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D3.2 – Data protection, Social, Ethical and Legal Frameworks – V2

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Executive summary

The project ALADDIN - Advanced hoListic Adverse Drone Detection, Identification and Neutralization is funded by the European Commission (EC) through the European H2020 research and innovation programme with Grant Agreement 740859.

This document, Deliverable 3.2 – Data Protection, Social, Ethical, and Legal Frameworks – V2, identifies and elaborates upon the relevant ethical and legal principles and frameworks which was either not present in Deliverable D3.1 or developed recently in order to cope issues posed by the use of UAVs. And the principles and frameworks highlighted in this deliverable D3.2 will be applicable to ALADDIN project. As the fifth deliverable of work package 3 (WP3), the relevant legal and ethical frameworks identified in this deliverable will be used to create a report the "ALADDIN Impact Assessment Report – V2", against which project activities and outcomes will be assessed. However, it is made clear that the issues touched and identified, regulatory frameworks touched upon by the previous deliverable D3.1 shall be equally abide by the ALADDIN system with the same spirit in which it was intended and submitted unless, a provision or principle or a part of that deliverable will be in direct contravention with the present deliverable D3.2 - *Data Protection, Social, Ethical, and Legal Frameworks – V2.*

The information presented below outlines the main findings of this deliverable.

A. Security of operation in the context of ALADDIN

A recognition of the risks is become very necessary when a system poses threat either to the society at large or to any similar object in its kind or method of operation. Calculation of these risks must be analyzed and be mitigated side by side with the development of any of the element of ALADDIN system. New regulatory regimes provides for on the developer of an element of ALADDIN system that not only risks related to technical and dynamic specifications should be examined but also environment, privacy and data protection, and space security threat must be evaluated.

In order to help in the doing of all such obligations newly framed statutes gives several definition and guiding principles to be taken into consideration while working on an element of ALADDIN system by taking necessary steps to mitigate them as soon as a risk or threat is discovered. The deliverable D3.2 points out the possibilities of risks while operating or working on it in order to operate ALADDIN system in near future by providing acute important information regarding it.

B. Classification, categorization, and standardization of UAS

The present deliverable gives detailed account about the classification methods opted, categorization criteria fixed, and standardization rules made by the regulations for the

development and ready to use ALADDIN system. The points enumerated in this deliverable will help ALADDIN system to develop it according to the criteria fixed for a class and/or category and/or standard of UAS. It also mentions like class logo or symbol that needs to be fixed according to the overall evolution of the status of ALADDIN system.

C. The improvement in the legal frameworks and the development of ALADDIN

The time duration between the submission of deliverables D3.1 and this draft is more than two years and in between several new steps have been taken by the legislative wing of the European Union. Now, legal requirements are more in order to operate a UAS in the European sky-space. ALADDIN system, too, is also busy in its development. At this stage it must be tested that whether the elemental as well overall project development of ALADDIN fulfills the current statutory requirements or not. Not only technical obligations have come from these regulations but also other factors will be focused on like remote pilot training, certification of compliance of any class or category of UAS, and registration for the operation in a sky-space of member state etc. So, discrepancy, if any, should be avoided according to the principles and obligations mentioned in this deliverable D3.2.

D. Privacy, data protection and recent development

As far as the regulatory compulsion of protection of personal data and privacy is concerned, the previous deliverable D3.1 has already covered in detail. The requirements mentioned under that deliverable is untouched here and is also deemed that the ALADDIN system will follow those principle without any excuse. In that deliverable detailed account has been provided to guide the very development of an element or overall ALADDIN system. The present deliverable D3.2 equally respect the SoEL framework requirement of D3.1 as its own.

Contents

1. Introduction

1.1 Project Overview

The project ALADDIN - Advanced hoListic Adverse Drone Detection, Identification and Neutralization is funded by the European Commission (EC) through the European H2020 research and innovation programme with Grant Agreement 740859.

It spans 36 months and will follow an iterative and incremental development that implements a user-centred design process for the duration of the project. The project is split into two main iterations, each one being a complete development cycle composed of requirement collection, platform design, development, integration, and end-user testing and evaluation. The evaluative results of the first cycle will feed into the second, refining project aims and activities.

The main objective of the ALADDIN project is to study and develop a state-of-the-art, global, and extensible system to detect, localise, classify, and neutralise suspicious, and potentially multiple, light unmanned aerial vehicles (UAVs) over restricted areas. This system will be tailored to operational constraints (such as easiness of use and deployment, quality of detection, or safety) in order to deliver unprecedented tools for operational support, including investigations, and training.

ALADDIN will also assess relevant technologies, threat trends, regulations, and important issues such as the relevant societal, ethical, and legal (SoEL) frameworks. By doing so, it expects to develop new knowledge which will be made available to LEAs and infrastructure designers, constructors, and operators, through innovative curricula.

1.2 Purpose of the Document

This deliverable constitutes the societal, ethical, and legal (SoEL) aspects of the ALADDIN project. The role of this deliverable is to identify, in broad terms, the legal and ethical principles which have developed in the course of time and that were not present in the deliverable D3.1 or passed as a legal framework after the completion and acceptance of D3.1 and will apply thoroughly to the ALADDIN project. The identification of these principles and the relevant legal frameworks will then be used, in D3.7 " ALADDIN Impact Assessment Report – V2".

1.3 Scope and Intended Audience

The intended audience of the document are the project stakeholders (European Commission DG HOME, Research Executive Agency (REA), ALADDIN Consortium executive members) and the project team (Consortium staff).

