of the system use, the time, the UA parameters, the location of the flight and other aspects, including, possibly, also assessing social equality and environmental impact aspects.[37]. From this perspective, the possibility of setting up a system of charges, i.e. payments in which all UA owners participate in the co-financing of a supervisory and control system aimed at reducing or eliminating the possible negative externalities of UA operations should be additionally considered. For example, this could be a small charge (1 % of the purchase price) charged by the seller of UA, while carrying out other activities such as registering, marking or identifying UA for a more efficient operation of the supervisory and control system (especially for UA categories not otherwise subject to requirements for registration or application for operations).

More detailed information on UA management and monitoring systems in other countries (the USA, Switzerland, Poland, the United Kingdom and Hungary have been considered) has been included in a separate report on assessment of the existing situation, but Table 8.1 provides a summary of possible funding sources for each of the

functional blocks proposed for creation of the Concept, taking into account other countries' funding models.

Table 8.1

Sources of funding by blocks

Block	Name	Manager	Country	CAA	End user
A	CAA functions	CAA	●	●	●
B	Design of UAS geographical zones	The CAA/LGS*	●		●
C	Declaration of UAS operations and coordination of UAS operations with UAS geographical zone managers	The CAA/others	●		●
D	Central data exchange point	CAA	●		●
E	U-space services	others			●
F	Other systems and extensions.	According to functional need	●	●	●
Designations: * – marked function may be performed by LGS if additional funding is available, taking into account the limitations of funding sources					

The assessment of the situation showed that each Member State is looking for solutions to provide funding in order to timely implement functions specified in the regulatory acts, thus reducing the possible threat to the security and safety of the population due to uncontrolled UAS operations. In the Member State models examined, countries have made significant contribution to the UAS management from public funding (especially Poland), as well as from resources available to the CAA or the ANSP, including user fees, and from contributions of private partners.

Taking into account the information provided in the interviews by the system developers who have developed the UA management and monitoring system in other countries (an overview of the interviews is available in the supplementary materials to the current situation assessment report), the costs of creation and maintenance of such a system are expected to be higher than the revenue as long as there are not enough users and services. Therefore, it is important to attract additional sources of funding at

the system development stage, as well as to set user fees in proportion to the user's involvement and ability to pay in order to facilitate the use of the system. On the other hand, the set level of fees should not be so high as to discourage potential users from participating in the system, as this would favour a shadow regime and adversely affect the interests of other users, including security and safety.

The online survey and stakeholder interviews (see Section 2.1) concluded that there is a cautious attitude towards paid access to information and services. Overall, about half of respondents indicated that they did not want to pay for digital services and/or access to information. The number of respondents who are ready to pay and those who are not are almost the same. Therefore, a significant emphasis shall be placed on the convenience and added value of the services to the user, which would encourage these users to choose the offered system by making an annual payment, rather than other solutions, which may contain incorrect information, thus creating potential security threats during UA operations. It is important to note that this question was mandatory for all respondents. It was not specified what these paid services would be, what the price and conditions would be. Interviewees indicated that access to digital services and information must be free of charge in public authorities. Commercial users could support the introduction of paid services, but further discussions and cost-benefit analysis are needed.

When analysing possible sources and mechanisms of funding, it is also important to look at regulatory restrictions in this field. According to the Law on Aviation, the CAA is a public budget non-financed administration authority under the supervision of the Ministry of Transport, which is financed from the funds received for provided public services and other own revenues, gifts and donations, foreign financial assistance, air navigation services in the Riga Flight Information Region, as well as from revenues for the provision of aircraft flight safety and civil aviation security monitoring[38]. Thus, the regulation currently does not explicitly provide that the CAA, as the manager of the UA management and monitoring system, could receive State budget funding for the further development (excluding foreign financial assistance) or maintenance of the system.

With regard to the funding received for air navigation services in the Riga Flight Information Region, both the CAA and LGS must comply with Article 15 (1) of Regulation 550/2004 that the air navigation charging system is based on the accounting of air navigation service costs incurred by service providers for the benefit of airspace

users. Regulation 2019/317 defines precisely what costs may be attributed to the provision of air navigation services and it follows from Article 20.3 of this Regulation that revenue from air navigation services must be used only for the provision of air navigation services. If the national supervisory authority finds that ineligible costs have been included in the unit fee, they are not included in the performance improvement plan in accordance with the requirements of Regulation 2019/317 and, accordingly, they are not covered by the applied unit fee. In addition, the EC's Directorate-General for Mobility and Transport has recently explained that ANSPs have limited possibilities to include UAS-related costs in their unit fees[39].

In addition, with regard to the stakeholders involved in the management system, it is necessary to assess whether the use of public funding for the development of the system's functionalities complies with the EU regulatory framework on permissible State aid. In accordance with Paragraph 2.2, Clause 17, Subclause (b) of the Commission Notice on the notion of State aid referred to in Article 107 (1) of the Treaty on the Functioning of the European Union (2016/C 262/01), Article 107 (1) of the Treaty does not apply in situations where the State acts "by exercising public power" or where public entities act "in their capacity as public authorities". An entity is considered to be one that acts by exercising public power if the activity in question belongs to the principal functions of the State or is, by its nature, purpose and the rules applicable to it, connected with those functions. In general, activities, which are carried out by the State and are an integral part of the prerogatives of public power, are not economic activities, unless the Member State concerned has decided to introduce market mechanisms. Relevant activities are, for example, air navigation security and control. Thus, the merchants involved, such as LGS, are entitled to receive public funding for activities related to air navigation security, including the interaction between manned and unmanned aviation, especially in the vicinity of aerodromes where there is a high threat to manned aviation. With regard to the rest of the territory of Latvia, it is necessary to additionally assess how best to ensure public safety, functions and tasks, including operations with UA, including external regulatory acts, as EU and national regulatory framework in the field of UA directly addresses the threats to manned aviation and the common goal – safe UA operations both for people in the air and on the ground. However, specific security measures throughout the national territory, as well as military activities, are left to the Member States, taking into account

the division of national competences, while maintaining the objective of security and interoperability between military and civilian systems[40].

