



Advance Notice of Proposed Amendment 2015-10

Introduction of a regulatory framework for the operation of drones

RMT: n/a — 31.7.2015

EXECUTIVE SUMMARY

The drone industry is diverse, innovative and international. It has an enormous potential for growth with the associated possibility to create jobs. To ensure a safe, secure and environmentally friendly development, and to respect the citizens' legitimate concerns for privacy and data protection, EASA has been tasked by the European Commission — following the Riga Conference¹ and its associated Declaration² — to develop a regulatory framework for drone operations as well as concrete proposals for the regulation of low-risk drone operations.

Both aspects are included in this consultation document together with a chapter containing background information. Following this consultation, which shall end in 25 September 2015, the Agency will submit a technical opinion to the European Commission by the end of 2015.

This A-NPA reflects the principles laid down in the Riga Declaration. It follows a risk- and performance-based approach; it is progressive- and operation-centric. It introduces three categories of operations as already proposed in the published EASA Concept of Operations for Drones³:

- 'Open' category (low risk): safety is ensured through operational limitations, compliance with industry standards, requirements on certain functionalities, and a minimum set of operational rules. Enforcement shall be ensured by the police.
- 'Specific operation' category (medium risk): authorisation by National Aviation Authorities (NAAs), possibly assisted by a Qualified Entity (QE) following a risk assessment performed by the operator. A manual of operations shall list the risk mitigation measures.
- 'Certified' category (higher risk): requirements comparable to manned aviation requirements. Oversight by NAAs (issue of licences and approval of maintenance, operations, training, Air Traffic Management (ATM)/Air Navigation Services (ANS) and aerodrome organisations) and by EASA (design and approval of foreign organisations).

This regulatory framework will encompass European rules for all drones in all weight classes. The amendments to Regulation (EC) No 216/2008 which are under way will reflect the above. This change will be part of the 'aviation package' legislative proposal to be issued in November 2015 by the European Commission.

¹ [The Future of Flying](#). Conference on remotely piloted aircraft systems, Riga, 6 March 2015.

² <http://ec.europa.eu/transport/modes/air/news/doc/2015-03-06-drones/2015-03-06-riga-declaration-drones.pdf>

³ http://easa.europa.eu/system/files/dfu/204696_EASA_concept_drone_brochure_web.pdf

Applicability		Process map	
Affected regulations and decisions:	n/a	Concept Paper:	N/A
Affected stakeholders:	National aviation authorities; aviation industry; general public; manufacturers and operators of drones; Air Navigation Service Providers (ANSPs); airspace users.	Terms of Reference:	N/A
Driver/origin:	Efficiency/proportionality; level playing field; safety; environment; legal requirements	Rulemaking group:	N/A
Reference:	Please refer to Section 5.3 of this A-NPA.	RIA type:	N/A
		Technical consultation during A-NPA drafting:	N/A
		Duration of A-NPA consultation:	8 weeks
		Review group:	No
		Focussed consultation:	No
		Publication date of the Decision:	n/a
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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this A-NPA in line with Regulation (EC) No 216/2008⁴ (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure⁵.

This A-NPA is issued to timely share the proposed concepts and received feedback on the possible contents of the regulatory framework and concrete proposals for low-risk drone operations. The outcome of the A-NPA consultation will be included in a technical opinion, which is planned to be published before the end of 2015.

1.2. The structure of this A-NPA

The objective and context of this A-NPA are presented in Chapter 2.

Chapter 3 contains:

- the general structure of the regulatory framework;
- the proposals for the regulation of low-risk operation of the 'open' category drones;
- the proposals for the regulation of medium-risk operation of the 'specific' category drones;
- best practices for national regulations on drone operations until European Union (EU) regulations are applicable.

1.3. How to comment on this A-NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at <http://hub.easa.europa.eu/crt/>⁶.

The deadline for submission of comments is **25 September 2015**.

Stakeholders are invited to comment in particular on the issues listed in Chapter 3. Key questions to stakeholders and proposals are included in boxes to make them more visible.

1.4. The next steps in the procedure

Following the closure of the A-NPA public consultation period, the Agency will review all comments received. The outcome of the A-NPA public consultation will be considered in the development of the regulatory framework. The Explanatory Note of the Opinion will contain a summary of the main comments and how these have been taken into account in the subsequent rule development process.

⁴ Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1).

⁵ The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision 01-2012 of 13 March 2012 concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure).

⁶ In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).



2. Objective and context of this A-NPA

The objective of this A-NPA is to prepare EU regulations on drone operations and to consult stakeholders on the proposed Concept of Operations for Drones, as well as on key elements of the future Implementing Rules (IRs), especially for low-risk drone operations.

The text of this A-NPA has been developed by the Agency based on the inputs of the Joint Authorities for Regulation of Unmanned Systems (JARUS), and numerous meetings and workshops with the EASA Member States (MSs), drone industry and operators as well as 'manned aviation' stakeholders. The Agency used these opportunities to present and discuss the Concept of Operations for Drones, which is published on its website.

2.1. What is a drone

Main components

An unmanned aircraft system is composed of the drone (the flying component), a command and control station, a data link, and any other components necessary for operations (e.g. take-off ramp). Please note that this is a description and not a regulatory definition.

There are two main groups of drones: those that are remotely piloted and those that are autonomous. An autonomous drone does not allow pilot intervention in the management of the flight⁷.

The description proposed above covers a wide range of aircraft (fixed-wing rotorcraft, tilt rotor, etc.), control links (Wi-Fi, VHF, etc.), and control stations (iPad, marine containers).

Regulatory definition

The Agency considered several terms such as Unmanned Aircraft Systems (UAS), Remotely Piloted Aircraft Systems (RPAS) (a UAS subcategory), but finally followed the general usage of the term 'drone' with the following definition:

'Drone shall mean an aircraft without a human pilot on board, whose flight is controlled either autonomously or under the remote control of a pilot on the ground or in another vehicle.'

This definition has significant consequences. It encompasses the two main groups of command and control systems, thus addressing the fast-growing development of drones operating autonomously. By defining only the drone (the flying part), it allows to treat regulatory-wise the drone and, for example, the command and control station separately thus providing flexibility. Consequently, rules need to address both the case of the drone and the case of the associated parts not attached to it.

⁷ ICAO Doc 10019 AN/507 'Manual on Remotely Piloted Aircraft Systems'.

2.2. Present regulatory context

International Civil Aviation Organization (ICAO)

ICAO is a United Nations specialised agency, created in 1944 upon the signing of the Convention on International Civil Aviation (Chicago Convention). ICAO works with the Convention's 191 Member States and global aviation organizations to develop international Standards and Recommended Practices (SARPS) which States reference when developing their legally-enforceable national civil aviation regulations.