According to the preliminary security scrutiny in the DOA Part B (section 6.1), this deliverable is classified as PU = Public. The actual dissemination level has been confirmed as PU = Public by the Security Advisory Board (SAB) chaired by the Project Security Officer (PSO).

1.4 Structure of Document

The deliverable is divided into three parts: Part 1: Regulatory Development against the smarter innovation in field of Unmanned Aerial System/Vehicle, consisting of Sections One, Two and Three; Part 2: Obligations cum Compliance on the part of Operator/Manufacture/Developer of UAS under Legal Frameworks, consisting of 3 Sections and 5 sub-sections; Part 3: Guiding Principles, from the regulatory Frameworks, to understand the legal duties, consisting of 8 Sections.

PART 1: Regulatory Development against the smarter innovation in field of Unmanned Aerial System/Vehicle

The following section will describe in detail the laws and regulations pertaining to the operation of UAS, or UAV, for the time being in Europe.

1.1 Key Organization and Institution

- **European Union Aviation Safety Agency**

The EASA has been established under chapter V of the regulation 2018/1139 to ensure the proper functioning and development of the civil aviation in the Union in accordance with the objective of the regulation. The agency therefore loaded with different tasks, like:

- Provide the Commission the technical, scientific, and administrative support
- Preparation of technical rules
- Conduction of inspection, monitor activities, and can-do investigation to fulfill its duties under this regulation and whenever the Commission so suggests
- On behalf of a member state it can also carry out other functions and task under international conventions, especially the Chicago convention
- Assistance to the competent national authorities in carrying out their tasks particularly in the exchange of information and expertise
- In a case where Union law establishes or prescribes for performance schemes relating to civil aviation, the agency may be required to contribute in the establishment, measurement, and reporting & analysis of performance indicators
- It needs to promote Union aviation standards and rules at international level
- To cooperate other institutions of the Union in the matter of civil aviation.

1.2 Key Legislations

- Regulation 216/2008 on Common Rules in the Field of Civil Aviation
- Regulation (EU) 2018/1139 of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency
- Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on Unmanned Aircraft System and on third-country operators of UASs
- Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft
- Commission Implementing Regulation (EU) 2020/639 of 12 May 2020 amending Regulation 2019/947 as regards to standard scenarios for operations executed in or beyond the visual line of sight
- Opinion No. 01/2020 on High-level regulatory framework for the U-space of European Union Aviation Safety Agency

- The UK's Air Traffic Management and Unmanned Aircraft Bill, 2019
- The UK's Air Navigation Amendment Order, 2018
- The UK's Air Navigation Amendment Order, 2019
- Italy's Regulation on Remote Pilot Air Vehicles. 2019

1.3 Introduction

Apart from the Regulation 216/2008 on Common Rules in the Field of Civil Aviation (Basic EASA Regulation) which has already covered under deliverable D3.1 the present document will provide introductory statements on regulation and opinion mentioned hereinbefore.

Regulation 2018/1139 proposes for the existence of common safety rules and measures to be taken for high and uniform level of civil aviation by considering goods, persons, and organizations. It further requires the compliance of the rules and safety measures by such goods, persons, and organizations. Environmental protection to the international standards shall also be taken into consideration by the operators of the operators of above noted things. Art. 2(1)(a) says the regulation shall apply to "the design and production of products, parts and equipment to control aircraft remotely by a natural or legal person". It defined 'unmanned aircraft' as "any aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board' and thus the remote pilot would be "a natural person responsible for safely conducting the flight of an unmanned aircraft by operating its flight controls, either manually or, when the unmanned aircraft flies automatically, by monitoring its course and remaining able to intervene and change the course at any time".[1]

Regulation 2019/945 lays down the requirements for the design and manufacture of unmanned aircraft systems ('UAS') intended to be operated under the rules and conditions defined in Implementing Regulation (EU) 2019/947 and of remote identification add-ons. It also defines the type of UAS whose design, production and maintenance shall be subject to certification. It also establishes rules on making UAS intended for use in the 'open' category and remote identification add-ons available on the market and on their free movement in the Union. It defines 'unmanned aircraft' ('UA') as an aircraft operating or designed to operate autonomously or to be piloted remotely without a pilot on board. Further it gives definition of UAS as an unmanned aircraft and the equipment to control it remotely. A UAS operator can either be a natural or legal person who either operate or intend to operate the system remotely. Moreover, a few specific terms have been defined like 'follow-up mode', 'direct remote identification' and 'geo-awareness' etc. A follow-up mode will be "a mode of operation of a UAS where the unmanned aircraft constantly follows the remote pilot within a predetermined

[1] Art. 3(30) & (31) of the regulation.

radius" and geo-awareness means a function "that detects a potential breach of airspace limitations and alerts the remote pilots so that they can take effective immediate and action to prevent that breach".[2] However, the detection will be based on the data provided by Member States. 'Direct remote identification' means a system that ensures the local broadcast of information about a UA in operation, including the marking of the UA, so that this information can be obtained without physical access to the UA.