By developing a specific financial model for the implementation of this Concept, the model is developed for blocks A, B and C as the primary ones to be implemented in order to achieve the goals set in the Concept and meet the most important requirements of the stakeholders (see sections 6.1 and 7.1), taking into account the infrastructure implementation period of 2 years and further creating a maintenance/renewal period forecast. The cost of Block D cannot be reliably estimated, given that radically different solutions are possible for its implementation (setting up its own infrastructure or renting a cloud data service) and the Manufacturers' survey does not provide information on the cost of implementing and maintaining Block D, as this functional block performs s specific technical task, which is not a standard solution for which market research could provide information. Until the introduction of significant additional services with the help of U-space in a larger territory of Latvia, which would allow to integrate more private sector financing into the financing model, the most important task is to provide basic functionalities (public function framework), primarily within blocks A and B, as well as blocks C and D.

Assumptions concerning expenses

In terms of costs, the management of UAS operations includes the costs of implementation and adaptation of the infrastructure, the costs of the human resources involved in operations and maintenance, the direct operating costs as well as the administrative overheads. The most important financial investment (one-off) is required at the initial stage of system creation, while a large part of the maintenance fixed costs is also the personnel costs required for the operation, management and further development of the system.

During the market research (available with additional documents for the study of the current situation), system suppliers working in this field were asked to provide more detailed information on the following functions embedded in the solutions:

- registration of UAS operators and UA;
- defining and maintenance of UAS geographical zones;
- declaration and coordination of UAS operations.

The preparation of the Concept does not provide for the selection of a specific solution or manufacturer, as well as the development of technical specification for the

newly created UA monitoring and management system. Manufacturers were provided with general information on the services to be implemented, as well as were asked to provide approximate estimates of the prices of the proposed standard solutions, as well as preliminary costs to adapt the existing functions to performance of additional tasks (for example, to acceptance of applications for operation permits and to decision management). This request for information did not provide information on which systems would need to be connected to this solution. Therefore, for the initial creation and adaptation of the systems, the financial model uses the average costs of development of the proposed modules, plus the adaptation costs of 45 %. With regard to the personnel servicing the system, the number of personnel resources required to ensure the availability of operational and technical personnel in the 12h/7d mode and the availability of technical personnel in the 8h/5d mode is assumed. To ensure the operation of the system in such a mode, a number of personnel corresponding to 5–7 full-time equivalents (FTE) for operational personnel and 2 FTE for technical personnel is required. For other personnel, it is assumed that as a result of digitalisation and automation of processes, the workload of existing employees may decrease and, accordingly, be redirected to address the increase in the intensity of functions.

Other most important assumptions of the financial model regarding expenses: In the first 5 years, the general administrative costs are 7 % of the system purchase costs, including the impact of inflation; personnel costs are expected to increase by 5 % per year based on the current legislation of the Republic of Latvia in the field of taxation; the licence maintenance fee is 7 % per year; service level agreement (SLA) 10 % per year; an increase of 4 % per year is assumed for these costs in years n+5 and beyond, including both inflation and possible increase in personnel costs and other changes; depreciation period for software is 5 years; depreciation period for infrastructure is 4 years. It should be noted that maintenance costs can vary significantly depending on the manufacturer's conditions and can reach 15–30 % per year, however, relatively average, i.e. standard costs are assumed for the calculation of the financial model.

Assumptions concerning revenue

In order to look at the possible indicative financial flows, for the revenue part, it is taken into account that the CAA has access to funding from EU funds for the creation of modules A, partly C and D. Taking into account that funding is available for a specific purpose, the financial model assumes that the costs of creation and adaptation

of these relevant modules are covered from the revenue from EU funds in the amount corresponding to these costs. In turn, with regard to the user fees, i.e. payments for services, the forecast of CAA services provided in the field of UAS for 2022–2024 is used, taking into account the valid price list, as well as the projected growth trend in the number of services. Revenue from services provided is assumed to grow faster after the introduction of all modules, starting from 2023, with an increase of 28 % per year (real growth + discount rate of 8 % per year), while after the initial faster growth, the revenue growth rate would gradually decrease to even 8 % per year in the 16th year of system maintenance. As the CAA price list has been approved by an external regulatory act and its revision has been performed in 2021, the specified fees are used in the currently determined amount.

At present, it is not possible to reliably estimate the services to be invented after the implementation of the modules. The possible revenue for possible services is taken into account in this financial model only as examples of what additional paid services could be implemented from 2024 onwards. It may be envisaged that new services would be created in the field of consultancy for defining the UAS geographical zones or by imposing a temporary restriction in UAS geographical zones, the conduct of risk assessments, as well as the registration of services and part of flight coordination functionalities.

The introduction of a charge for each UA sold in order to co-finance the maintenance of the management and monitoring system, thus charging a user fee for creating possible threats and providing a control and monitoring system for the whole company, should be additionally included and evaluated within the framework of the model. In addition, a most important increase in revenue from the services provided can only be expected in the case of the introduction of U-space services, which would create new opportunities for users, such as the creation or updating of a U-space zone for CIS services.

