Roadmap for the integration of **civil Remotely-Piloted Aircraft Systems** into the European Aviation System

Final report from the European RPAS Steering Group

JUNE 2013

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Disclaimer:

This report summarises the findings of the European RPAS Steering Group (ERSG). These findings and any timing suggested for regulatory, research and complementary actions have not been adopted or in any way approved by the European Commission and should not be relied upon as a statement of the European Commission.

FOREWORD

This document has been prepared by the "European RPAS Steering Group" (ERSG), a group of stakeholders gathering the main organisations and experts interested in the integration of RPAS into the European aviation system: EASA, EUROCONTROL, EUROCAE, SESAR JU, JARUS, ECAC, EDA, ESA, ASD, UVSI, EREA and ECA.

This group has been set-up by the European Commission in July 2012, as an outcome of the consultation conducted by the Commission between 2009 and 2012 on the future of RPAS in Europe.

This consultation identified the safe integration of RPAS into the European aviation system as the main priority to support the development of this sector in Europe.

The European RPAS Steering Group (ERSG) received the mandate to establish a Roadmap for the safe integration of civil RPAS into the European aviation system, aiming at an initial RPAS integration by 2016. On 20 June 2013 the Roadmap was handed over to the European Commission at the occasion of the Paris Air Show.

The Roadmap identifies all the issues to be addressed and establishes a step-by-step approach to address them. The complete document includes 3 annexes entitled:

- A Regulatory Approach
- A Strategic Research Plan
- A Study on the Societal Impact

The complete version with its 3 annexes is available online at http://ec.europa.eu/enterprise/sectors/aerospace/uas/index_en.htm

By presenting a clear way forward towards the integration of RPAS, the Roadmap is expected to facilitate the decisions to be taken by the different organisations involved, provide transparency and efficiency in the planning of different initiatives and support the coordination of the related activities in Europe.

1.INTRODUCTION

Aviation today provides benefits to the society mainly for transport applications: i.e. it is a typical fall-out of the second industrial revolution. RPAS can add, to the existing aviation activities, digital technologies and massive exploitation of information: in other words bringing aviation in the realm of the third industrial revolution, and so creating highly qualified jobs in the manufacturing sector, in operations and in exploitation of the information acquired through RPAS.

RPAS are themselves multi-systems and involve a great variety of equipment and payloads. Beyond the RPAS manufacturers and system integrators, the RPAS industry also includes a broad supply chain providing a large range of enabling technologies (flight control, communication, propulsion, energy, sensors, telemetry, etc.). Finally, RPAS will generate the emergence of a new service sector. The development of RPAS technologies is likely to create civil spin-offs with significant impact in many sectors.

The consultation conducted by the Commission Services through five public Workshops held from July 2011 to February 2012 (namely the UAS Panel), concluded that the emerging technology of RPAS applied to the development of non-military aviation applications (commercial, non-commercial or governmental non-military) can contribute to boost industrial competitiveness, promote entrepreneurship and create new businesses in order to generate growth and jobs[1].

The UAS panel highlighted that the potential of RPAS is today limited by the fact that RPAS flight authorisations are still issued on a case by case basis through burdensome procedures and are limited to segregated airspace. Moreover, it showed that some Civil Aviation Authorities have already issued (or are about to issue) their national regulations, not necessarily aligned one-another, thus determining a suboptimal situation in Europe. It finally concluded that more efforts are required in Europe to remove the present fragmentation by developing a seamless regulatory framework and enhancing the coordination of various on-going R&D initiatives. One basic principle underpinning the integration of RPAS, perfectly aligned with ICAO principles, is that RPAS have to be treated just as manned aircraft whilst duly considering the specific character of RPAS.

RPAS rules must also be as light as necessary, in order to avoid an unnecessary burden on the emerging industry. Last but not least, RPAS integration requires addressing adequately the societal impact of RPAS applications by covering important elements as liability, insurance, privacy, etc.

Achieving a broad, safe and swift integration of RPA of all sizes into non-segregated airspace requires an enhanced coordination between the numerous actors and the different activities involved (regulatory, R&D and other measures). It is also recognized that achieving a common regulatory framework covering RPA of all sizes and all types of operations would be an ideal end state.

Since not all key technologies required for RPA to fly in non-segregated airspace are today mature and standardized, all experts in the world agree that the insertion of RPA in airspace will be gradual and evolutionary: i.e. initially restricted access under specified conditions and subsequent alleviation of the restrictions as soon as technology, regulation and societal acceptance progress.

This roadmap covers RPA of all types with the exception of model aircrafts (defined as a non-human-carrying aircrafts capable of sustained flight in the atmosphere and exclusively used for recreational, sport or competition activity) and toys. Model aircrafts are subject to specific national regulations, if any. Toys are ruled by Directive 2009/48/EC on the safety of toys and are also excluded. This roadmap does not introduce nor modify any existing distinction between model aircraft and aircraft.

RPAS are under control of a remote pilot-in-command for the entire flight under normal conditions and movements on the ground. However, on-board automation can trigger manoeuvres in the absence of pilot command, in specific non-normal failure conditions: loss of command and control (C2) link and imminent risk of mid-air collision with another aircraft. RPAS belong to the wider family of Unmanned Aircraft Systems (UAS), which also comprises 'autonomous' RPAS (i.e. no human action is necessary after take-off).