Regulation 2019/947 provided for the operation of unmanned aircraft within the single European sky airspace alongside manned aircraft irrespective of their mass. To the calculation of risk level, it proposed for three categories of operation i.e. 'open', 'specific', and 'certified'. Registration of UAVs will be necessary for the operator if such vehicle can transfer impact of a kinetic energy of 80 joules or more. If a UAV has its take-off mass of 250 g or more in a 'open' category shall also need to be registered. Furthermore, if a UAV operates with a sensor which is able to capture personal data of an individual will also needed to be registered. Apart from these marking criteria, the regulation further defines several important terminologies used by it. First in the line is '**UAS geographical zone**', '**robustness**', '**standard scenarios**', and '**unmanned sailplane**' etc. 'UAS geographical zone' means a portion of airspace established by the competent authority that facilitates, restricts or excludes UAS operations in order to address risks pertaining to safety, privacy, protection of personal data, security or the environment, arising from UAS operations.[3] 'Robustness' stands for the property of mitigation measures resulting from combining the safety gain provided by the mitigation measures and the level of assurance and integrity that the safety gain has been achieved.[4] 'Standard scenario' means a type of UAS operation in the 'specific' category for which a precise list of mitigating measures has been identified in such a way that the competent authority can be satisfied with declarations in which operators declare that they will apply the mitigating measures when executing this type of operation.[5] 'Unmanned sailplane' will be an unmanned aircraft that is supported in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine. It may be equipped with an engine to be used in case of emergency.[6]

Regulation 2020/639 further categorizes the operation of UASs, or UAVs, in two scenarios i.e. 'STS-O1' and 'STS-02' for standard scenarios one and two, respectively depending upon the conduction of operation within and beyond the 'visual line of sight'. Maximum height of operation in both these scenarios has been kept on 120 meter over a controlled ground area.

[2] Ibid
[3] Art. 2(4) of the regulation 2019/947
[4] Art. 2(5) of the regulation 2019/947
[5] Art. 2(6) of the regulation 2019/947
[6] Art. 2(23) of the regulation 2019/947

In scenario 2 especially, where operation is carried out in beyond visual line of sight, the UAV must be not be distant more than 2 kms from the remote pilot with the airspace observers. An unmanned aircraft when flews in night shall activate flash green light. The UAV operator shall be required to make well defined rules applicable to practical training and assessment of remote pilots operating in any of these two scenarios. The present regulation added several technical terms by defining each which were not present before. These are 'unmanned aircraft observer', 'airspace observer', 'command unit', 'C2 link service', 'flight geography and its are', 'contingency volume', 'operational volume', and 'ground risk buffer'.

a) "Unmanned aircraft observer" means a person, positioned alongside the remote pilot, who, by unaided visual observation of the unmanned aircraft, assists the remote pilot in keeping the unmanned aircraft in VLOS and safely conducting the flight.[7]

b) "airspace observer" means a person who assists the remote pilot by performing unaided visual scanning of the airspace in which the unmanned aircraft is operating for any potential hazard in the air.[8]

c) "command unit" ("CU") means the equipment or system of equipment to control unmanned aircraft remotely which supports the control or the monitoring of the unmanned aircraft during any phase of flight, with the exception of any infrastructure supporting the command and control (C2) link service.

d) "C2 link service" means a communication service supplied by a third party, providing command and control between the unmanned aircraft and the CU.[9]

e) "flight geography" means the volume(s) of airspace defined spatially and temporally in which the UAS operator plans to conduct the operation under normal procedures.

f) "flight geography area" means the projection of the flight geography on the surface of the earth.[10]

g) "contingency volume" means the volume of airspace outside the flight geography where contingency procedures.

h) "contingency area" means the projection of the contingency volume on the surface of the earth.[11]

i) "operational volume" is the combination of the flight geography and the contingency volume.[12]

[7] Amending Art. 1(24) of the regulation 2020/639
[8] Ibid, Art. 1(25)
[9] Ibid, Art. 1(27)
[10] Ibid, Art. 1(29)
[11] Ibid, Art. 1(31)
[12] Ibid, Art. 1(32)

j) "ground risk buffer" is an area over the surface of the earth, which surrounds the operational volume and that is specified in order to minimize the risk to third parties on the surface in the event of the unmanned aircraft leaving the operational volume.[13]

Opinion No. 01/2020 provides for the first set of implementing rules on U-space. The EASA refers this 'first set' as a minimum necessary rule. It requires 'adapted services and sharing of essential traffic information' in order to mitigate the risk of collision. As 'detect and avoid (DAA) and/or sense and avoid (SAA)' system is still under development phase, there is a single way to keep the U-space airspace safe is to cooperate i.e. by sharing real-time information of their position. This requirement will be more severe when a UAV operates in a beyond visual line of sight.

PART 2: Obligations cum Compliance on the part of Operator/Manufacture/Developer of UAS under Legal Frameworks

2.1 Regulatory (EU - 2018/1139) requirements under SoEL framework:

*I. Taking into the nature of risks involved in the activity, the operational characteristics of the unmanned aircraft concerned and the characteristics of area of operation, a **Certificate** shall be required for the design, production, maintenance and operation of unmanned aircraft and their engines, propellers, parts, non-installed equipment and equipment to control them remotely, as well as for the personnel, including remote pilots, and organizations involved[14];*

II. The certificate will only be issued after an application which must demonstrate that it fulfills the requirements to be certified under this regulation. The certificate will cover the safety related limitations, operating conditions, and privileges. This certificate can be amended to add or subtract in any of these factors.

III. This certificate however can be suspended or revoked if the operator fails to comply with or to demonstrate the regular improvements in these factors.

2.2 Regulatory (EU - 2019/945) requirements under SoEL Framework:

*I. The unmanned aircraft systems ('UAS') whose operation presents the lowest risks and that belong to the '**open**' category of operations may be given relaxation to classic*

[13] Ibid, Art. 1(33)
[14] Art. 56(1) of the regulation 2018/1139

aeronautical compliance procedures.