Until recently, ICAO had no SARPS on drones as pilotless aircraft were addressed by Article 8 of the Chicago Convention which by and large prevented the international circulation of drones except when there was an agreement between Contracting States. The first discussions in ICAO started in 2003 and in 2007 ICAO set up the Unmanned Aircraft Systems (UAS) Study Group which developed Circular 328 AN/190 on 'Unmanned Aircraft Systems (UAS)'⁸, an amendment to Annex 2 (Rules of the Air) and to Annex 7 (Aircraft Nationality and Registration Marks). The next step was the development of the RPAS Manual.

ICAO has now set up a Remotely Piloted Aircraft Systems Panel (RPASP), which shall produce draft Standards and Recommended Practices (SARPs) for drones by 2018 focussing its work on international operations. The Agency participates actively in the RPASP.

European Aviation Safety Agency (EASA)

The current Basic Regulation addresses drones. The combination of its Article 2 and Annex II results in the scope of EU regulations being limited to drones with an MTOM above 150 kg that are not used for military, customs, police, firefighting, search and rescue, and experimental work. This means that the vast majority of drone development today is regulated by national aviation legislation.

Although safety is ensured through dedicated legislation in many EASA MSs, the current situation is not fully satisfactory for two reasons:

1. EASA MSs' legislation is not harmonised and there is no obligation on mutual recognition of certificates. This means that a drone operator authorised in one Member State must obtain another authorisation in another Member State if wishing to operate there.
2. The current legislation in EU is based on the assumption that small drones are operating locally, which is largely true today. However, there are small drones that can fly very high or can operate at long distances from their base. Operations of such drones would affect several EASA MSs and, therefore, would need multiple authorisations. In addition, such drones are likely to be complex as they possess a significant level of autonomy and some EASA MSs may not have the competence to address this complexity and the cross border impact.

The Agency is working on two applications for certification: one for a drone with fixed wing, and one for a helicopter drone. The certification is using a policy⁹ that was adopted by the Agency in 2009. This policy establishes the general principles for type certification (including environmental protection) of drones.

⁸ http://www.icao.int/Meetings/UAS/Documents/Circular%20328_en.pdf

⁹ E.Y013-01 available at <http://easa.europa.eu/document-library/policy-statements/ey013-01>.



EASA Member States (MSs)

To date, 18 EASA MSs have adopted or are going to adopt regulations on small drones. There are some common principles, like categorisation based on mass criteria, operational limitations like visual line of sight and altitude limitations. Annex I gives an overview of the current situation. The national regulations are not harmonised. Categorisation, and especially the 'open' category, is the subject of heated discussions. Some challenging issues are: airspace use, toys and consumer products, occurrence reporting, enforcement of the regulations, privacy, etc.. A lesson learned is that prescriptive rules create difficulties due to the fact that the technical area is developing too fast. EASA MSs that have published rules early are now revising them to simplify their systems, and some move towards a more risk-based approach.

As a consequence of such debates, a regulatory framework at EU level including detailed guidance or regulations was strongly requested.

2.3. Industrial context and trends

Main characteristics

Innovative and diverse: the drone industry is extremely innovative and the risk that regulations are superseded by new developments will be always present. Innovation is both in terms of type of machines and type of operations. The range of type of machines is quite large ranging from microdrones to machines of an MTOM of 16 000 kg. Drone configuration can be fixed wing, rotorcraft, tilt rotor, or airship. Electrical propulsion is used by a significant number of drones. While up to now drones were mainly piloted remotely, the development of autonomous and cooperative drones is progressing well.

The types of operations are also diverse: precision agriculture, aerial photography, surveillance, inspections of buildings, inspection of railways, pre-flight aircraft inspection, etc. In some cases drones are replacing manned aircraft while in others they are creating a new market (e.g. building inspections).

Small and Medium-sized Enterprises (SMEs): another characteristic of the drone industry is the importance of SMEs in the drone business. This is the case for both manufacturers and operators. These SMEs may not be too familiar with aviation legislation, and awareness campaigns might be an appropriate way to reach out this sector.

Huge number of drones: the production rate of small drones is simply unprecedented in aviation. In 2014, the two main manufacturers of small drones have produced around 1 000 000 drones and they plan to produce the double in 2015. Such numbers go beyond the current NAA or Agency certification capacity.

Trends

Most analyses indicate a growth of the drone civil market including an increase of its share compared to the military market. However, the military market will remain largely predominant. Market development is dependent on three main elements: firstly, the implementation of a regulatory framework that will allow for safe, secure and environmentally friendly drone operations and at the same time respect the citizens' concerns about privacy and data protection; secondly that technologies



are mature enough to ensure full integration in non-segregated airspace; and thirdly the availability of the necessary spectrum frequencies for the drones operations (see Annex III). Today, drone activities are essentially what is called aerial work in manned aviation. However, several companies and institutions are looking at transportation of goods. It started with the transportation of medications in disaster areas where access through roads was not possible. Trials have already been conducted in France and Germany (and will soon be conducted in Switzerland) for the delivery of goods in remote areas of the countries (e.g. islands, mountains). There is currently serious work under way to be able to deliver goods in urban environments — an operation which will pose significant challenges (e.g. traffic management between drones of the same or other companies). In the intended regulatory framework, such urban operations will be treated as ‘specific operations’ and the applicable requirements shall be based on the results of a risk assessment. Apart from delivering goods, a soldier was evacuated recently using an unmanned rotorcraft; a case which could be the first step towards transportation of persons. There could also be synergies with personal air vehicles where drone technologies could be used to design fully automated aircraft where persons on board would be passengers that would simply provide the itinerary or define the destination. There will be a long way towards transportation of persons, but it should be kept in mind when drafting the regulatory framework.

Other trends could be: miniaturisation following the general development of electronics; continuous development of autonomous drones; swarms of drones cooperating to ensure a mission.

2.4. Societal context

Support at political level: the European Commission, the European Parliament and the Council of the European Union are calling for the safe, secure and environmentally friendly development of the drone industry as it will bring about employment, growth and technological development, while respecting at the same time the public concerns about privacy and data protection. This support has been expressed in the Declaration which was adopted following a Summit organised during the Latvian Presidency in Riga in early March 2015.

The following principles were identified as the main drivers for a European regulatory framework

- Drones need to be treated as new types of aircraft with proportionate rules based on the risk of each operation.
- EU rules for the safe provision of drone services need to be developed now.
- Technologies and standards need to be developed for the full integration of drones in the EU airspace.
- Public acceptance is key to the growth of drone services.
- The operator of a drone is responsible for its use.

These principles have been used as guiding lines for the work of the Agency.



Public acceptance

The public attitude towards drones may be a mix of attraction to this new technology with multiple applications and concerns about safety, security and privacy.

Attractive technology: Until recently, the public was quite favourable to the development of drones as it is an innovative industry. However, following some incidents where drones came too close to manned aircraft or overflew sensitive areas, the attitude of the public is changing. This change of attitude is reflected in more and more critical articles in the media.