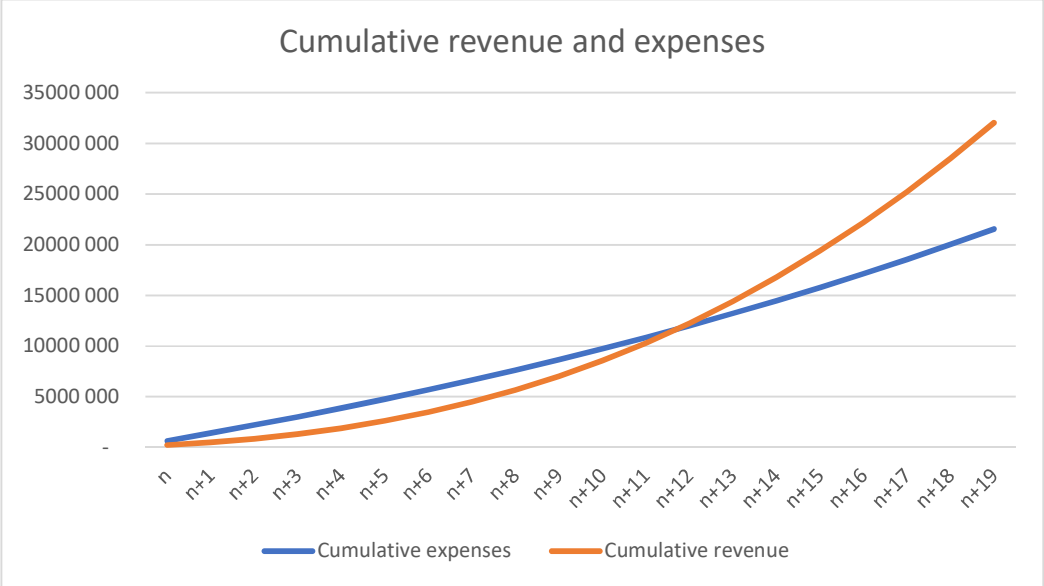


Fig. 8.1. **Cumulative expenses and revenue for the period n to n+19, P/L EUR**

Looking at the projected revenue and expenses over a 20-year period (financial model in Microsoft Excel format is submitted additionally) shows that the cumulative expenses exceed the potential revenue up to year n+12, thus it shall be concluded that the system cannot sustain itself without additional external funding.

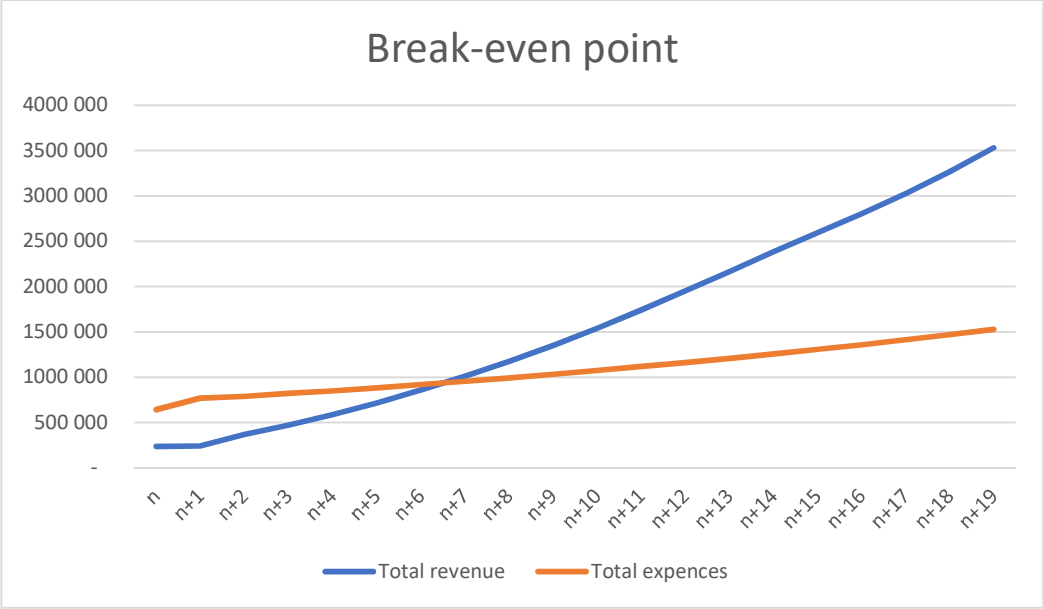


Fig. 8.2. **System operation break-even point**

Under the above assumptions, a possible break-even occurs in year n+7. When conducting a sensitivity analysis for individual parameters, such as the increase in the number of users, it can be concluded that a faster achievement of the break-even point

in terms of the increase in the number of users is possible only if it increases by at least 40–50 % compared to what is forecasted here. This is due to the fact that user fees are generally low, but this does not mean that they can be significantly increased, as user demand is likely to be inelastic at higher prices according to surveys, so the number of users is likely to decrease or not continue to grow, while also moving them outside the monitoring system. There are no significant changes in this situation with the EU funds project, if the investment costs are covered by external financing, as maintenance costs form a significant part of the costs, especially in terms of IT personnel costs. The sensitivity of the financial model to the costs or number of personnel is high, similar to changes in the number of users. Thus, faster achievement of the break-even point can only be achieved by increasing revenue, for example by increasing existing fees or reducing system operating costs, including personnel costs, as well as creating new, user-friendly paid services or improving existing ones.