Currently ICAO is limiting the scope of its recommendations to RPAS (for use by international civil aviation)[2]. The European roadmap follows the same approach, therefore fully autonomous aircraft will not be considered as part of its scope.

1. The conclusions of the Consultation process have been presented in a Staff Working Document by the European Commission services "Towards a European strategy for the development of civil applications of Remotely Piloted Aircraft Systems (RPAS)"

2. The focus of the ICAO UASSG would be on those SARPs that facilitate integration of RPAS into the ATM system. Not all RPAS can be integrated; therefore determining the capabilities of those that can is paramount. The first such capability is ensured through a pilot-in-command and his/her associated responsibilities. This leads to the conclusion that focus must be on remotely-piloted aircraft, for which there are remote pilots working at remote pilot stations. While other types of unmanned aircraft (UA) (e.g. unmanned free balloons, autonomous aircraft) are recognized, they are not currently part of the work program of the UASSG. See minutes of the 4th ICAO (UASSG) meeting held in South Africa in February 2010.

2. ESSENTIAL REQUIREMENTS CONSIDERED FOR RPAS INTEGRATION

As mentioned above, in line with the ICAO principle expressed in Circular 328, this Roadmap considers RPAS as aircraft. RPAS should be able to operate in airspace, mixed with a variety of manned aircraft (e.g. from gliders to large airliners) under instrument (IFR) or visual (VFR) flight rules adhering to the requirements of the specific airspace in which they are operating.

RPAS have to comply with the aviation rules. In other words, RPAS integration should not impact on the current airspace users (i.e. no degradation of the safety in the air; no disruption of current operations; no modification of ATC procedures; no additional mandatory equipment caused by RPAS). In consequence, the Roadmap considers that RPAS behaviour in operations must be equivalent to manned aviation, including for the air traffic control (ATC). RPAS must comply with the Communication, Navigation and Surveillance requirements applicable to the class of airspace within which they are intended to operate. They must also comply with the trajectory management concept envisaged in SESAR system and with air traffic control rules/procedures. The future aviation system should accommodate flight profiles different from those currently used by CAT, responding to the needs not only of RPAS, but also of aerial work civil aviation traffic and helicopters.

The Roadmap also considers that, as in manned aviation, an RPAS operator will obtain a permission to operate only when essential pre-requisites to safeguard the total aviation safety system are in place. The three following basic pre-requisites are expected to apply to RPAS[3] :

1. RPAS must be approved by a competent authority. According to the International Civil Aviation Organisation (ICAO), they are systems comprising a remotely piloted aircraft (RPA), one or more associated remote pilot station (RPS), the required command and control (C2) links, including those supported by satellite communications, and any other components as specified in the type design of the RPAS.

2. The RPAS operator must hold a valid RPAS operator certificate.

3. The remote pilot must hold a valid licence.

One of the principal objectives of the aviation regulatory framework is to achieve and maintain the highest possible and uniform level of safety. RPAS shall be designed, manufactured, operated and maintained in such a manner that the risk to people on the ground and other airspace users is at an acceptable level.

This level shall be set through essential requirements adopted by the legislator, following substantial consensus by all involved parties during the rulemaking process. When developing the safety requirements for RPAS, the risk must be considered in relation to the different size of RPAS and the type of operation involved.

This is of particular importance for light RPAS, as most industries acting in this sector are SMEs which would be unable to cope with a disproportionate regulatory burden. In addition, disproportionate regulation would considerably reduce the potential offered by RPAS to develop innovative applications and services.

3. These principles are contained in Appendix 4 to Annex 2 to the Chicago Convention (amendment 43), applicable to RPA of any mass. The European Aviation Safety Agency (EASA), through its Notice of Proposed Amendment (NPA) 2012-10 has proposed to transpose them into the EU law, for civil RPAS above 150 kg.

3. ADDRESSING THE CHALLENGES

In order to help address the challenges of RPAS integration in Europe, the Roadmap identifies the actions that should be taken in the areas of regulation, research and the societal impact of RPAS, taking into account the necessary coordination and interdependencies between these three streams of activities. Each of these areas is developed in a specific annex to the Roadmap:

• **Annex 1** provides a Regulatory Work Plan identifying the improvements to the existing regulatory framework considered necessary to allow RPAS operating outside segregated airspace;

• **Annex 2** presents a Strategic R&D Plan identifying the technology enablers and the research activities necessary to achieve a safe integration of RPAS;

• **Annex 3** analyses aspects of the societal impact of RPAS.

The following sections provide an overview of each of these annexes.

3.1. PLANNING THE DEVELOPMENT OF THE REQUIRED SAFETY REGULATION

Achieving the full integration of all types of RPAS requires the development of appropriate regulations in the three essential domains of airworthiness, flight crew licensing and air operations. These are essential pre-requisite safety requirements for insertion into non-segregated airspace.

Given the complexity of this task, the Roadmap proposes to address it through a stepwise approach spanning over 15 years, in synchronization with the ICAO ASBU concept[4] and ensuring a close coordination with R&D plans and the development of the necessary technologies.