Safety, security and privacy concerns: Safety concerns are in particular expressed by pilots of manned aircraft (commercial¹⁰, General Aviation and military) who highlight that flying very low does not mean that the risk of collision with other manned aircraft is zero. They argue that there is a quite significant traffic below an altitude of about 150 m: military, police, emergency helicopters, recreational aviation. Their concerns are acknowledged and the following measures can alleviate them: drones give the right of way to all other aircraft, minimum level of competence for the drone pilot, awareness campaigns for pilots and operators, operations in Visual Line of Sight (VLOS). The objective of safety regulations for drones should be to minimise the frequency of occurrence of the following events:

- mid-air collision with manned aircraft;
- harm to people; and
- damage to property, in particular to critical and sensitive infrastructure.

Chapter 3 will further elaborate on how to minimise occurrence of such events.

There is limited data on drone civil operations available yet, but lessons may be learned from the military domain. The Agency conducted such a study in 2013 and found that loss of link and human factors issues were the two main causes of accidents. Exchange of information between civil and military will be important in order to improve safety.

A practical system for occurrence reporting would be a key element to improve safety, as analysis of occurrences (like for manned aircraft) will allow to identify safety issues and take corrective measures.

Finally, it should be kept in mind that using drones to inspect buildings or power lines could also improve safety because the consequences of hitting the building or the power line are likely to be material only compared to a manned aircraft where injuries to persons are to be expected.

Security concerns have increased following flights over restricted areas. There were some highly publicised overflights of nuclear power plants in France. Also overflights of or landings on residences of head of States in France, Japan and the US have alerted the public. A lot of research is ongoing or is planned in the EASA MSs and also in the Commission's Joint Research Centre on how to detect, identify and possibly intercept the intruding drone. The Agency is anticipating that National Authorities in charge of security will participate in the consultation.

Privacy concerns have also increased because drones bring a new dimension to it. They are indeed quieter, less visible than manned aircraft, can avoid obstacles and can go above walls. Therefore, they may be able to gather much more data and transmit them in real time.

¹⁰ ECA Position Paper — The RPAS 'Open Category' in EASA's Concept of Operations for Drones
(https://www.eurocockpit.be/sites/default/files/eca_position_paper_concept_of_operations_open_category_for_drones_pp_15_0723_f.pdf).



The opinions of Art. 29 WG and of the EDPS highlight the importance of the privacy/data protection issues in the case of drones, and notably the new dimension brought by drones, and provide useful recommendations. Annex II provides a summary.

Security and privacy concerns may not all be resolved through the actions of the Agency, but such actions can help address them. The proposed essential requirements to be included in the revised Basic Regulation will give the possibility to introduce geofencing and identification should other legislation on privacy or security require so.

Addressing properly these safety, security and privacy concerns is key to the successful development of the drone industry.

2.5. Related activities

Aviation package and specific impact assessment for drones

In parallel to this A-NPA, the Agency is assisting the EC in the drafting of the amendments to the Basic Regulation, which are the result of the EASA Opinion 01/2015¹¹ as well as of the implementation and development of the Basic Regulation during the last 10 years. This aviation package also includes drones. During the public consultation of A-NPA 2014-12¹², that led to said Opinion, a clear majority suggested that the 150 kg threshold that separates EU competence from the MSs should disappear. All drones, including the small ones, would then be within the EU competence. The Agency proposed that the modification concerning drones should essentially take the form of the introduction of a definition for drones and of a specific article complemented by essential requirements. The proposed article and essential requirements reflect the regulatory framework proposed in this A-NPA. The Commission plans to submit the legislative proposal on the aviation package to the Parliament and the Council before the end of 2015.

Cooperation to ensure harmonisation

ICAO

The Agency considers it important to achieve international harmonisation on drones, especially as there are approximately 60 countries worldwide that are designing and producing drones — compared to the considerably smaller number of countries designing and producing manned aircraft.

As described in the paragraph on the ICAO activities, the Agency is participating in the Panel and is contributing to its working groups.

JARUS

JARUS is a cooperation of 40 CAAs worldwide and its aim is to develop harmonised rules for drones. JARUS has been recognised by the European Commission and the European Parliament as the ‘working engine’ to develop the necessary rules for drones. This will ensure harmonisation worldwide and JARUS is expected to contribute to the ICAO work. The Agency is, therefore, fully engaged in JARUS and provides significant resources.

¹¹ <http://www.easa.europa.eu/document-library/opinions/opinion-012015>

¹² <http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2014-12>



European RPAS Steering Group

The role of this Group is to better organise and coordinate the efforts in the EU regarding the implementation of the regulatory framework for drones and the overall RPAS integration. Its current membership comprises the European Commission (Directorate-General for Mobility and Transport (DG MOVE) and Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)), EUROCONTROL, the Agency, JARUS, SESAR¹³ Joint Undertaking (SJU), the European Defence Agency (EDA), the European Organisation for Civil Aviation Equipment (EUROCAE), the Aerospace and Defence Industries Association of Europe (ASD), and UVS-International (Unmanned Vehicle Systems-International). The Agency is committed to contribute effectively to the work of the Steering Group.

Elaboration of a rulemaking programme

Priorities: the first priority is IRs for the 'open' and 'specific' categories. The IRs will be prepared so that they could be adopted shortly after the Basic Regulation is amended to reflect the new EASA competence.

The work on the 'certified' category could start as of 2016 as this category is already within the Agency's scope; however, the full integration in non-segregated airspace may take some more years because the main technologies are not yet fully mature for implementation.

Planning and prioritisation of the activities of standardisation bodies

Standardisation bodies are organisations developing industry standards. This activity is planned for October–November 2015, following the closure of the public consultation of this A-NPA in September 2015. Its purpose is to ensure, with the cooperation of the standardisation bodies, that the necessary standards to support the regulatory framework are drafted. The outcome would be a standardisation road map for drones. Such a road map already exists but needs to be adapted to the proposed regulatory framework with its three categories (Example of standards could be those related to the product safety legislation)

¹³ SESAR: Single European Sky ATM Research.



Research

The Agency is contributing to the research activities of EDA, the European Space Agency (ESA) and the SJU. Beyond these activities, the Agency has identified the following ones and is discussing with other organisations how to best finance them:

- Propose acceptable levels of safety especially for the operation of small drones in urban areas, above crowds and for low-level operations beyond visual line of sight,
- Develop a tool for registration, identification and (geo)fencing of certain small drone operations.
- Identify options for the environmental regulation of small drones.
- Define a concept for traffic management of all type of drone operations including low level airspace design, traffic rule, security of landing zones, the need for human to be in the loop, interception rules and techniques, and devices for electronic conspicuity and autonomous operations. An outlook for an ATM concept is presented in Annex IV.
- Electric propulsion (not only an issue for drones, but still small drones are making extensive use of electric propulsion).