Conclusions

It can be concluded that the revenues from the currently defined paid services cannot cover the costs related to the establishment and operation of the system, as well as covering the costs of establishment of the system from external sources (EU funds) does not create preconditions for achievement of the break-even point significantly faster. It is important to create convenient and user-friendly services so that users are ready to participate in the maintenance of the system through paid services. When implementing the Concept, it is also important to create preconditions for the involvement of the private sector in the further development of the system, which could also create new services for which users would be willing to pay. The involvement of private partners in the further development and maintenance of the UA management and monitoring system is likely to be possible through the creation of new services with new functionalities that users would be willing to pay extra for, such as BVLOS flights or services offered in U-space environment.

Effective implementation of Concept activities, which would create potential synergies within the scope of public functions, are essential for the implementation of public functions in relation to public safety and security, thus reducing system management costs. The UA management and monitoring system is created considering the experience in the management of civil manned aviation (see Regulation 1139/2018), however, the regulatory framework and regulations in this field

apply to the entire territory of Latvia and can be used to manage risks not only with regard to manned and unmanned aviation interaction, but also with regard to public security throughout the national territory.

Taking into account the contribution of the UA management and monitoring system to be created to the improvement of supervisory and control processes, in particular as regards the availability of information to law enforcement, military and security authorities (the State Police, the Military Police, the municipal police, the State Border Guard, the TAIIB, the CRPC) involved in the implementation of these functions, the allocation of public funding for the development and maintenance of this system essentially provides resources and support for the performance of the functions for which these authorities are responsible (in terms of public order, public security and security of the population). It is essential for the further efficient operation of the system that these authorities and their employees, especially those performing operational activities, have resources for easy access (for example, portable mobile devices) and use of the information contained in the system in real time.

Taking into account the restrictions of the regulatory framework noted above regarding the CAA funding opportunities, as well as the need for the State to participate in the financing of the UA management and monitoring system, the possibility of amending Section 5 of the Law on Aviation must be considered, supplementing it with the possibility for the CAA to receive funding from the State, if it is necessary for the implementation of functions related to ensuring safety, security and public order throughout the national territory.

In addition, taking into account the importance of such a system in ensuring supervision, control and public security, the possibility of encouraging the involvement of each UA owner in the maintenance of this system, for example in the form of a one-off fee, may be considered. The proportionality of the fees included in the CAA price list with the parameters of the operated UA, the operator’s operational objectives, their frequency, possible risk and threat must also be assessed, because the registration fee included in the price list is a fee for the operation of the common system, including the quality of available information, ease of access and visualization.

9. Proposals

9.1 Proposals for amendments to legislation

The solution proposed in the Conceptual model envisages digitization of services and optimization of many processes, such as automatic processing of online theoretical knowledge exam results and generation of a corresponding certification under the relevant user profile (account). In these and other processes, the emphasis is on the logic and process optimization embedded in the solutions.

From a regulatory point of view, a number of changes to the national legislation in the field of UAS would be required, which were described in Section 2.3. The essence of the changes is: digitization of processes, introduction of new e-services and solutions and strengthening of their role in UA monitoring and management system, solution of UAS geographical zone management issues. Funding issues for the implementation and maintenance of individual solutions shall be highlighted separately.

The Part C of the annex provides an overview of the most important changes in the regulatory framework resulting from the proposed modules in accordance with the Conceptual model.

9.2 Proposals for additional actions for the integrated implementation of the Concept

Given the scope of the Concept, it is primarily based on the legal framework specified for the field of UAS and the identified needs of stakeholders. However, the successful implementation of the Concept requires further research and elaboration of separate courses of action that would integrate the UA management and monitoring system into other coexisting systems, for example, related to law enforcement, insurance, or organize communication with manned aviation and rescue services.

The following can be identified as one of the topics to be addressed: The parties involved in the UA management and monitoring system, including those who have the competence to conduct administrative offence proceedings in accordance with the procedure specified by law, namely the Military Police, the State Police, the municipal police, the State Border Guard, indicated that in order to perform their assigned functions properly, they need solutions to ascertain that the UAS operator has general

civil liability for damage that UA could cause to the health, life or property of a third party, as well as the environment.

The regulatory framework in force sets requirements for minimum limits of liability depending on the parameters, operation category and subcategory of UA. UAS operators can apply for these services to an insurance company whose place of business may be in any EU Member State or third country – this means that the check of a valid insurance fact may take time, as there are no uniform requirements for making this information available in the field of UAS.

An example of a good practice is the set of solutions in the field of compulsory civil liability insurance (hereinafter – CCLI), where the Motor Insurers' Bureau of Latvia (hereinafter – the MIBL) was established to ensure better operation of the system and implementation of European Commission directives. It unites insurance companies that have the right to provide CCLI in Latvia and ensure the operation of the system[41].

In the future processes of policy planning and development of regulatory enactments, it is recommended to establish a UA general civil liability insurance system with standard rules and coordination mechanisms similar to those of the CCLI system. The establishment of such a system will increase the awareness of all parties involved about insurance requirements and systematize the insured risks, as well as allow the collection of data in one place and facilitation of their use in the UA monitoring and management system.

In order to strengthen user habits and establish a systematic monitoring and control system, mandatory registration of all UA shall be further evaluated, which would most likely be solved through the regulatory framework for the movement of goods, possibly also providing for an additional fee to ensure the operation of the monitoring and control system.