A complicating factor for Europe comes from the text of annex 2 to EC Regulation 216/2008, according to which an RPA with a Maximum Take-off Mass (MTOM) above 150 kg falls under the European Aviation Safety Agency (EASA) competency, while RPA with a MTOM below 150 kg are ruled by national Civil Aviation Authorities (CAAs). It is, however, broadly recognized that the 150 kg distinction is not relevant to regulate this aviation segment and that coherence of the regulation below and above 150 kg must be ensured. As a matter of fact, many aspects of RPAS operations are irrelevant to take-off mass and already fall under EASA's remit. The roadmap will address this legislative impediment and propose a viable medium term solution.

In addition, the majority of the emerging civil and commercial applications in Europe are undertaken with light RPAS. Today the development of these applications depends on the capacity of national CAAs to develop the necessary regulation. 15 European countries have developed (and others are developing) some elements of regulation, due to the mounting pressure from civil RPAS operators. Curently, the Czech Republic, France, Ireland, Italy, Sweden, Switzerland and UK, have national rules and regulations in place, and national regulations are being prepared in Belgium, Denmark, The Netherlands, Norway and Spain.

The size, content and granularity of these regulations are however different. Hence the condition for the mutual recognition between European countries has not yet been reached, with a direct impact to cross-border operations. In addition, the experience of the first European operators and services providers clearly shows that solid businesses cases require internationalisation of the activities beyond the national market. A true European Single Market for RPAS based on common rules is necessary to support the development of the European industry.

Taking the above considerations into account, the Regulatory Work Plan proposes the transfer of national competence for RPAS <150 kg to the EU around 2016. This will be achieved in a smooth and progressive way.

In a first step, EASA will produce, as soon as practically possible, RPAS rules within the remit of its current competencies. In parallel, national Civil Aviation Authorities (CAAs) are expected to further develop and/or harmonize their national regulation on the basis of the recommendations and guidance materials developed by JARUS[5] and published by EASA. This will allow CAAs who have not yet developed RPAS regulations, to develop them, based on this guidance material. National CAAs are also invited to actively contribute with their experience and resources to the work of JARUS.

4. http://www.ibac.org/wp-content/uploads/2010/08/ASBU-Working-Doc-full-version_Edition2_V3.pdf

5. JARUS, the Joint Authorities for Rulemaking on Unmanned System, is a group of national Civil Aviation Authorities aiming at drafting harmonised regulations to cover all aspects of RPAS operations. Info at : http://www.jarus-rpas.org/

Once the transfer of competencies for RPAS < 150 kgs to EU will be effective, common EU rules developed by EASA on the basis of the pre-existing harmonized material will replace national rules after an appropriate transition period. The validity of certificates or approvals already issued should be recognized.

The Regulatory Work Plan details all the activities to be performed by the different stakeholders (EASA, EUROCAE, JARUS, CAAs, etc). It takes into consideration all deliverables published and planned on the subject by ICAO, EUROCAE and JARUS.

The Regulatory Work Plan identifies 27 regulatory improvements to be achieved in four distinct timeframes respectively by 2013, 2018, 2023 and 2028, with initial priority on harmonisation of rules to safely open the internal market for RPAS < 150 kg. For each regulatory improvement a detailed planning identifies the necessary deliverables, the responsible organisation, the deadlines and the dependencies.

A number of detailed activities mentioned in the Regulatory Work Plan has already started during 2013, if not earlier. Possible delays occurring in a specific activity do not mean that the sequence of activities will have to change, but that only the suggested dates will have to be adjusted.

3.2. IDENTIFYING THE NECESSARY TECHNOLOGY DEVELOPMENTS

Not all technologies necessary to ensure the safe integration of civil RPAS into the airspace are today available. Technological gaps have been identified in 6 areas:

- Integration into ATM and Airspace environments
- Verification and Validation
- Data communication links incl. spectrum issues
- Detect & Avoid systems and operational procedures
- Security issues
- Operational contingency procedures and systems
- Surface operations incl. take-off and landing