Communication plan

Due to the complexity of the drone issue and its multiple dimensions, the considerable number of organisations involved in drones activities in the EU and worldwide and the rapid evolution of the drone industry, it is necessary to develop a communication plan to explain the concepts, the intentions and the planning. This should be done in parallel with the development of the regulatory framework and the associated IRs. The communication plan should address the public, the stakeholders, international organisations, EU/EASA MSs and EU institutions. This plan should include a high-level event. Such a plan should be developed before the end of 2015.



3. Proposals for the regulatory framework for drones and the regulation of drone categories

3.1. Principles and general framework

General

This regulatory framework proposes that all drones be regulated at EU level. The arbitrary limit of 150 kg would therefore disappear. The reason for this scope is that operators have asked for such harmonisation. Currently, they have to obtain individual authorisations in each MS. Regulating drones at EU level does not mean that the Agency would be in charge of the implementation: EASA MSs, as described below, would continue to be in charge of all implementation tasks, except when the rules require the certification of drones by the Agency. As for manned aircraft, the Agency would keep its role in rulemaking activities and would ensure standardised implementation of the EU rules by the EASA MSs.

Operation-centric

This regulatory framework is based on the risk posed by drone operations. Another choice would have been the classic approach used today for manned aircraft. However, in most cases there is nobody on board a drone and the consequences of loss of control are highly dependent on the operating environment. A crash in the Antarctic would lead only to the loss of the drone whereas the same event may have different consequences if occurred in a major city or close to an aerodrome. Therefore, an operation-centric regulatory framework seems more appropriate to the reality of drone operations.

Risk-based

The following safety risks must be addressed:

- mid-air collision with manned aircraft;
- harm to people; and
- damage to property, in particular to critical and sensitive infrastructure.

The level of risk depends on: the energy and the complexity of the drone (kinetic and potential energy); the population density of the overflown area; and the design of the airspace and density of traffic.

The proposed regulatory framework applies to both commercial and non-commercial operations as the identical drone might be used for both commercial and non-commercial activities with the same risk to uninvolved parties.

Proposal 1: It is proposed to regulate commercial and non-commercial operations as the identical drone might be used for both commercial and non-commercial activities with the same risk to uninvolved parties.

This approach affects mostly model aircraft practitioners and the 'open' category drones. Model aircraft flying has been practised for decades with a good safety record because it is a well-structured activity. The intention is to develop rules for the 'open' category that will not affect model aircraft flying. One significant element in this respect is that it will be required that the pilot of a drone, even in the 'open' category, has as a minimum knowledge of aviation regulations. This needs to be further elaborated, but simple education through web-training or similar to the one provided by model associations could be acceptable.

Proportionate

Proportionality is a key feature of the regulatory framework. The requirements associated with each category are tailored to the risk associated to each category. In particular, the need or not for approvals or certificates by the NAAs has been carefully evaluated when defining the appropriate limitations, and in particular for the 'open' category.

Progressive

The categories have been established with the idea that a start-up company would start to operate in the 'open' category with small and simple drones in operating conditions that pose very low risk, e.g. VLOS and very low-altitude operations, and as its experience increases to move more progressively to the 'specific' and 'certified' category with more complex operations, e.g. heavier and more complex drones and Beyond Visual Line of Sight (BVLOS) operations.

Performance-based

Performance-based regulation is a regulatory approach that focusses on desired, measurable outcomes. It can be objective-based, process-based or performance-standard-based.

- Objective-based rule: only the objective is defined, not the means to achieve it.
- Process-based rule: specific organisational requirements or processes are prescribed as enablers of a desired outcome.
- Performance-standard-based rule: a set of performance metrics (quantitative and qualitative) is defined and based on it, it is determined whether a system is operating according to expectations.

The Agency proposes to use a combination of the first two approaches for the drones (i.e. require certain functionalities, e.g. identification, or require a risk assessment to be performed). As explained in 2.5., the rules for the drones will be included in the Basic Regulation (first level: principles and essential requirements) and in the IRs (second level). These two levels are binding 'hard law'. Principles and essential requirements are adopted by the legislator (Council and Parliament) based on a legislative proposal from the Commission; IRs are adopted by the Commission based on an Agency Opinion and after consultation of the EASA MSs.

The third level, or 'soft law', are Acceptable Means of Compliance (AMC) and Guidance Material (GM). They are adopted by the Agency, are non-binding, and provide either one means but not the only one to comply with the rule or general explanations. Certification Specifications (CSs) are another example of 'soft law'.



The current trend is to have this 'soft law' developed by standardisation bodies. These industry standards could be used, for example, to:

- identify and provide the means to comply with the Certification Specifications for new technologies to ensure that safety objectives are met; or
- provide methods to perform risk assessments.

The Rulemaking Procedure applied by the Agency in order to issue opinions and to adopt 'soft law' can be found on the Agency's website at: <http://easa.europa.eu/system/files/dfu/EASA%20MB%20Decision%2001-2012%20Revised%20MB%20Decision%20RM%20Process%20.pdf>.

Categories

Although the risk of the whole population of drones can be represented as a continuum, in order to be practical, it has been proposed to set up three categories of operations from low to high risk. These three categories are called 'open', 'specific' and 'certified'. Like any categorisation, there is some form of arbitrariness; yet, particular effort has been made to justify the limit of each category. For the 'open' category, the experience of EASA MSs has been taken into account.



Picture 1: EASA Concept of operations for drones

Proposal 2:

Three categories will be established for the operation of drones:

- 'Open' category (low risk): safety is ensured through operations limitations, compliance with industry standards, and the requirement to have certain functionalities and a minimum set of operational rules. Enforcement mainly by the police.
- 'Specific category' (medium risk): authorisation by an NAA possibly assisted by a Qualified Entity (QE) following a risk assessment performed by the operator.
A manual of operations lists the risk mitigation measures.
- 'Certified' category (higher risk): requirements comparable to those for manned aviation. Oversight by NAA (issue of licences and approval of maintenance, operations, training, ATM/ANS and aerodromes organisations) and by the Agency (design and approval of foreign organisations).

Regulatory framework

It is proposed to develop dedicated IRs for the regulation of the 'open' and 'specific' category of drones.

The new rule should contain an annex covering all aspects of drone operation for these categories including airworthiness aspects, operational and organisational requirements, and related processes. It will not be applicable for the certification and continuing airworthiness of drones and related products and parts, and of design, production and maintenance organisations used in higher-risk operations or where such approvals and releases are requested voluntarily by applicants.

Security and privacy

These two issues are major concerns of the public. Security and privacy concerns may not all be resolved by EU legislation, but Agency actions can help address them. The proposed essential requirements for drones to be included in the revised Basic Regulation will give the possibility to introduce geofencing and identification. Such approach is supported by the fact that geofencing and identification will also contribute to safety.