The implementation of the Concept will introduce new requirements for users, UA operators. Taking into account that one of the primary management goals is to facilitate informed UAS operations while mitigating potential risks, it is important to familiarize users with the new requirements in a collaborative way. Consult first, because the purpose is to achieve mutual understanding between businessmen and supervising authorities by facilitating compliance with certain requirements, rather than imposing penalties[42]. It is recommended to apply this principle to all parties involved in implementing the actions set out in the Concept, because, as the study of the situation

concluded, the vast majority of remote pilots want to comply with the rules and not pose a threat with their UAS operations.

When developing additional functionalities or detailing the requirements of the UA management and monitoring system, the OSS principle ("one-stop shop" principle) must be followed – the use of such work organization methods in the provision of services which, on the basis of the principle of good administration and mutual cooperation of institutions, allow for the receipt of services in one place or electronically, even when several institutions are involved in their provision, regardless of the institution and place.[43] This principle successfully reflects the identified requirements of users to use the newly created services.

According to this Concept, many new e-services will be created in the field of UAS, which envisage the development, implementation, maintenance and modernization (including expansion) of new solutions in the long term. Taking into account that the Conceptual model covers many stakeholders and areas, it would be desirable to create solutions in a way that makes them relatively easy to adapt to industry needs and standards. A good example is the principles of U-space architecture (see 4.2.3.4), which provide that with the development of technology, there will be a need to improve existing solutions.

The field of UAS is not currently highlighted as a vision or considered as one of the directions of national economy and economic development in the policy planning documents, therefore they do not include sequential tasks to be performed. For the sustainable development of the field of UAS, it is recommended to include it in the SDSL as one of the directions of national economy and economic development.

Table 9.1

Proposals related to Conceptual model modules

Module name		Proposal
A.1	Registration	It is proposed to set up an IT system that will ensure all processes in accordance with existing regulations and will be integrated with both the IT systems of the parties involved and external systems (including the Repository).
		Possibility to use system data will also be provided so that the relevant services can quickly find out if everything is in order with the status of UA, the legitimacy and qualification of the UA operator and/or pilot.

Module name		Proposal
C.1	Declaration of UAS operations	It is proposed to provide mandatory registration of UAS operations through a centralized IT system. This mechanism could facilitate both "situational awareness" and the recording of all UA flights in order to use this information both for statistical purposes and to analyse emergencies that may be related to UA flights.
		This system could be further upgraded to ensure compatibility with the USSP and to continue provision of services in the entire airspace of the Republic of Latvia.
C.2	Approval of UAS operations	It is proposed either to expand the IT system, which is proposed in relation to Block C.1, or to develop a new system with additional functions in order to ensure the approval of operations with the UAS geographical zone owners and the effective coordination of operations with the responsible services.
		Particular attention needs to be paid to the coordination of operations in the vicinity of aerodromes, where changes to airspace reservation/release should be responded to with regard to manned aviation. This could be resolved if a system is implemented that allows for the dynamic reservation and release of airspace parts (divided in order to effectively manage CTR airspace) depending on the situation at and near the aerodrome. This system must process data on air traffic, aerodrome configuration, planned UAS operations, airspace structure.
D.1	Central data exchange point	It is proposed to implement a centralized data exchange IT system in order to ensure the exchange of data between the parties involved. It is recommended not to keep all data in the system, but to provide data transfer and transaction recording.
F.2	UAS geographical zone visualization system/tool	Given the nature of UAS operations (operations are performed outdoors, airspace is used), it is necessary to adapt the eUARV for convenient use on devices regardless of the display resolution.

10. Summary

The aim of the project is to establish the UA management and monitoring system in order to promote environmental and security measures at Riga International Airport and to improve the security of the airspace of Latvia in the air traffic control zone. The development of the UA management system Concept is one of the main activities of the project.

The Concept includes an overview of the following fields: national and international regulation framework; studies and reviews carried out so far; description of the field of UAS regarding the stakeholders and their roles, the importance of the existing airspace structures and the defining of UAS geographical zones, future development trends in the field; UA management and monitoring system and its objectives and tasks, as well as key performance indicators for 5 years; Conceptual model of the UA management and monitoring system, its development and financing possibilities.

The Concept mainly addressed both the requirements arising from the regulatory framework and the key topics raised by users, stakeholders and members of the public as those to be solved. These topics are: security and safety, remote pilot skills and knowledge, limitations, information, control and monitoring, application for flights, regulatory framework, browser, privacy, coordination, system (single IT solution), specific category, remote pilot culture, equality and others.

Based on the identified requirements and needs, the main directions that could be addressed in developing the Conceptual model of UA management were defined: in Latvia, as in the rest of the world, the number of UAS operations is expected to increase; increasing digitization and automation of processes (solutions based on logic and algorithms) is expected in all areas and also in this; users and stakeholders, as well as the general public, need clear and targeted information materials and campaigns; there is a need to strengthen the supervisory and control authorities in the field of UAS, also within the framework of the functional system solutions available to them; the planning of UAS operations and their easy coordination online is an essential precondition for users to use it and, accordingly, for supervisory authorities to be able to carry out their tasks, creating a sense of both security in society and equality between users; the significance of UAS signal receiving equipment in the operation of supervisory and control authorities.

When developing the UA management and monitoring system solution model, it is proposed to create functional blocks, which are grouped taking into account the data contained in them and their functional significance, implementation deadlines specified in regulatory enactments, as well as the potential manager. The functional blocks to be created according to their implementation priorities are as follows:

I. Block A – Functions specified in the CAA regulatory framework in the field of UA;
II. Block B – Design of UAS geographical zones;
III. Block C – Declaration of UAS operations and coordination of UAS operations with UAS geographical zone managers;
IV. Block D – Central data exchange point.