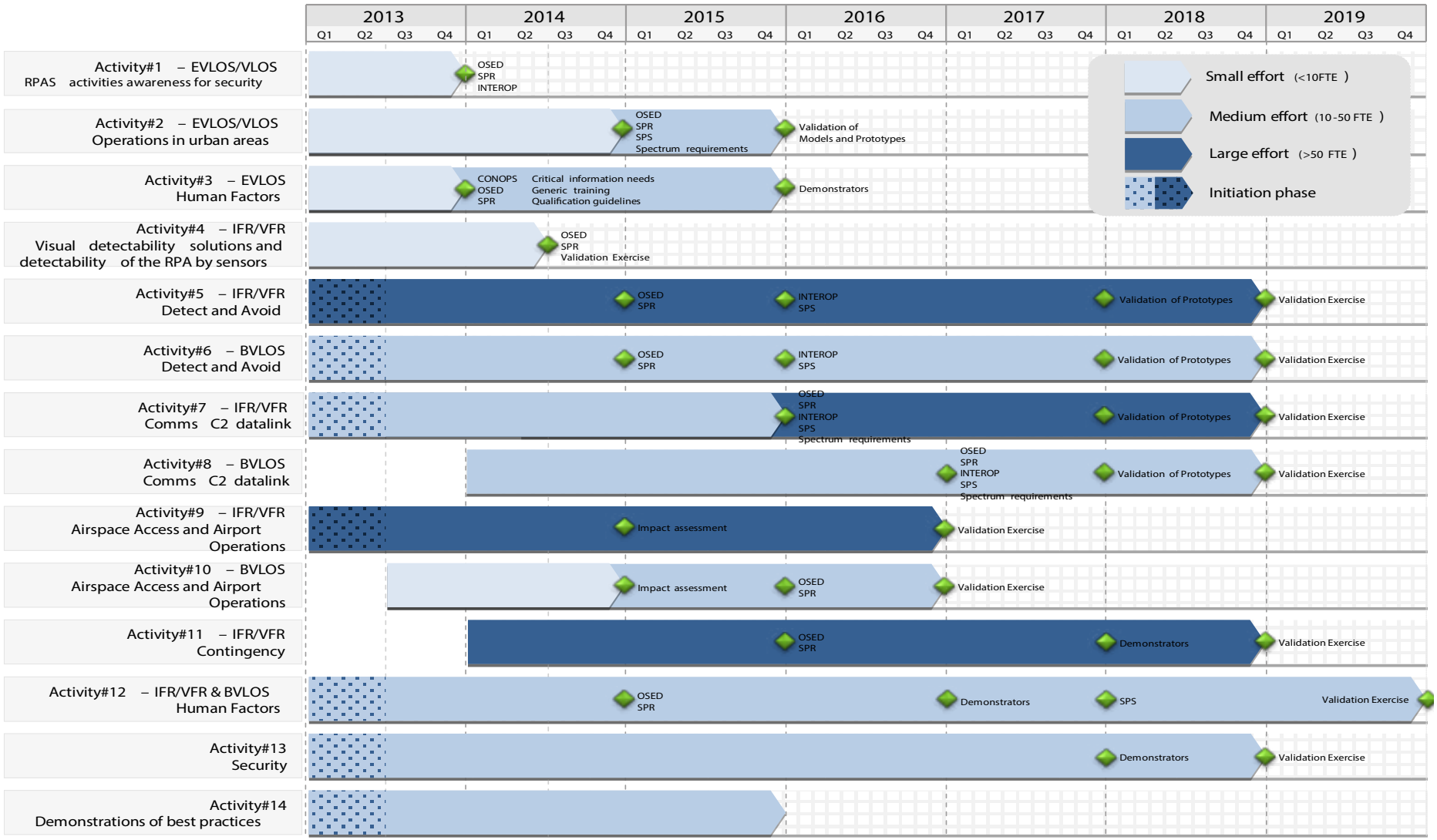
The R&D effort to close the identified operational and technology gaps will include the need to develop operational procedures, technical systems models or prototypes leading to proposed standards in parallel, but clearly linked to the development of regulations and standards for the safe and efficient integration of RPAS. Several, if not most of the topics, are of such complexity that an iterative and stepped approach will be needed.

The description of the R&D effort has been grouped into 14 activities. These activities are described in the Strategic R&D Plan. Within each activity, the foreseen deliverables are described including key milestones, the timeline and an initial estimation of the required types of expertise, as well as the level of resources (FTE´s) needed for its achievement.

The Strategic R&D Plan should support the definition and the coordination of future research programmes for RPAS integration at the EU and national levels. The content of the plan will also need to be integrated into the SESAR Master Plan, which describes the transition of the present ATM environment into a future efficient and harmonised European civil/military ATM environment.

The European RPAS Steering Group suggests that all R&D initiatives supporting the safe integration of civil RPAS into the aviation system need to be addressed under the umbrella of the SESAR programme. This will allow an efficient coordination of all R&D efforts at the European level, and help the coordination with other initiatives of relative to this aviation sector, in particular the military ones, as many of the enabling technologies for RPAS integration are dual-use.