Security is not limited to overflight of sensitive areas. Cybersecurity is also an issue for drones. The essential requirements for the intended general product safety directive and standards for drones in the certified category should consider the issue of cyber security

Enforcement

Over time, manned aviation has developed its own oversight and law enforcement mechanisms, driven especially by the NAAs. Drone operations will pose additional enforcement challenges to authorities. Experience needs to be gained as to how existing rules on safety, data protection and privacy, security and environmental protection, or liability/insurance shall be implemented. Guidelines are often not available, and those who are engaged in drone operations have low awareness of the applicable rules.

Rules have to be enforced by local forces. As the police and other law enforcement agencies are expected to play a key role in the oversight of the 'open' category, they should be provided with an information manual and a training syllabus after coordination with the relevant national authorities.

Proposal 3: EASA MS have to designate the responsible authorities for the enforcement of the regulations. It is proposed not to include the oversight of the 'open' and 'specific' categories into the EU aviation system. This will provide the EASA MSs with the required flexibility at local level, thus not being subject to EASA oversight ('EASA Standardisation').



Environmental protection

With regard to the environment, nuisance from noise and emissions should be mitigated. Noise is a complex issue that requires a range of mitigation measures. Although the current framework foresees regulatory limitations on noise only for drones subject to type certification ('certified' category), noise even from drones in the 'open' category should be abated as much as possible. This can be achieved by installing the latest noise-reducing technology to limit noise at source and by operating the drone in a considerate way, striving to minimise nuisance to other persons as much as possible. Operating restrictions defined at local level could be another measure including, e.g., flight altitude limitations, no-drone zones or curfews).

Use of QEs

In order to ensure availability of resources, QEs should be able to work on behalf of the Agency or the NAAs as regards the issuing of certificates.

Proposal 4: QEs will be approved and audited by the NAAs or the Agency to ensure their adherence to common rules.
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3.2. Low-risk operations — ‘open’ category

The ‘open’ category operation is low-risk and simple-drone operation, where the risk to third parties on the ground and to other airspace users is mitigated through operational limitations. The ‘open’ category drones should not require an authorisation by an NAA for the flight, but should stay instead within defined limitations for the operation (e.g. safe distance from aerodromes, from persons). This category of operations would only be subject to a minimal aviation regulatory system, focussing mainly on defining the limits of such a category of operations. No certification, approval, licence or other equivalent document is required in relation to the operation of drones, except in the case of more complex, low-risk operations where adequate knowledge and skills need to be demonstrated.

Proposal 5: ‘Open’ category operation is any operation with small drones under direct visual line of sight with an MTOM of less than 25 kg operated within safe distance from persons on the ground and separated from other airspace users.

The upper limit of 25 kg for the mass of drones in the ‘open’ category is based on current thresholds in EASA MSs for the regulation of small drones or models. In theory, depending on the density of population, heavier drones would not significantly increase the risk, but a practical limit needs to be established.

Even very small drones can quickly fly high enough, thus posing a severe risk to aviation safety. As mentioned in the Riga Declaration: ‘Drone accidents will happen’. The challenge is now to find the balance and means to ensure appropriate safety while not hampering the market considering that a zero risk approach is not practical.

The classic assumption is that only the traditional certification and licensing processes would mitigate such hazards and keep the aviation system safe. Even if certification and licensing conditions were kept as ‘light’ as possible, the traditional manned aviation approach is likely to produce a too heavy approach to drones, especially to the small-drone market. The level of rigour applied to safety management in manned aviation (involving strict controls of aircraft design, production and maintenance; pilots; operations with (in most cases) ex ante licensing and continuous monitoring) is disproportionate to the risk posed by many drone operations. Overburdening low-risk operations lead to a climate of indifference or to illegal operations adversely affecting safety.

In the drone sector a typical operator does not have an aviation background, even commercial operators don’t consider themselves as aircraft operators and they want to use a tool which is in many cases much safer than, e.g., climbing on oil rigs for inspections.

Technology

The Agency proposes an overall flexible safety framework that sets concrete safety performance targets so that industry can come up to the appropriate standards. The rules are sufficiently flexible to cater for divergence in risks that drone operations entail.

The affordable and easy operation of drones gives the possibility to almost everybody to become an airspace user, but it cannot be assumed that all actors have a strong aviation culture and that are aware of the safety consequences their actions have. Embedded safety features, identification means



and technologies can improve compliance with regulations and enable enforcement in practice and can mitigate the lack of basic pilot competence.

Proposal 6: To prevent unintended flight outside safe areas and to increase compliance to applicable regulations, it is proposed to mandate geofencing and identification for certain drones and operation areas.

- Geofencing means automatic limitation of the airspace a drone can enter. In principle, the feature is already embedded in some commercially available drones. There are relatively simple two-dimensional (2D) solutions possible requiring some manual update, and in the future the principle might be applicable in a dynamic way to support operators and pilots in complying with temporarily limitations or even local needs, e.g. to create a safe bubble around a rescue helicopter when landing at the accident site.
- ‘I-Drone’ means the capability to react on interrogations from enforcement entities and provide information about the drone, the operator and the operation. Such systems might use technologies like cell-phone networks or Radio-Frequency Identification (RFID). The principle could be combined with a registration similar to the process of registering SIM cards for mobile phones or could be publicly accessible, for example, through a web-based system or direct communication of the drone with smartphones using Wi-Fi. A portable chip providing that function independently could be attached to the drone in operation.

Proposal 7: To ensure safety, environmental protection, and security and privacy, the competent authorities can define ‘no-drone zones’ where no operation is allowed without authority approval, and ‘limited-drone zones’ where drones must provide a function to enable easy identification and automatic limitation of the airspace they can enter and should have a limited mass.