II. *When manufacturers place a UAS (UAV for our purposes) on the market with the intention to make it available for operations under the 'open' category and therefore affix a class identification label on it, they need to fulfill the requirements of that particular class.*

III. *To provide citizens with high level of environmental protection, it will be necessary to limit the noise emissions to the greatest possible extent.*

IV. *To ensure a high level of protection of public interest, such as health safety, and to guarantee fair competition on the Union market, economic operators should be responsible for the compliance of UAS intended to be operated in the 'open' category.*

V. *To facilitate communication between economic operators, national market surveillance authorities and consumers, economic operators supplying or distributing UAS intended to be operated in the 'open' category should provide a website address in addition to the postal address.*

VI. *It would be the duty of the manufacturer, who designs and or having knowledge of design and production process, to carry out* ***conformity assessment*** *on routine basis if it intends to operate in 'open category'. Conformity assessment with the requirements will be the sole obligation of manufacturer.*

VII. *Conformity assessment will be a process by which product related requirements needs to be fulfilled and demonstrated. A 'conformity assessment body' must be deployed by the developer of the UAS/UAV to perform conformity assessment activities including calibration, testing, certification, and inspection.*

VIII. *The UAV developer shall also need to prepare* ***technical documentation*** *that must contain all relevant data and details of the means used by the manufacturer to ensure the product compliance with the requirements. The technical documentation shall be drawn up before the product is placed on the market and shall be continuously updated.*

IX. *The technical documentation and correspondence relating to any EU-type examination procedure or the assessment of the quality system of the manufacturer shall be drawn up in an official language of the Member State in which the notified body is established or in a language acceptable to that body.*

X. *In the absence of the above two points, the market surveillance authority may ask the manufacturer or the importer to have a test performed by a body acceptable to the market surveillance authority at the expense of the manufacturer or the importer within a specified period in order to verify compliance of the product with the requirements.*

2.3 Regulatory (EU - 2019/947) requirements under SoEL Framework:

Firstly, it categorizes the UAS operation in two types i.e. 'open' and 'specific or certified'.

- **Open**: Operation will be deemed to be 'open category' only if:
  a) the UAS will have a maximum take-off mass of 25 kgs or less, and
  b) the remote pilot ensures that the unmanned aircraft is kept at a safe distance from people and that it is not flown over assemblies of people, and
  c) the remote pilot always keeps the unmanned aircraft in VLOS except when flying in follow-me mode or when using an unmanned aircraft observer, and
  d) during flight, the unmanned aircraft is maintained within 120 meters from the closest point of the surface of the earth, except when overflying an obstacle, and
  e) during flight, the unmanned aircraft does not carry dangerous goods and does not drop any material, and
  f) the UAS is built privately or fall under specific rules in this regard.[15]

The 'open category' operation of a UAS is further divided in three sub-category and will be discussed latter in the draft. UAS operations in the 'open' category shall not be subject to any prior operational authorization, nor to an operational declaration by the UAS operator before the operation takes place.

- **Specific**: If the UAS/UAV does not fall under 'open category' the operator will need a declaration to be made and it will also require an operational authorization issued by the competent authority in the member state where it is registered. When applying to a competent authority for an operational authorization and the operator shall perform a risk assessment and submit it together with the application, including adequate mitigating measures. The operator must get operational authorization from the competent authority.

- **Certified**: If the UAS/UAV has a characteristic dimension of 3 m or more and is designed to be operated over assemblies of people; or is designed for transporting people; or is designed for the purpose of transporting dangerous goods and requiring a high level of robustness to mitigate the risks for third parties in case of

[15] Art 4 of the regulation 2019/947

accident. UAS operations shall be classified as UAS operations in the 'certified' category where the competent authority considers that the risk of the operation cannot be adequately mitigated without the certification of the UAS and of the UAS operator and, where applicable, without the licensing of the remote pilot. In August 2016, a prototype Commission Regulation on Unmanned Aircraft Operations was published specifically for the "open" and "specific" categories detailed above. Over the course of the following year, consultation regarding this regulation was held by the EASA with an expert group appointed by the agency.

2.3.1To appoint a remote pilot the operator needs to obey category specific rules like:

a) In 'specific category' the pilot must have the ability: to apply operational procedures (normal, contingency and emergency procedures, flight planning, pre-flight and post-flight inspections); ability to manage aeronautical communication; manage the unmanned aircraft flight path and automation; leadership, teamwork and self-management; problem solving and decision-making; situational awareness; workload management; coordination or handover, as applicable.

b) Remote pilot must not be below the 16 years of age.

c) Member state however can reduce the minimum age criteria by 4 years in 'open category' and 2 years in 'specific category'.

d) If a member state lowers the age of remote pilot, the lowered remote pilot age will only be valid in that member state and nowhere else.

2.3.2 Operational Risk Assessment: The operation risk assessment must:

a) describe the characteristics of the UAS operation,

b) propose adequate operational safety objectives,

c) identify the risks of the operation on the ground and in the air,

d) identify a range of possible risk mitigating measures,

e) determine the necessary level of robustness of the selected mitigating measures in such a way that the operation can be conducted safely,

f) explain the nature of the activities performed,

g) convey the complexity of the operation, which planning and execution, personnel competencies, experience and composition, required technical means are planned to conduct the operation,

h) mention the operational environment and geographical area for the intended operation, in particular overflown population, orography, types of airspace, airspace volume where the operation will take place and which airspace volume is

kept as necessary risk buffers, including the operational requirements for geographical zone,

i) describe the competence of the personnel for conducting the operation including their composition, role, responsibilities, training and recent experience.