Finally, it should be noted that the R&D activities that have been identified for the purpose of integrating RPAS into the general airspace and ATM environments could as well serve the evolution of operational procedures and technical systems for manned aviation to increase safety, efficiency and improve environmental friendliness.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Activity#2 – EVLOS/VLOS Operations in urban areas
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SPR
SPS
Spectrum requirements
Validation of Models and Prototypes
Activity#3 – EVLOS Human Factors
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OSED
SPR
Critical information needs
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Qualification guidelines
Demonstrators
Activity#4 – IFR/VFR Visual detectability solutions and detectability of the RPA by sensors
OSED
SPR
Validation Exercise
Activity#5 – IFR/VFR Detect and Avoid
OSED
SPR
INTEROP
SPS
Validation of Prototypes
Validation Exercise
Activity#6 – BVLOS Detect and Avoid
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INTEROP
SPS
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Validation Exercise
Activity#7 – IFR/VFR Comms C2 datalink
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INTEROP
SPS
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Validation Exercise
Activity#8 – BVLOS Comms C2 datalink
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Spectrum requirements
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Validation Exercise
Activity#9 – IFR/VFR Airspace Access and Airport Operations
Impact assessment
Validation Exercise
Activity#10 – BVLOS Airspace Access and Airport Operations
Impact assessment
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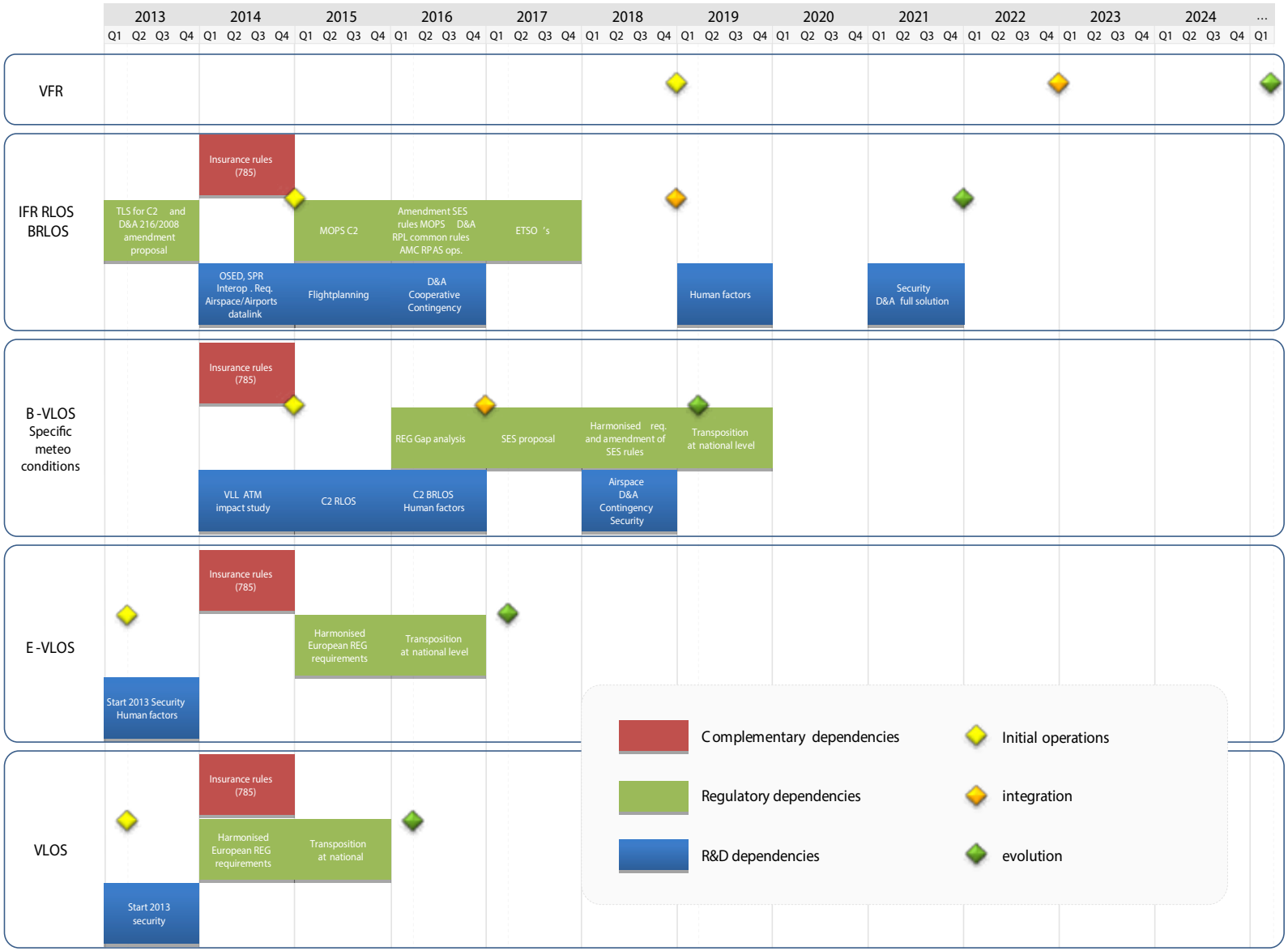
Validation Exercise
Activity#11 – IFR/VFR Contingency
OSED
SPR
Demonstrators
Validation Exercise
Activity#12 – IFR/VFR & BVLOS Human Factors
OSED
SPR
Demonstrators
SPS
Validation Exercise
Activity#13 Security
Demonstrators
Validation Exercise
Activity#14 Demonstrations of best practices
Small effort (<10FTE)
Medium effort (10-50 FTE)
Large effort (>50 FTE)
Initiation phase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ETSO 's
OSED, SPR Interop . Req. Airspace/Airports datalink
Flightplanning
D&A Cooperative Contingency
Human factors
Security D&A full solution
B-VLOS Specific meteo conditions
Insurance rules (785)
REG Gap analysis
SES proposal
Harmonised req. and amendment of SES rules
Transposition at national level
VLL ATM impact study
C2 RLOS
C2 BRLOS Human factors
Airspace D&A Contingency Security
E-VLOS
Insurance rules (785)
Harmonised European REG requirements
Transposition at national level
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VLOS
Insurance rules (785)
Harmonised European REG requirements
Transposition at national
Start 2013 security
Complementary dependencies
Regulatory dependencies
R&D dependencies
Initial operations
integration
evolution

3.3. ANALYSING THE SOCIETAL IMPACT OF RPAS

To truly benefit from the potential offered by RPAS, they have to be integrated safely into the airspace. The consultation process conducted by the European Commission between 2009 and 2012[6] identified a number of other issues to be addressed simultaneously with airspace integration, in order to ensure the societal acceptability of this new technology.