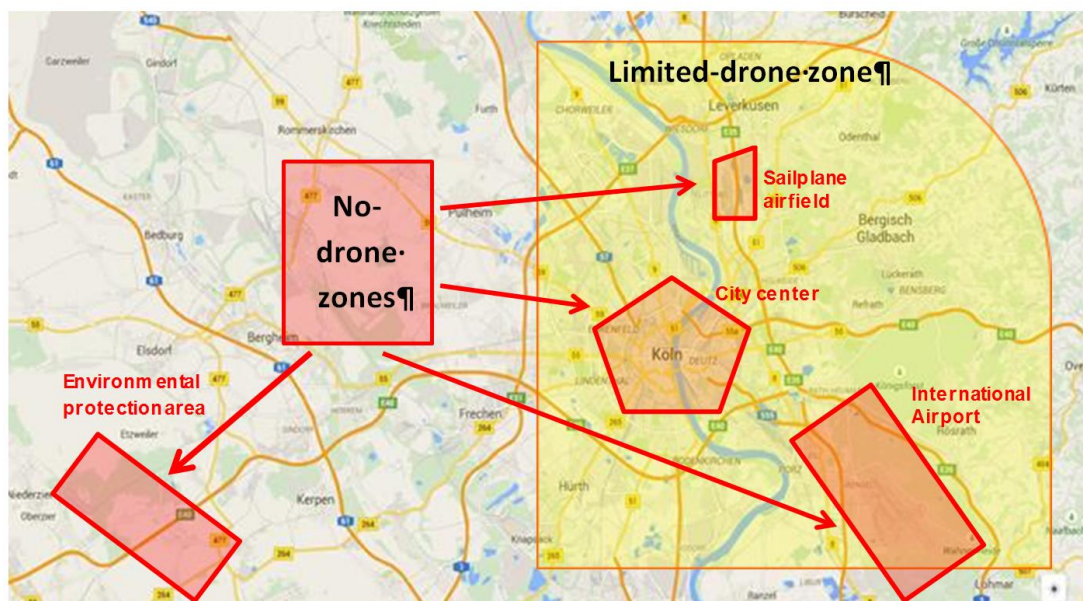


Figure 1: ‘No-drone zones’ and ‘limited-drone zones’ map

Proposal 8: Standards for identification and geofencing functions will be endorsed by the Agency and could be referenced in the market regulations system in order to ensure that the majority of consumer products comply with these standards and to ensure harmonisation at technical level. This will enable manufacturers to develop adequate equipment and to declare compliance with these standards.

Proposal 9: The Agency will define a commonly used data format (e.g. for map data) that should be used to provide the information in an open web interface. This information could be made available through service providers, presented through a smartphone app, or directly uploaded to the drone.

In the future, also features like interoperability with systems for manned aviation or autonomous cooperation and ‘traffic management’ for low-level operations can be assumed that will probably be required once traffic in urban environment increases dramatically.

Technologies to be embedded in drones cannot be defined or mandated in a prescriptive way at IR level, as the regulatory processes at this level cannot follow the speed of the technological development.

Detailed standards that can be used to mandate these features for certain operations need to be developed urgently. Local requirements can refer then to the standard ensuring interoperability and harmonisation as it is done today for required equipment in certain airspaces (e.g. radio communication, transponder).

Activities are already ongoing at national level, and synchronisation at EU and international level has to be initiated as soon as possible in order to agree on basic principles and create appropriate standards.

On the other hand, there is the risk that technologies are mandated because they are available. The consequence could be additional costs and efforts for manufacturers and operators, therefore every mandate should be well-justified. Models are normally manually controlled and don’t carry a GPS unit or similar on board; there must be a clear benefit to mandate future drone technology and there is definitely a limit towards simplest, low-risk operations where it is not proportionate to increase costs without benefit (e.g. to install a GPS on a tethered balloon). Therefore, the technological measures for the very small vehicles should be enforced through limitation of performance.

Use of market regulation

The ‘Blue Guide’ on the implementation of the EU product rules is available at http://ec.europa.eu/growth/single-market/ce-marking/index_en.htm.

The ‘Blue Guide’ explains the new legislative framework for regulating the free movement of products, goods and services, and relies on a system of essential requirements, harmonised standards, conformity assessments, accreditation of notified bodies, and market surveillance.



One important piece of legislation in the new legislative framework is Directive 2001/95/EC (the general product safety Directive) whose purpose is to ensure that products put on the market are safe.

On the basis of the legislation on internal market, drones may be covered by a product legislation to be adopted, which would ensure that the product placed on the market is safe. Such legislation applies only to the products placed on the market. It covers neither prototypes nor the use of the products. Operations of drones would remain subject to aviation rules.

The main characteristics of a product legislation would be: definition of the essential requirements and related standards, certification by the manufacturer of the conformity of its product, same treatment applied to EU manufacturers and importers, enforcement by the market surveillance authorities, 'CE' marking easily identifiable by the general public, specifications for a user manual.

The rationale for using market regulation for drones could be further developed as follows:

The purpose of the 'open' category is to define well the safety barriers in which the operations take place and to keep the threshold as low as possible, preferably with very limited aviation rules, processes and enforcement. As this category concerns mainly operations by individuals without an aviation safety background, safety systems (e.g. I-Drone, geofencing, and performance limitations) should be embedded in the drone. It is required to develop performance requirements (e.g. I-Drone shall take the form of an electronic chip that enforcement authorities must have easy access to). Some drones of a very low mass are indeed toys. They should only be subject to very light regulation as the risk they pose is very low.

Industry would apply the product rules. The products will be accompanied by customer leaflets to draw attention to safety issues. Enforcement of the quality of the product would be left to 'market complaints' by customers or competitors. So, competitors could check compliance and lodge complaints. Police could enforce the appropriate use of the drones.

Proposal 10: Manufacturers and importers of drones have to comply with the applicable product safety Directive, and will have to issue information to respective customers on operational limitations applicable to the 'open' category. The market regulations will be applicable to smaller drones and an upper threshold needs to be established.

Proposal 11: Essential requirements for the intended general product safety directive and related standards will be developed with the involvement of the Agency defining the safety characteristics (e.g. kinetic energy, performance, characteristics, loss-of-link capability) appropriate for the category and subcategory of the drone.

Limitations

All drone operations in the 'open' category must be conducted within the defined limitations.

- Proposal 12:** All drone operations in the 'open' category must be conducted within the defined limitations:
- Only flights in direct visual line of sight of the pilot are allowed.
 - Only drones with a maximum take-off mass below 25 kg are allowed.
 - No operation of drones in 'no-drone zones' is permitted.
 - Drones operating in 'limited-drone zones' must comply with the applicable limitations.
 - The pilot is responsible for the safe separation from any other airspace user(s) and shall give right of way to any other airspace user(s).
 - A drone in the 'open' category shall not operate at an altitude exceeding 150 m above the ground or water.
 - The pilot is responsible for the safe operation and safe distance from uninvolved persons and property on the ground and from other airspace users and shall never fly the drone above crowds (> 12 persons).

To separate drone operations from normal manned aviation, the operation needs to be performed in direct visual line of sight where the pilot is capable and responsible to ensure separation from other airspace users.

To mitigate the risks to third parties on the ground, different limitations are foreseen for drones in the different mass categories.

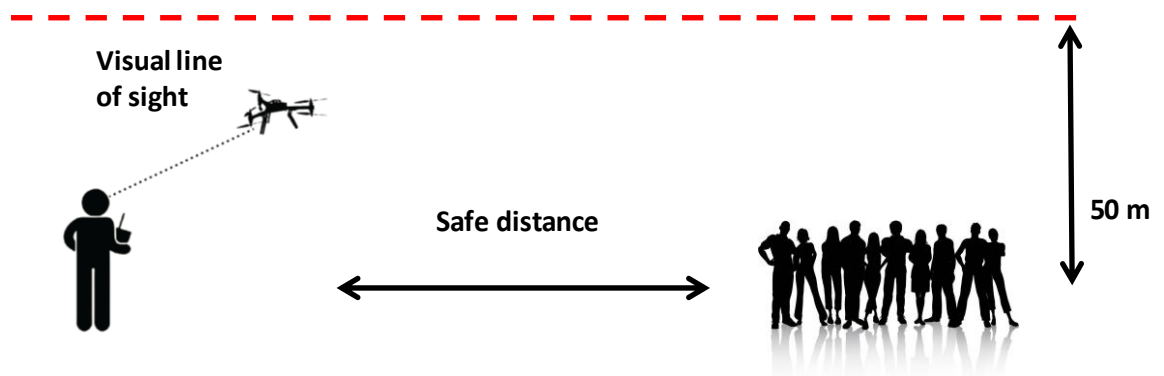


Figure 2: Limitations in the 'open' category: visual line of sight, maximum altitude and minimum distance with respect to uninvolved persons on the ground.