Priority for Block E – U-space and Block F – Other systems is not determined, because a separate decision must be made on the implementation of U-space in Latvia, which must be represented in regulatory enactments, while within Block F additional systems are created as needed.

Regarding the implementation of the priority functional blocks A, B, C, the financing model is considered in a 20-year perspective in order to identify trends. Looking at the projected revenues and expenditures over a 20-year period, it can be seen that the cumulative costs do not exceed the potential revenues, thus it can be concluded that the system cannot sustain itself without external, additional funding. Also, financing the development of the system from external resources does not significantly change the situation, taking into account the operating costs of the system. Concentration of module management could be a possible way to reduce operating costs, which would allow optimizing the required number of human resources by creating synergies between modules, their maintenance or development. In this scenario, the break-even point can be reached in year n+12.

An action plan for the implementation of functional blocks is determined, which represents the solutions to the main problematic issues raised as regular activities, such as information campaigns and discussions, as well as cyclical activities, such as defining system requirements, system implementation and further development. The Concept also indicates the necessary amendments to the regulatory enactments currently identified, as well as proposals for additional activities for the integrated further implementation of the Concept.

11. Annexes

Part A

ATS airspaces are classified and designated in accordance with the following[1]

Class	Type of flight	Separation provided	Service provided	Speed limitation/1/	Radio communication capability requirement	Continuous two-way air-ground voice communication required	Subject to an ATC clearance
A[4]	IFR only	All aircraft	Air traffic control service	Not applicable	Yes	Yes	Yes
B[4]	IFR	All aircraft	Air traffic control service	Not applicable	Yes	Yes	Yes
	VFR	All aircraft	Air traffic control service	Not applicable	Yes	Yes	Yes
C	IFR	IFR from IFR IFR from VFR	Air traffic control service	Not applicable	Yes	Yes	Yes
	VFR	VFR from IFR	(1) Air traffic control service for separation from IFR (2) VFR-VFR traffic information (and traffic avoidance	250 kt IAS below 3 050 m (10 000 ft) AMSL	Yes	Yes	Yes

[1] https://ais.lgs.lv/eAIPfiles/2022_002_24-MAR-2022/data/2022-03-24-AIRAC/html/eAIP/EV-ENR-1.4-en-GB.html#ENR-1.4

Class	Type of flight	Separation provided	Service provided	Speed limitation/1/	Radio communication capability requirement	Continuous two-way air-ground voice communication required	Subject to an ATC clearance
			advice on request)				
D	IFR	IFR from IFR	Air traffic control service, traffic information about VFR flights (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Yes	Yes	Yes
	VFR	NIL	IFR/VFR and VFR/IFR traffic information (and traffic avoidance advice on request)	250 kt IAS below 3 050 m (10 000 ft) AMSL	Yes	Yes	Yes
E[4]	IFR	IFR from IFR	Air traffic control service and, as far as practical, traffic information	250 kt IAS below 3 050 m (10 000 ft) AMSL	Yes	Yes	Yes

Class	Type of flight	Separation provided	Service provided	Speed limitation/1/	Radio communication capability requirement	Continuous two-way air-ground voice communication required	Subject to an ATC clearance
			about VFR flights				
	VFR	NIL	Traffic information as far as practical	250 kt IAS below 3 050 m (10 000 ft) AMSL	No[2]	No[2]	No
F[4]	IFR	IFR from IFR as far as practical	Air traffic advisory service; flight information service if requested	250 kt IAS below 3 050 m (10 000 ft) AMSL	Yes[3]	No[3]	No
	VFR	NIL	Flight information service if requested	250 kt IAS below 3 050 m (10 000 ft) AMSL	No[2]	No[2]	No
G	IFR	NIL	Flight information service if requested	250 kt IAS below 3 050 m (10 000 ft) AMSL	Yes	No[2]	No
	VFR	NIL	Flight information	250 kt IAS below 3 050 m	No2	No[2]	No

Class	Type of flight	Separation provided	Service provided	Speed limitation/1/	Radio communication capability requirement	Continuous two-way air-ground voice communication required	Subject to an ATC clearance
			service if requested	(10 000 ft) AMSL			

1. When the transition altitude is lower than 3050 m (10000 ft) AMSL, FL100 should be used in lieu of 10000 ft. The competent authority may also exclude aircraft types which, for technical or safety reasons, cannot maintain speed.

2. Pilots shall maintain continuous air-ground voice communication watch and establish two-way communication, as necessary, on the appropriate communication channel in RMZ.

3. Air-ground voice communication is mandatory for flights participating in the advisory service. Pilots shall maintain continuous air-ground voice communication watch and establish two-way communication, as necessary, on the appropriate communication channel in RMZ.

4. Classes A, B, E and F are not used in the Riga FIR.

Class A

IFR flights only are permitted. All flights are provided with ATC service and are separated from each other. Continuous air-ground voice communications are required for all flights. All flights shall be subject to ATC clearance.

Class B

IFR and VFR flights are permitted. All flights are provided with ATC service and are separated from each other. Continuous air-ground voice communications are required for all flights. All flights shall be subject to ATC clearance.

Class C

IFR and VFR flights are permitted. All flights are provided with ATC service and IFR flights are separated from other IFR flights and from VFR flights. VFR flights are separated from IFR flights and receive traffic information in respect of other VFR flights and traffic avoidance advice on request. Continuous air-ground voice communications are required for all flights. For VFR flights a speed limitation of 250 kt indicated airspeed (IAS) applies below 3 050 m (10 000 ft) AMSL, except where approved by the competent authority for aircraft types, which for technical or safety reasons, cannot maintain this speed. All flights shall be subject to ATC clearance.