2.3.3 The manufacture/developer/operator must also identify risks including:

a) the unmitigated ground risk of the operation considering the type of operation and the conditions under which the operation takes place,

b) the unmitigated air risk of the operation taking into account; the exact airspace volume where the operation will take place, extended by a volume of airspace necessary for contingency procedures, the class of the airspace, the impact on other air traffic and air traffic management.

2.3.4 The identification of the possible mitigation measures necessary to meet the proposed target level of safety shall also be ascertained by:

a) containment measures for people on the ground,

b) strategic operational limitations to the UAS operation,

c) strategic mitigation by common flight rules or common airspace structure and services

d) ensuring the capability to cope with possible adverse operating conditions,

e) way of organization factors such as operational and maintenance procedures elaborated by the UAS operator and maintenance procedures compliant with the manufacturer's user manual,

f) level of competency and expertise of the personnel involved in the safety of the flight

g) risk of human error in the application of the operational procedures

h) design features and performance of the UAS,

i) robustness of the proposed mitigating measures shall be assessed in order to determine whether they are commensurate with the safety objectives and risks of the intended operation, particularly to make sure that every stage of the operation is safe.

2.3.5 To register the UAS in a member state, the operator needs to provide the following information:

a) the full name and the date of birth for natural persons and the name and their identification number for legal persons,

b) the address of UAS operators,

c) their email address and telephone number,

d) an insurance policy number for UAS if required by Union or national law,

PART 3: Guiding Principles, from the regulatory Frameworks, to understand the legal duties

3.1 The introduction of UAS Geographical Zones

It would be the duty of a member state to define UAS geographical zone for the safety, security, privacy and environmental protection concerns. In this zone the member state may restrict certain or all UAS operations, request particular conditions for certain or all UAS operations or request a prior operational authorization for certain or all UAS operations. That member state can also subject UAS operations to specified environmental standards and allow access to certain UAS class only. Nonetheless, access may be given only to UAS equipped with certain technical features, in particular remote identification systems or geo awareness systems.

3.2 UAS Operations in the 'open category'

Based on operational limitations, requirements for the remote pilot and technical requirements, 'open' operations of a UAS has been divided in three sub-categories viz-a-viz A1, A2, and A3. Where the UAS operation involves the flight of the unmanned aircraft starting from a natural elevation in the terrain or over terrain with natural elevations, the unmanned aircraft shall be maintained within 120 meters from the closest point of the surface of the earth.[16] The measurement of distances shall be adapted accordingly to the geographical characteristics of the terrain, such as plains, hills, mountains.[17] The measurement of distances shall be adapted accordingly to the geographical characteristics of the terrain, such as plains, hills, mountains.[18] When flying an unmanned aircraft within a horizontal distance of 50 meters from an artificial obstacle taller than 105 meters, the maximum height of the UAS operation may be increased up to 15 meters above the height of the obstacle at the request of the entity responsible for the obstacle.[19]

Below are the requirements for **operation under sub-category A1 (UAS.OPEN.020)**:

a) A UA that is marked as class C1 and complies with the requirements of class C1 and is

[16] Annex, part – A, provision 2 of the regulation 2019/947
[17] Ibid
[18] Ibid
[19] Ibid, provision 3

operated with active and updated direct remote identification and geo-awareness systems, the UAS operation in sub-category A1 must be conducted in such a way that a remote pilot of the unmanned aircraft does not overfly assemblies of people and reasonably expects that no uninvolved person will be overflown. In the event of unexpected overflight of uninvolved persons, the remote pilot shall reduce as much as possible the time during which the unmanned aircraft overflies those persons.

b) The unmanned aircraft has an MTOM, including payload, of less than 250 g and a maximum operating speed of less than 19 m/s, in the case of a privately built UAS and is marked as class C0 and complies with the requirements of that class.

Below are the requirements for **operation under sub-category A2 (UAS.OPEN.030):**

a) The UAS operation must be conducted in such a way that the unmanned aircraft does not overfly uninvolved persons and the UAS operations take place at a safe horizontal distance of at least 30 meters from them; the remote pilot may reduce the horizontal safety distance down to a minimum of 5 meters from uninvolved persons when operating an unmanned aircraft with an active low speed mode function and after evaluation of the situation regarding weather condition, performance of the unmanned aircraft, and segregation of the overflown area.[20]

b) The operation must be fulfilled by a remote pilot who is familiar with the user's manual provided by the manufacturer of the UAS and holds a certificate of remote pilot competency issued by the competent authority or by an entity recognized by the competent authority of the Member State of registration of the UAS operator.

Below are the requirements for **operation under sub-category A3 (UAS.OPEN.040):**

a) the UAS operation must be conducted in an area where the remote pilot reasonably expects that no uninvolved person will be endangered within the range where the unmanned aircraft is flown during the entire time of the UAS operation,

b) the same must be conducted at a safe horizontal distance of at least 150 meters from residential, commercial, industrial or recreational areas,

c) the operation should be performed with an unmanned aircraft that has an MTOM, including payload, of less than 25 kg.