The risk to persons on the ground is mitigated through the use of low-energy aircraft and by establishing minimum distances with respect to the persons on the ground. Flights above crowds are prohibited, but flights above persons not related to the operation in cities or populated areas is allowed for smaller drones.

Risk awareness, education, training, and safety promotion

The basic principle is that the pilot is responsible for the safe operation and:

- shall give the right of way to all other airspace users;
- should not be negligent or reckless; and
- needs to be fit to fly, as well as the drone and the equipment.

The key element in the 'open' category is, therefore, the responsibility and awareness of the operators. This starts with the need to make drone buyers aware that they operate an aircraft.

A leaflet listing the *dos and don'ts* for drone operators should be available to every customer buying a consumer drone. Such leaflets have already been developed by some EASA MSs. They could be published on the Agency's and on the EASA MSs' websites and be distributed when drones are bought. Such leaflets should be translated with the support of the drone community in all EU official languages.

For any drone operation over 50 m above ground with a higher risk of conflict with manned aviation, it is foreseen to require basic aviation awareness for the pilot.

Proposal 13: For any drone operation over 50 m above ground, basic aviation awareness shall be required for the pilot.

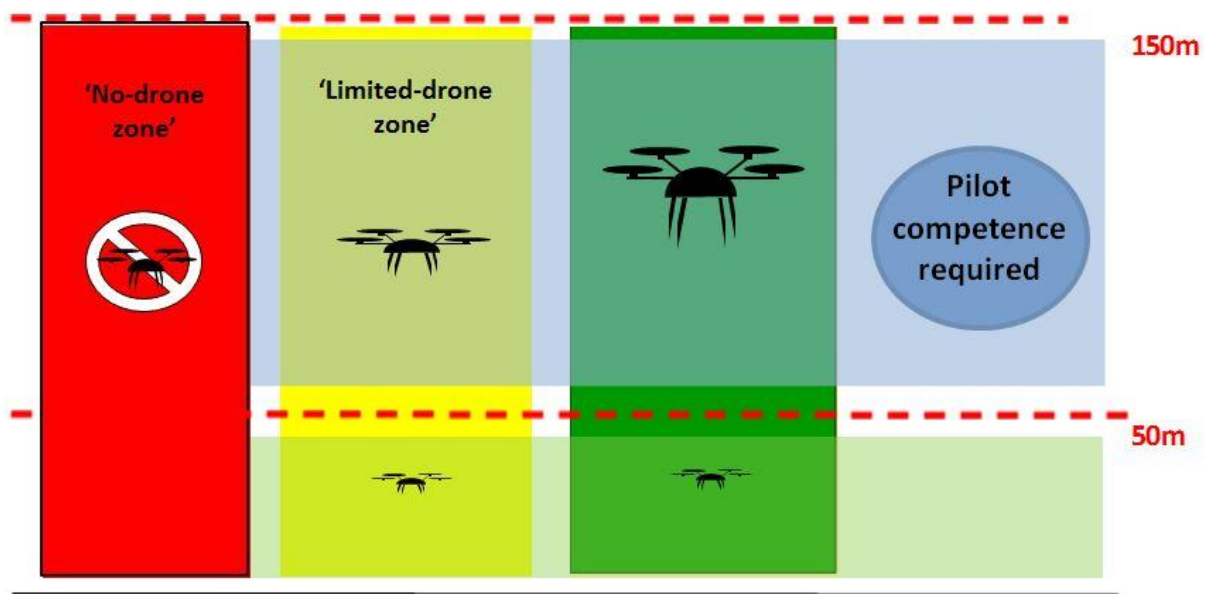


Figure 3: Pilot competence required for drone operations over 50 m above the ground.

It is not the intention to create a licence, but merely to develop learning objectives or an e-learning tool. Alternatively, the education provided at model-flying associations could be accepted as equivalent.

Mass and subcategorisation

Today, EASA MSs use mainly mass as the criterion for the involvement of NAAs. In line with the current practice, in most EASA MSs it is proposed to establish subcategories for the 'open' category to allow for a more flexible adaption to the risk.

0 to 999 g — CAT A0

A considerably high number of consumer products fall into this subcategory which are operated in all kind of operational environments. Depending on the exact definitions, this category includes tethered balloons, kites, toys as well as sophisticated devices following automatically the owner.

1 to 3,99 kg — CAT A1

The majority of better performing consumer products fall into this subcategory. Normally equipped with navigation and automation systems, their performance is impressive and can carry payload, and start posing a more significant risk to third parties.

4 to 25 kg — CAT A2

In this subcategory there are mainly products operated commercially, e.g. carrying high-quality camera systems, or drones or models operated by enthusiasts.

Proposal 14: Create three subcategories in the 'open' category:

- CAT A0: 'Toys' and 'mini drones' < 1 kg
- CAT A1: 'Very small drones' < 4 kg
- CAT A2: 'Small drones' < 25 kg

Again, the mass is chosen as a simple and 'enforceable' parameter to separate (sub)categories of drones. Together with other simple thresholds for altitude and distance to persons, this enables the practical implementation of risk classes.

To ensure proportionality of rules, additional requirements would apply for each subcategory:

Proposal 15: Additional requirements for CAT A0: 'Toys' and 'mini drones' < 1 kg:

- Any drone sold as a toy or consumer product with a mass below 1 kg could comply with the applicable product safety Directive and shall have limited performance to assure flight below 50 m above ground and local operation or alternatively the means to automatically limit the altitude and the airspace they can enter.
- Operation shall be performed below 50 m above ground.

Proposal 16: Additional requirements for CAT A1: 'Very small drones' < 4 kg:

- Any drone sold as a consumer product which is heavier than 1 kg could comply with the applicable general product safety Directive and shall have the means to automatically limit the airspace it can enter and the means to allow automatic identification.
- Drones operating in the 'limited-drone zones' shall have active identification and up-to-date geofencing capability enabled.
- For any operation over 50 m above ground, the pilot needs to have basic aviation awareness.
- Any failures, malfunctions, defects or other occurrences that lead to severe injuries to or fatalities of any person need to be reported.