Class D

IFR and VFR flights are permitted and all flights are provided with ATC service. IFR flights are separated from other IFR flights, receive traffic information in respect of VFR flights and traffic avoidance advice on request. VFR flights receive traffic information in respect of all other flights and traffic avoidance advice on request. Continuous air-ground voice communications are required for all flights and a speed limitation of 250 kt IAS applies to all flights below 3 050 m (10 000 ft) AMSL, except where approved by the competent authority for aircraft types, which for technical or safety reasons, cannot maintain this speed. All flights shall be subject to ATC clearance.

Class E

IFR and VFR flights are permitted. IFR flights are provided with ATC service and are separated from other IFR flights. All flights receive traffic information, as far as is practical. Continuous air-ground voice communications are required for IFR flights. A speed limitation of 250 kt IAS applies to all flights below 3 050 m (10 000 ft) AMSL, except where approved by the competent authority for aircraft types, which for technical or safety reasons, cannot maintain this speed. All IFR flights shall be subject to ATC clearance. Class E shall not be used for control zones.

Class F

IFR and VFR flights are permitted. All participating IFR flights receive an air traffic advisory service and all flights receive FIS if requested. Continuous air-ground voice communications are required for IFR flights participating in the advisory service and all IFR flights shall be capable of establishing air-ground voice communications. A speed limitation of 250 kt IAS applies to all flights below 3 050 m (10 000 ft) AMSL, except where approved by the competent authority for aircraft types, which for technical or safety reasons, cannot maintain this speed. ATC clearance is not required.

Class G

IFR and VFR flights are permitted and receive FIS if requested. All IFR flights shall be capable of establishing air-ground voice communications. A speed limitation of 250 kt IAS applies to all flights below 3 050 m (10 000 ft) AMSL, except where approved by the competent authority for aircraft types, which for technical or safety reasons, cannot maintain this speed. ATC clearance is not required.

Part B

Risks related to UAS operations and their mitigation measures

No.	Area of risk	Risk mitigation measures
1.	Environment	• Promote the use of renewable energy sources for recharging batteries; • use sustainable aviation fuel in hybrid UA; • develop a culture of environmental protection in the field of UAS; • regulate the use of light to reduce light pollution at night; • equip UA with systems to prevent them from being attacked by birds of prey; • establish no-fly zones for UA to preserve natural areas; • fly as slowly as possible to save the lives of the animals; • further research is needed to fully understand the unique acoustic effect of UA.
2.	Noise	• Limit the minimum height; • establish no-fly zones for UA to preserve nature areas, schools, hospitals, etc.; • regulate/limit UA flight time, traffic volume; • set a minimum ingress protection code (IP) for UA producers; • use random trajectories to spread UA noise in several areas; • avoid/limit UA flights and fly as fast as possible to obtain lower noise exposure; • equip UAS with systems to prevent birds of prey from attacking.
3.	Safety	• Develop a risk and security culture in the field of UAS; • regulate/limit UA flight time, traffic volume; • identify UA operation classes that can be performed in certain extreme meteorological conditions; • introduce an artificial intelligence system capable of detecting abnormal behaviour of the UA; • improve the accuracy of short-term weather forecasts at local level; • allow the use of any UA in search and rescue operations (diverting it from the original mission),

		unless its mission is already of an emergency or security nature; • establish an independent authority to investigate accidents/incidents/complaints related to the UA operation; • ensure that the correct level of technical and operational skills/competences/knowledge is available throughout the UAS operator.
4.	Security	• Introduce an artificial intelligence system capable of detecting any abnormal behaviour of the UAS; • register cameras, restrict camera type/position; • enable law enforcement authorities to monitor UAS traffic directly during operations; • establish countermeasures for criminal/illegal use of UAS.
5.	Privacy	• Ensure that UAS electronic devices (cameras, sensors, etc.) cannot be used to violate privacy; • register cameras, restrict camera type/position; • strictly restrict access to video recordings during and after UAS operations; • limit the minimum height; • establish UAS no-fly zones to protect schools, hospitals, etc.
6.	Transparency	• Improve public knowledge of UAS technologies and operations; • promote the environmental benefits of UAS in terms of quantifying emission savings; • carry out early public involvement campaigns to gain public support or reduce public resistance; • set up a public website to identify and monitor societal problems; • quantify and advertise the economic contribution of UAS in terms of jobs created and number of people transported, volume and cost of goods transported; • promote the mobility and economic benefits of UAS.
7.	Responsibility	• Establish clear rules and insurance to cover possible losses to third parties, infrastructure and wildlife caused by UAS; • Request appropriate insurance from the UA operator in the event of damage due to extreme weather conditions.

8.	Operational and economic risks, fair access	• Identify a strategic location for the vertiport to improve connectivity; • Provide proper battery maintenance processes and control devices to extend their life; • Ensure that the cost of UAS services remains commensurate with the value of the operation (access to services); • Allow all types of companies to use UTM services; • Improve the accuracy of short-term weather forecasts at local and regional level.