The third annex of the Roadmap provides a broad analysis of the societal impact of RPAS. The main issues that must be addressed to achieve RPAS integration are described in the following sections.

3.3.1. THIRD PARTY LIABILITY AND INSURANCE

Despite the efforts made to ensure the safety of RPAS, accidents may happen and casualties have to be taken into consideration (to other airspace users or third parties on the ground). If this happen, there is a need to adequately compensate for any injury or damage caused by the operation of an RPAS.

This requires that the party liable towards the victims can be clearly identified and that it is able to meet its financial obligations. In other terms, a clear liability regime and an adequate insurance obligation must be in place. The Civil Aviation Authorities, which are responsible for the authorization of RPAS operations, should ensure that the appropriate regulatory framework is in place.

This requires, as a first step, to analyse the existing legal framework for third party liability (damage on the surface and in the air) and the current insurance practices, in order to make recommendations for the development of future RPAS regulations and the necessary related insurance. Sharing experience and good practices between national CAAs should be promoted.

3.3.2. SECURITY

RPAS run the risk of being hijacked and used as weapons against other airspace users or targets on the ground. Terrorists could also use their own RPAS to crash into specific targets or jam or spoof the Global Positioning System signals of other RPAS, causing serious hazards to air safety. This could be achieved by any means like physical attacks (e.g. destruction of parts of the RPAS components, i.e. the Ground Station or the Remote Pilot), electronic attacks (e.g. jamming or spoofing of data links or satellite navigation systems) or cyber-attacks (e.g. hacking through internet web, spoofing, and cyber-attack on specific information networks). The consequences of such cyber-attacks could represent a major challenge for future large scale RPAS operations. The security issues have been carefully addressed in both the regulatory and R&D activities defined by the Roadmap.

3.3.3. PRIVACY AND PROTECTION OF PERSONNEL DATA

Flexibility, discretion, low costs and ever more sophisticated sensors are some of the characteristics that make RPAS unique tools for effective and discrete video surveillance and monitoring missions. The increased use of RPAS resulting from their progressive integration into the airspace may raise serious and unique privacy and data protection concerns in the society and undermine the overall benefits of this innovative technology.

Europe, has a comprehensive framework of privacy and data protection legislations. The Charter for Fundamental Rights of the EU establishes, in particular, the rights to respect private and family life, home and communications (Article 7) and addresses the protection of personal data (Article 8). These rights are implemented through specific EU and national regulations (Article 16 of the Treaty on the Functioning of the European Union, Directive 95/46/EC, national laws on data protection, video surveillance, etc.). RPAS operators must also comply with this regulatory framework. Today, ensuring compliance with these rules is primarily a responsibility of the Member States.

Actions should be taken to ensure full compliance of RPAS operations with the existing privacy and data protection legislation. The utilisation of RPAS may however result in new issues that are not adequately addressed by the current regulation. National Data Protection Authorities (DPA) should further evaluate the impact to privacy determined by different RPAS applications, identify the weaknesses and shortages of the existing regulatory framework and provide clear recommendations on how to adequately address them

6. Hearing on light UAS of 2009, European High Level Conference on Unmanned Aircraft Systems of 2010 and the 5 workshops of the UAS Panel from 2011/2012

(e.g. regulatory improvements, Data Protection Impact Assessment, Code of Conduct, etc.). CAAs should contribute to the enforcement of privacy and data protection regulations by including appropriate provisions in national RPAS regulations on safety, in close collaboration with the national Data Protection Authority, and the European Data Protection Supervisor in the case of EU regulation (e.g. include in the certification of an RPAS operator the provision related to any required approval by national DPA, court, etc.).

4. MILESTONES FOR A PROGRESSIVE INTEGRATION

4.1INTEGRATION OBJECTIVES

The objective of the Roadmap is to support the development of RPAS applications, whilst ensuring the safety, security and privacy of citizens, as well as the safety of other airspace users. In order to take the full benefit of the emerging RPAS technology, the Roadmap proposes an ambitious integration scenario. This scenario provides the basis for the planning of the challenges described above.

The range of possible operations and scenarios in which RPAS can be used is much wider than those of traditional commercial aviation operators. The safe integration of RPAS into non-segregated airspace requires, for each type of operation, the development of the necessary regulation and technologies, as well as, adequate solutions to the societal issues identified. In the same way, the wide range of potential applications relies on an equaly broad variety of operations. For this reason, the proposed integration scenario identifies distinct objectives for different types of operations.