3.3 UAS operation in the ‘specific category’

For operation in this category the unmanned aircraft must be having either maximum characteristic dimension up to 3 meters in VLOS over controlled ground area except over

[20] Ibid

assemblies of people or maximum characteristic dimension up to 1 meter in VLOS except over assemblies of people or maximum characteristic dimension up to 1 meter in BVLOS over sparsely populated areas or maximum characteristic dimension up to 3 meters in BVLOS over controlled ground area.

3.4 CE Marking

The Union regulation 2019/945 defines 'CE marking' as a "a marking by which the manufacturer indicates that the product is in conformity with the applicable requirements set out in Union harmonization legislation providing for its affixing"[21]. The CE marking shall be affixed visibly, legibly and indelibly to the product or to the data plate attached to it. Where that is not possible or not warranted on account of the size of the product, it shall be affixed to the packaging. The UA class identification label shall be affixed visibly, legibly and indelibly to the UA and its packaging and shall be at least 5 mm high. The CE marking and, when applicable, the indication of the sound power level and the UA class identification label shall be affixed before the product is placed on the market.

3.5 Third country UAV operators

The competent authority for the third country UAS operator shall be the competent authority of the first Member State where the UAS operator intends to operate.[22]

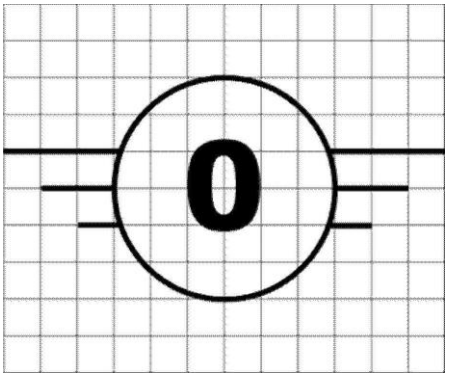
3.6 Specifications for UAS' classes

There are four different classes in which an unmanned aircraft will fall. These are C0, C1, C2, C3, C4, and C5.

I. In C0 class the unmanned aircraft should have an MTOM of less than 250 g, including payload and having a maximum speed in level flight of 19 m/s.[23] In this class maximum attainable height must not be above 120m. It should be safely controllable with regards to stability, maneuverability, and data link performance. It should also be designed and constructed in such a way as to minimize injury to people during operation, sharp edges shall be avoided, unless technically unavoidable under good design and manufacturing practice. If equipped with propellers, it shall be designed in such a way as to limit any injury that may be inflicted by the propeller blades.[24] The unmanned aircraft must be

[21] Art. 3(12) of the regulation 2019/945
[22] Art. 41(2) of the regulation 2019/945
[23] Ibid, Annex
[24] Ibid

designed and constructed in such a way as to minimize injury to people during operation, sharp edges shall be avoided, unless technically unavoidable under good design and manufacturing practice. If equipped with propellers, it shall be designed in such a way as



to limit any injury that may be inflicted by the propeller blades. If equipped with a follow-me mode and when this function is on, be in a range not exceeding 50 m from the remote pilot and make it possible for the remote pilot to regain control of the UA. Unmanned aircraft of this class must show an identification label on it. And for this class here is the label:

Fig 1: C0 class UAS[25]

II. **C1 class indeed require much more attention compare to C0 and includes the following**:

a) Wherein the UAS made up of materials and have performance and physical characteristics such as to ensure that in the event of an impact at terminal velocity with a human head, the energy transmitted to the human head is less than 80 J, or, as an alternative, shall have an MTOM of less than 900 g, including payload;

b) If the UA has a maximum speed in level flight of 19 m/s;

c) If UA has the requisite mechanical strength, including any necessary safety factor, and, where appropriate, stability to withstand any stress to which it is subjected to during use without any breakage or deformation that might interfere with its safe flight;

d) It should be powered by electricity and have a nominal voltage not exceeding 24 V DC or the equivalent AC voltage; its accessible parts shall not exceed 24 V DC or the equivalent AC voltage; internal voltages shall not exceed 24 V DC or the equivalent AC voltage unless it is ensured that the voltage and current combination generated does not lead to any risk or harmful electric shock even

[25] Annex, Part 1, 'requirements for a class C0 Unmanned aircraft system', of the regulation 2019/945

when the UAS is damaged;

e) It contains a unique physical serial number compliant with standard ANSI/CTA-2063 Small Unmanned Aerial Systems Serial Numbers and having direct remote identification and is equipped with geo-awareness system,

f) Unmanned aircraft of this class must show an identification label on it. And for this class here is the label:

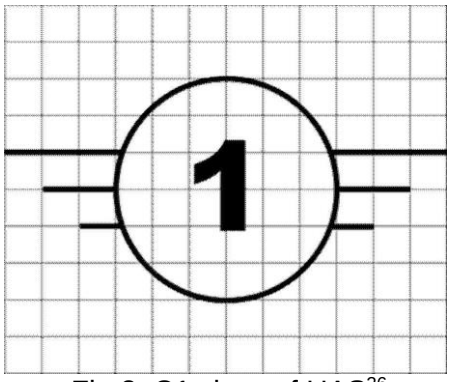


Fig 2: C1 class of UAS[26]