Part C

Impact of the modules on the legal framework is identified (the most important necessary changes are highlighted)

Module name		Regulatory framework	The essence of change
Block A: CAA functions			
A.1	Registration		
A.1.1	Registration of UAS operators	Cabinet Regulation 457	Changes in Subparagraph 14.1 – the data are updated immediately due to the use of a platform with digital services.
A.1.2	Registration of certified UA	Cabinet Regulation 200	There may be potential changes to this regulatory document as soon as the requirements for UA, whose design is to be certified, are clear.
A.1.3	UA registration	Cabinet Regulation 457	Changes in Subparagraph 14.1 – the data are updated immediately due to the use of a platform with digital services.
A.1.4	Remote pilot registration		
A.1.5	Registration of aircraft model clubs and associations		
A.1.6	Recognized entities		Changes in the list of data subjects for which data are processed. The possibility for representatives of these organizations, observers (in recognized entities) to register with the relevant role, thus creating a digital profile of the organization, must be assessed.
A.1.7	Common information services		
A.1.8	U-space service providers		
A.2	Qualification		
A.2.1	Training	Cabinet Regulation No. 436	Paragraph 12 needs to be clarified with regard to the CAA service portal – CAA-recognized entities will also be able to provide training in the field of UAS. It must be clarified in Paragraph 15 that the data of the passed A1/A3 exam are immediately available in the remote pilot's account on the portal.

A.2.2	Examinations	Cabinet Regulation No. 436	Changes to Section 10 – an agreement with recognized entities on the use of the platform must be provided for;
A.2.2.1	Examination e-environment	Cabinet Regulation No. 436	Change to Section 14 – the check of theoretical knowledge (exam) takes place on a unified platform, i.e. application may also take place through this platform; Change to Section 28 – in the case of a face-to-face examination, testing takes place in an e-environment provided by the CAA.
A.2.2.2	Bank of examination questions	Cabinet Regulation 374	Changes to Section 10 regarding the way in which the recognized entity submits questions. Further discussion is required as to whether questions from a recognized entity or those prepared by the CAA are used during the exam.
A.2.2.3	Exam schedule	Cabinet Regulation No. 436	Change to Section 11 – exam information becomes available automatically as soon as the CAA-recognized entity applies for the exam session on the platform.
A.2.2.4	Types of exams and course of exams		
A.2.3	Certificates and their management	Cabinet Regulation No. 436	Changes to Section 15 and Section 20 – information on a successfully passed exam becomes available immediately below the remote pilot profile. The certification or certificate of competence becomes available immediately.
A.3	Permits for operations in a specific category	Cabinet Regulation No. 437	Clarification is needed on how applications for permits can be submitted using digital tools.
A.3.1	Operation permits		
A.3.2	Approvals of declarations of operation		

A.3.3	Light UAS operator certificates (LUC)		
A.3.4	Cross-border operations in a specific category		There is a need for a broader discussion on how permits for operation in a specific category issued by a competent authority in another Member State are processed.
A.4	Access to the EASA repository		Is not currently stated
A.5	Monitoring programme (in the field of UAS)	Cabinet Regulation No. 437 Cabinet Regulation No. 374 Cabinet Regulation No. 627	Changes in the procedure for monitoring these regulations, namely how the relevant persons are informed about planned and unplanned audits, inspections.
A.6	An application for fast data verification		Is not currently stated
A.7	Management of UAS geographical zones	Cabinet Regulation 429	Amendments and additions to the second part on the division of roles and competence in the UAS geographical zones management process.
A.8	Reporting occurrences in the field of UAS		Is not currently stated
A.9	Information on the field of UAS		Is not currently stated
Block B: Design of UAS geographical zones			
B.1		Cabinet Regulation 429	Amendments and additions to the second part on the division of roles and competence in the UAS geographical zones management process. It is necessary to emphasize the importance of the ED-269 data

			model in the process of defining UAS geographical zones.
		Cabinet Regulation 26	Taking into account the requirement stipulated in Cabinet Regulation 429 regarding the transformation of airspace structure elements into UAS geographical zone, amendments to Cabinet Regulation 26 are required that the airspace structure element manager submits data on the respective element in accordance with the ED-269 model.
Block C: Application for UAS operations and their coordination			
C.1	Declaration of UAS operations	Law on Aviation, Development of a new Cabinet regulation	Amendments to the Law on Aviation are necessary to strengthen the requirement regarding the need to register or apply for each UA flight. Similar amendments are required if UAS geographical zone managers use module C.2 for the confirmation of UAS operations – i.e. making this coordination legally recognized, i.e. those that need to be recognized by the State Police, municipal police and so on; if necessary, to check the legality of the UA flight. The development of a new Cabinet regulation is necessary for the description of the objective, operation, etc. of modules C.1 and C.2
C.2	Approval of UAS operations		
Block D: Central data exchange point			
D.1	Central data exchange point	Development of a new Cabinet regulation	The impact of Block D on the regulatory framework will only be in the case of a centralized approach (see 6.2). The new regulatory documents must stipulate the role of the CDEP in the field of UA management and monitoring system, the procedure for establishment and operation, the types of data exchange, the procedure for financing.
Block E: U-space			

E.1	Common information services	Law on Aviation, Development of a new Cabinet regulation	In the case of the introduction of U-space, changes to the Law on Aviation are needed to include a relevant concept. It is necessary to develop a new Cabinet on how the procedure for application, approval and monitoring of the respective service providers will be performed. Certification requirements must be defined.
E.2	U-space service providers		
Block F: External systems			
F.1	UAS signal receiving equipment	Development of a new Cabinet regulation	The development of a new Cabinet regulation is necessary if it is planned to use data from UAS signal receiving equipment as evidence within the administrative procedure.
F.2	UAS geographical zone visualization system/tool		Is not currently stated
F.3	UAS geographical zone data set		Is not currently stated
F.N	Other systems		The impact of the “Other systems” module on the regulatory framework depends on the functions performed by the specific module.

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