The typical flight profiles of RPAS can comprise a wide range of scenarios, which are categorised in the following types of operations:

1. Very low level (VLL) operations (alias non-standard VFR or IFR operations) below the typical IFR and VFR altitudes for manned aviation: i.e. below 500 ft (~150 m) above ground level; they comprise:

a. Visual line of sight (**VLOS**) in a range not greater than 500 meters from the remote pilot, in which the remote pilot maintains direct unaided visual contact with the remotely piloted aircraft;

b. Extended Visual Line of Sight (**E-VLOS**) where, beyond 500 meters, the pilot is supported by one or more observers, in which the RPS crew maintains direct unaided visual contact with the remotely piloted aircraft;

c. Beyond VLOS **(B-VLOS)** where the operations are also below 500 ft., but beyond visual line of sight requiring additional technological support.

2. RPAS operations in **VFR** or **IFR**, above 500 ft and above minimum flight altitudes; they comprise:

a. IFR (or VFR) operations in radio line-of-sight (RLOS) from the RPS in non-segregated airspace where manned aviation is present. The key capability of 'detect and avoid' (D&A) is required in relation to cooperative and non-cooperative nearby traffic (otherwise specific procedures and restrictions would apply);

b. IFR (or VFR) operations beyond radio line-of-sight (BRLOS) operations, when the RPA can no longer be in direct radio contact with the RPS and therefore a wider range of communication (COM) services (including via satellite) are necessary. In this case, communications would typically be offered by a COM service provider. BRLOS (SATCOM) operations may apply to long range transport of freight, which is expected to follow flight profiles similar to those used by current manned commercial air transport.

An increasing level of complexity corresponds to the different operations identified. Since not all the key technologies required for RPAS to fly in a mixed environment where 'manned' aviation is also present, are today mature and standardized, the insertion of RPAS in airspace must be gradual and evolutionary: i.e. initially restricted access under specified conditions and subsequent alleviation of the restrictions while technology, regulation and societal acceptance would progress.

The Roadmap proposes a phased and gradual introduction of RPAS operations, based on the 5 types of operations identified above, and three subsequent levels of integration. It provides a detailed plan for **initial operations** of RPAS for all types of scenarios. Operations will still be subject to limitations, not only in terms of accessible airspace classes, but also over densely populated areas and in particular in the vicinity of aerodromes. The Roadmap suggests realising further **integration**, partially alleviating any restrictions/limitations. This **evolution** would lead to full integration of RPAS.

1. Initial operations

At this first level of integration, operations are conducted under restrictions defined by the CAAs. In this phase, a significant volume of cross-border operations is not expected. Integration into non-segregated airspace will only be possible under strict conditions.

At the same time, the development of the necessary regulation will have started. When national competences exist, rules will be developed by CAAs with the greatest possible degree of voluntary harmonisation.

2. Integration

In this second integration step, RPAS start conducting their operations according to harmonized regulations, alleviating a number of restictions/limitations.

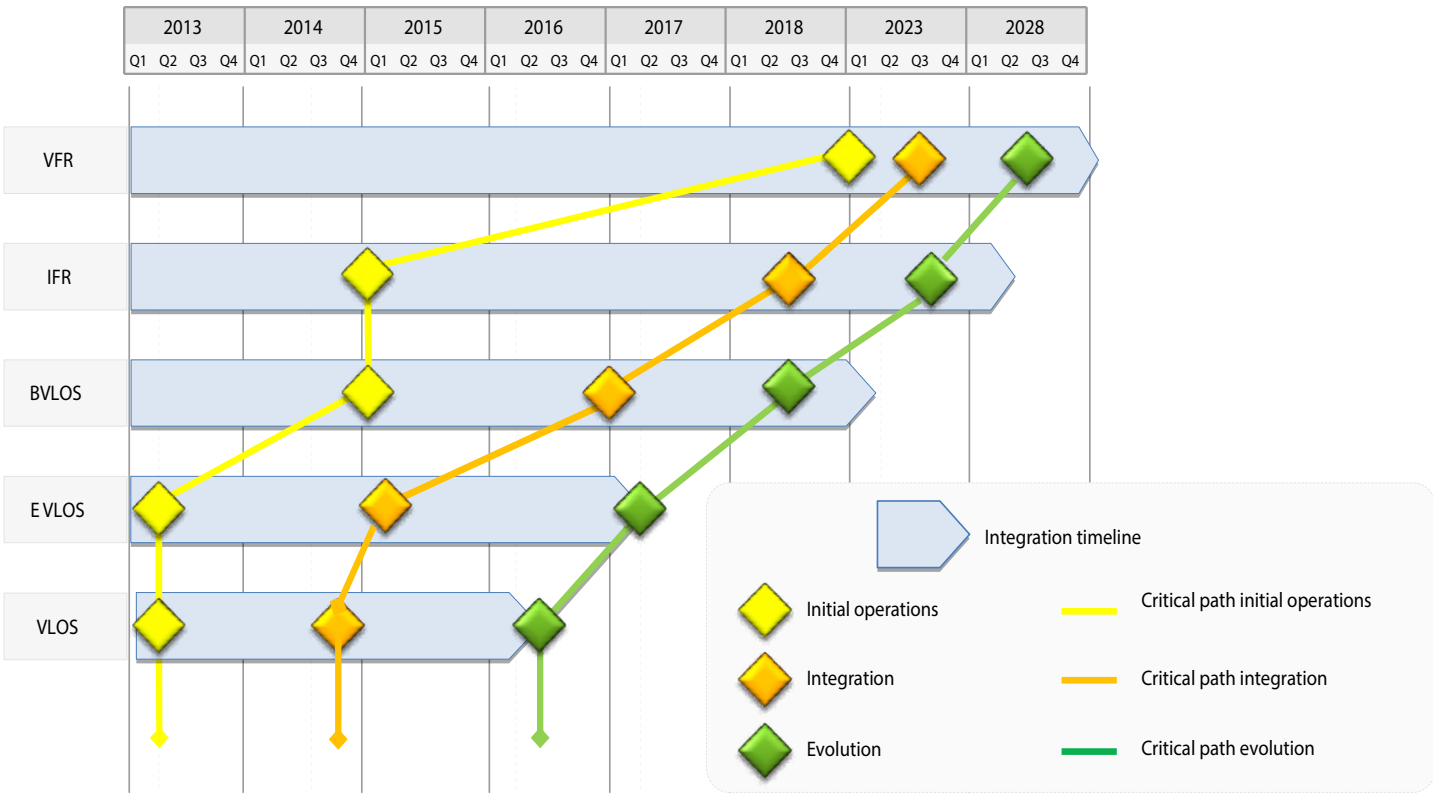
Operation of RPAS < 150 kgs are progressively based on common rules, which would alleviate some of the restrictions to access non-segregated airspace (controlled and non-controlled) and to operate at aerodromes.