III. **In C2 class of UAS, following is the requirements**:

a) should have an MTOM of less than 4 kg, including payload,

b) in the case of a tethered UA, it should have a tensile length of the tether that is less than 50 m and a mechanical strength that should not less than for heavier-than-air aircraft, 10 times the weight of the aerodyne at maximum mas,

c) such mechanical strength should also not less than for lighter-than-air aircraft, 4 times the force exerted by the combination of the maximum static thrust and the aerodynamic force of the maximum allowed wind speed in flight,

d) unless it is a fixed-wing UA, be equipped with a low-speed mode selectable by the remote pilot and limiting the maximum cruising speed to no more than 3 m/s,

e) the UA should be powered by electricity and have a nominal voltage not exceeding 48 V DC or the equivalent AC voltage; its accessible parts shall not exceed 48 V DC or the equivalent AC voltage; internal voltages shall not exceed 48 V DC or the equivalent AC voltage unless it is ensured that the voltage and current combination generated does not lead to any risk or harmful electric shock even when the UAS is damaged,

[26] Annex, Part 2, 'requirements for a class C1 Unmanned aircraft system', of the regulation 2019/945

f) it should have a unique physical serial number compliant with standard ANSI/CTA-2063 Small Unmanned Aerial Systems Serial Numbers, etc.

g) Unmanned aircraft of this class must show an identification label on it. And for this class here is the label:

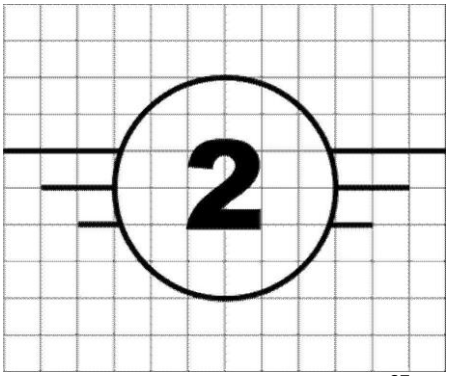


Fig 3: C2 class of UAS[27]

IV. **In C3 class of UAS, following will be the needs**:

a) the UA when carries an MTOM of less than 25 kg, including payload, and have a maximum characteristic dimension of less than 3 m,

b) in the case of a tethered UA, have a tensile length of the tether that is less than 50 m.

c) It must also carry a mechanical strength of no less than for heavier-than-air aircraft, 10 times the weight of the aerodyne at maximum mass and for lighter-than-air aircraft, 4 times the force exerted by the combination of the maximum static thrust and the aerodynamic force of the maximum allowed wind speed in flight,

d) Can be powered with same energy as in class C1,

e) Unmanned aircraft of this class must show an identification label on it. And for this class here is the label:

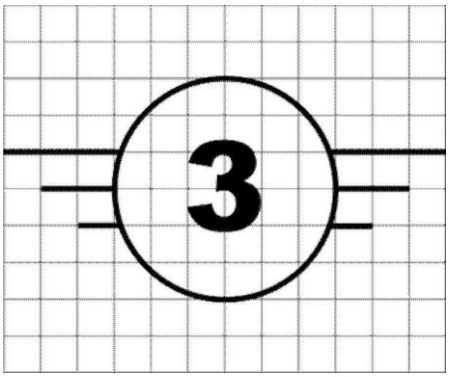


Fig 4: C3 class of UAS[28]

[27] Annex, Part 3, 'requirements for a class C2 Unmanned aircraft system', of the regulation 2019/945
[28] Annex, Part 4, 'requirements for a class C3 Unmanned aircraft system', of the regulation 2019/945

V. **Class C4 requirements**:

a) should have an MTOM of less than 25 kg, including payload,

b) cannot be capable of automatic control modes except for flight stabilization assistance with no direct effect on the trajectory and lost link assistance provided that a pre-determined fixed position of the flight controls in case of lost link is available, etc.

c) Unmanned aircraft of this class must show an identification label on it. And for this class here is the label:

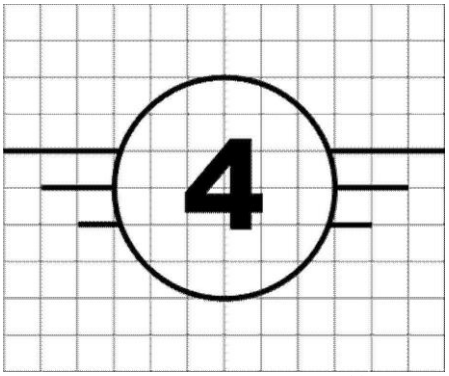


Fig 5: C4 class of UAS[29]

3.7 Regulatory (EU - 2020/639) requirements under SoEL Framework:

I. If UAS operator submits a declaration to the competent authority of the Member State of registration in accordance with point UAS.SPEC.020 for an operation complying with a standard scenario, the UAS operator shall not be required to obtain an operational authorization.

II. If UAS operator holding an LUC with privileges in accordance with point UAS.LUC.060 and intends to conduct an operation in the “specific category” taking place partially or entirely in the airspace of a Member State other than the Member State of registration, the UAS operator shall provide the competent authority of the Member State of intended operation; a copy of the term of approval received in accordance with point UAS.LUC.050, and the location or locations of the intended operation.

3.8 U-Space

U-space is meant as a set of services provided in an airspace volume designated by the Member State to manage a large number of UAS operations in a safe and efficient manner.[30] In other words “U” space can be meant as a management of traffic for unmanned aircraft in

[29] Annex, Part 5, ‘requirements for a class C4 Unmanned aircraft system’, of the regulation 2019/945
[30] European Union Aviation Safety Agency, Opinion No. 01/2020, p - 26

the European Union. Draft to annex Opinion No. 01/2020 suggests that it is a way to respond the growth of UAS operations in the Union airspace and to achieve harmonization over that space. "……The aim of the U-space services is to provide the UAS operators with information about where and how high can they fly, the status of the airspace volume in which they intend to fly, information about other traffic that may be conflicting with their planned trajectory/mission, and weather information such as wind. Furthermore, the aim of the U-space services is to support the UAS operators by processing their flight authorization requests….".[31] A high level regulatory framework on U-space is about to come very soon.

[31] Ibid

PART 4: Significant update in national regulation regarding SoEL compliance of UAVs

After successful publication of ALADDIN project deliverable D3.1, it appears that national legislation has seen less discussion on the SoEL requirements of a UAV than at Union level. The past years have been very fruitful in recognizing the advance needs to regulate the various aspects of UAVs at European level. We have discussed them in the present deliverable at length. On the other hand, the noted regulations, orders, and opinion of this deliverable are applicable from very recently and it is difficult to legislate on the same issues at member state level swiftly. There are numerous aspects where the member states are free to provide more legal and technical requirements then in the present regulations. Research shows that after publication of deliverable D3.1, updates on SoEL frameworks came more from Union side and very less by any member state.

As far as countries like France, Spain, Greece, and Italy are concerned, a first look on their national laws and regulations provides no identification of any significant changes since the publication of the project deliverable D3.1. However, Italy has updated certain provision in its recent 2019 version order of “regulation on remote pilot air vehicles” but the changes made in this order already covered under European regulation and need to point out again. The United Kingdom has, nonetheless, passed a few executive orders and is on the line to adopt a new law for which a bill i.e. “Air Traffic Management and Unmanned Aircraft Bill” has been tabled before the lawmakers. This Bill will give the power to the Police that they can require an unmanned air vehicle to be grounded or to stop. They can require from a person to show the evidence or documents that shows that he has a permission to fly in a flight-restriction zone of a protected aerodrome, and can also compel a remote pilot to provide its competency to do so. Apart from the above, the police under this bill can also require operator registration and can penalize by fine in a few related offences. In case of unlawful use of UAVs, the police under this bill can interfere with the property or wireless telegraphy (or jamming) in order to prevent or detect a future offence.

The UK government has also issued two executive order i.e. Air Navigation amendment Order 2018 and 2019 respectively. The 2018 order is mostly related to the remote pilot and SUA operator of a small unmanned aircraft. The EU regulations, mentioned in this deliverable, have provided enough requirements for being or act as a remote pilot and SUA operator. The 2019 order provides for the prior certification mechanism in order to fly a small UAV, both for the remote pilot and SUA operator. However, both the orders talk about certain terms like “operational hours, protected aerodromes, and flight restriction zones”. This new flight restriction zone will cover aerodrome traffic zone and runway protection zones 1 km wide (or 1.55 kms in case of Heathrow airport) extending 5 kms from

the runway threshold as well as any additional area within 1km of aerodrome boundary.

PART 5: Conclusion

This deliverable provides in legal definitions of number of technical as well operational phrases as is required to be complied by the ALADDIN system. Further, it compiled duties from various regulatory sources whose compliance is necessary in order to operate UAS in the sky space of European Union. Moreover, it also tried to include guiding principles which may benefit our consortium partners either in developing a constituent part of ALADDIN project or to check whether an already developed element of ALADDIN fulfills the present requirement of SoEL framework or not. New developments in the project can be tested upon the discussion made in this deliverable and that may be fruitful in the finalization or penultimate testing of ALADDIN system and its element.

It is not disputed that after the submission and acceptance of project deliverable D3.1 number of legal instruments regarding unmanned aerial system have been come into force. Environmental protection, privacy and data protection, space security, and fair air traffic management are key points that has found a place in these statues. So, to keep our project up to date this deliverable kept every factor into consideration, analyzed them accordingly, and thus submitted for partners' opinion and their compliance as they are intended by the European lawmakers.

PART 6: ANNEXES

6.1 Annex I – List of Acronyms

Acronym	Meaning
DOA	Description of Action
PSO	Project Security Officer
SAB	Security Advisory Board
IA	Impact Assessment
SOEL, SoEL	Social, Ethical and Legal
N/A	Not applicable
WP	Work Package
UAS	Unmanned Aerial System
UA	Unmanned Aircraft
CA	Conformity Assessment
LUC	Light UAS Operator Certificate

6.2 Annex II – List of Partners

Acronym	Partner
DXT	Diginext SRL (France)
CERTH	Centre for Research and Technology Hellas – Information Technologies Institute (Greece)
IDMT	Fraunhofer - Institute for Digital Media Technology (Germany)
CS	Communication & Systèmes (France)
PIAP	Przemysłowy Instytut Automatyki i Pomiarów PIAP (Poland)
IDS	Ingegneria Dei Sistemi S.p.A.(Italy)
SIRC	Sensing & Imaging Research Centre (Poland)
MC2	MC2-Technologies (France)
HGH	La société HGH Systèmes Infrarouges (France)
FADA	Center for Advanced Aerospace Technologies (Spain)
KEMEA	Center for Security Studies (Greece)
ACCI	ACCIONA Construcción (Spain)
MIF / Civipol	Ministère de l'intérieur français / Cicipol (France)
CAST DSTL	UK Home Office - Centre for Applied Science and Technology integrated into Defence Science and Technical Laboratory (as of 1st April 2018)
PJ	Polícia Judiciária (Portugal)
MIPS	Polizia di Stato (Italy)
ADM	Ayuntamiento De Madrid (Spain)
VUB	Vrije Universiteit Brussel (Belgium)