Mutual recognition of certificates or licences, based on common rules, facilitate intra EU cross border operations.

Harmonisation on a worldwide scale will however continue to be pursued mainly through ICAO and EASA with contributions of JARUS.

3. Evolution

Further evolution would allow to achieve the ultimate goal, where appropriately certified and approved RPAS, flown by licensed remote pilots and under the legal responsibility of certified RPAS operators will be able to operate cross-border, in non-segregated airspace and over any populated territory. In other words, complete integration into the European and global civil aviation system. However, some restrictions may still apply in congested terminal areas and at aerodromes.



4.2. RESULTING AIRSPACE ACCESS

4.2.1. TIME FRAME 2013

Currently, light RPA (< 150 kg) operations in VLOS and E-VLOS are taking place in a number of European countries, but based on non-mutually recognized or harmonized national rules. Such operations can be conducted in all airspace classes, but always in visual contact of the remote pilot or an observer. Routine operations are normally allowed outside congested areas, to reduce the risk for people on the ground, while alleviating the airworthiness certification processes for RPAS of small mass (e.g. below 25 Kg).

Additional safety requirements and processes apply, when an RPAS operator wishes to fly over densely populated areas. Operations at airports are segregated from other traffic. On a case-by-case basis, IFR operations and demonstrations are carried out under strict conditions and mostly in segregated airspace.

Civil commercial operations are already allowed in some member States under the responsibility of an approved RPAS operator. An initial set of common rules on the principles to access non-segregated airspace has been proposed by EASA through NPA 2012-10.

4.2.2. TIME FRAME 2014-2018

In this timeframe, VLOS and E-VLOS operations of light RPA will have become a daily occurrence, thanks to the progressive harmonisation of national rules. Common rules might be expected towards the end of the period.

These types of RPAS operations could also be conducted over and in congested urban and highly populated areas, when harmonized safety objectives for airworthiness are complied with.

Further progress would be made for IFR access of RPAS in class A to C airspace, thanks to a D&A system capable of interacting at least with corporative targets. However, RPAS operations may not be allowed along the standard arrival and departure routes in major Terminal Airspace, nor at airports mainly used by manned aviation and in busy en route environments.

B-VLOS operations at very low level will be further developed, which could enable initial operation in very sparsely populated areas or over the high seas.

VFR operations could be allowed under certain conditions on a case by case basis and if justifiable business case can be made.

4.2.3. TIME FRAME 2019-2023

In this timeframe, licensed remote pilots, under the responsibility of certified RPAS operators, would be able to operate approved RPAS, comprising an airworthy RPA, under IFR in almost all airspace classes. Common and proportionate rules developed by EASA, progressively apply to civil RPAS, comprising RPA of any mass.

It is expected that, based on the performance requirements, some areas will still be off limit to RPAS, such as major airports and Terminal Airspace and some bottlenecks for all airspace users in Europe.

Initial VFR RPAS operations could start.

VLOS and E-VLOS RPAS operations will be fully integrated in day-to-day civil aviation operations. B-VLOS operations will be further expanded and possibly include operations over populated areas.

As State RPAS flights (Military and governmental non-military) are subject to National regulations, it implies that public EU RPAS flights, which have the nature of state flights, (e.g. by FRONTEX) may have to comply with different sets of National rules.

4.2.4. TIME FRAME 2024-2028

In this timeframe, besides the evolution of technical and operational rules, which will lead to alleviation of residual restrictions, RPAS are expected to operate in most non-segregated airspace, mixed with manned aviation, following the same ATM procedures and ensuring the same level of safety and security. Furthermore, common rules can be envisaged for public EU flights.

Finally, based on common rules, acquired experience and mutual recognition established among the member states, RPAS operators could fly cross border intra EU, based on the “File and Fly” principle, and avoid the administrative burden to apply for special authorization before filing the flight plan.