Proposal 17: Additional requirements for CAT A2: 'Small drones' < 25 kg

- Any drone sold as a consumer product which is heavier than 4 kg could comply with the applicable general product safety Directive and shall have the means to automatically limit the airspace it can enter and the means to allow automatic identification.
- Operation in the 'limited-drone zones' is not permitted in the 'open' category for drones with a take-off mass above 4 kg.
- For any operation over 50 m above ground, the pilot needs to have basic aviation awareness.
- Any failures, malfunctions, defects or other occurrences that lead to severe injuries to or fatalities of any person need to be reported to the Agency.



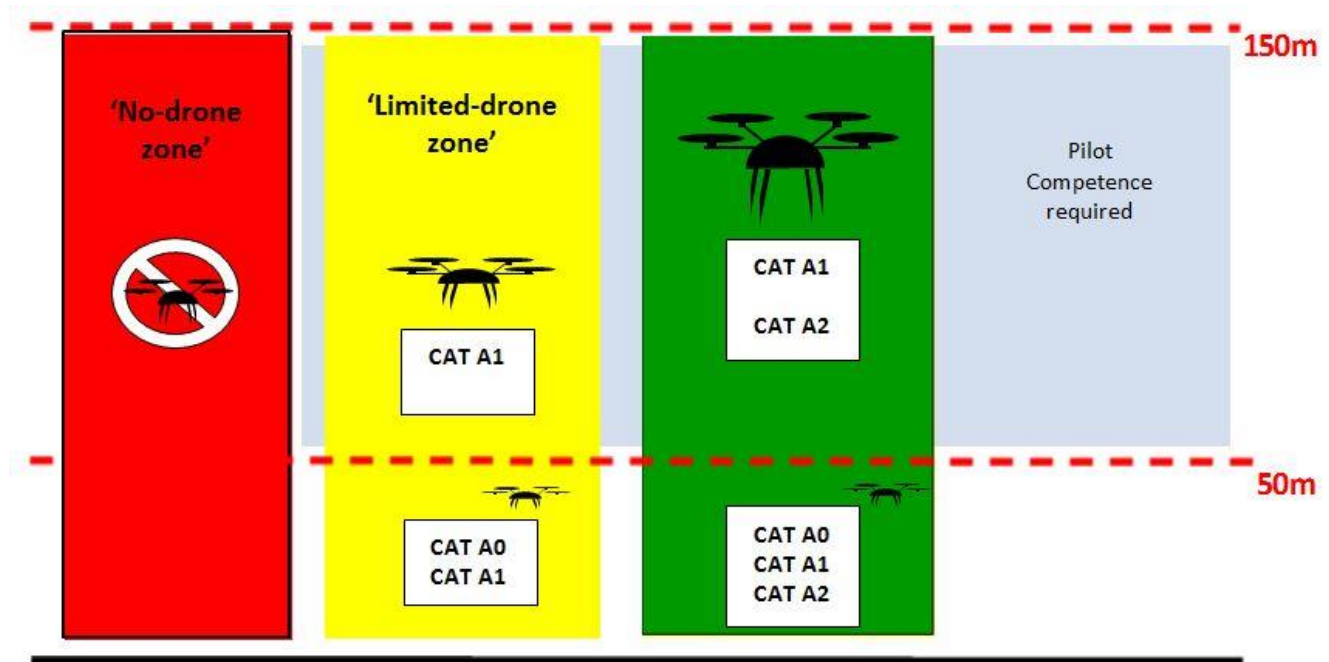


Figure 4: Zones of operation for the three subcategories of drones.

Special operations — Models — Tethered vehicles

In many cases today model aircraft are operated close to cities or airfields and need special provisions. Some of these operations should be covered by Operation Authorisation (OA) within the specific category based on the existing procedures, but in many cases the operation could be performed in dedicated areas without having one responsible operator for all operations.

Proposal 18: In dedicated areas the operation of drones (or models) can be performed in the 'open' category according to the conditions and procedures defined by the competent authority.

Proposal 19: Tethered aircraft up to a mass of 25 kg or a defined volume for aircraft lighter than air can be operated in the 'open' category outside 'no-drone zones' below 50 m above ground or water, or in dedicated areas notified to other airspace users.

3.3. Specific risk operation — ‘specific’ category

As soon as an operation starts posing more significant aviation risks to persons overflown or involves sharing the airspace with manned aviation, the operation is placed in the ‘specific’ category. The ‘specific’ category will require an OA issued by an NAA with specific limitations adapted to the risk posed by the operation. For these activities, each specific aviation risk would be analysed and adequate mitigation means need to be agreed by the NAA before the operation can start, based on a safety risk assessment. The approval would be materialised with the issue of an OA.

Proposal 20: ‘Specific risk operation’ is any operation with drones which poses more significant aviation risks to persons overflown or which involves sharing the airspace with manned aviation. Each specific aviation risk needs to be analysed and mitigated through a safety risk assessment.

The operation of drones outside the limits of the ‘open’ category requires specific mitigation of an otherwise higher risk to persons and properties on the ground and to other airspace users due to the fact that one or several of the safety barriers of the ‘open’ category are exceeded.

In the ‘specific’ category we could expect operations of drones out of the visual line of sight of the pilot, sharing airspace with other users where separation assurance with respect to other aircraft cannot be performed by the pilot and this function relies on the safety equipment installed on the drone (i.e. the ‘detect and avoid’ function), or on specific operational procedures. Operations with large drones but also with small drones above densely populated areas, like city centres, could also fall in the ‘specific’ category.

Safety risk assessment of the operation

In order to reduce the risk to an acceptable level, a safety risk assessment shall be performed by the operator taking into account all the elements that contribute to the risk of the particular operation.

The safety risk assessment should identify all hazards of the drone operation and the severity of their effects. These hazards shall be technical (related to the failure of aircraft functions) and operational (related to airspace and pilot competence). The effect on people on the ground and on other airspace users shall be determined and mitigated.

The acceptable methods to perform the safety risk assessment as well as the acceptable means of mitigation, guidance and templates need to be provided by the Agency to ensure common understanding and equal treatment of applicants.

Key factors of the safety risk assessment are the following:

- area of operation: population density, areas with special protection;
- airspace: class of airspace, segregation, ATC procedures;
- design of the drone: functions provided, redundancy and safety features;
- type of drone operation: operational procedures;
- pilot competence;
- organisational factors of the operator.



The operator is responsible to provide a safety risk assessment and an Operations Manual to the competent NAA as the basis of the OA.

- Proposal 21:** A safety risk assessment shall be performed by the operator taking into account all the elements that contribute to the risk of the particular operation. For this purpose, the operator shall:
- provide to the competent NAA all the information required for a preliminary applicability check of the category of operation;
 - provide to the competent authority a safety risk assessment covering both the drone and the operation, identifying all the risks related to the specific operation, and proposing adequate risk-mitigation measures.
 - compile an appropriate Operations Manual containing all the required information, descriptions, conditions and limitations for the operation, including training and qualification for personnel, maintenance of the drone and its systems, as well as occurrence reporting and oversight of suppliers.

Operation Authorisation (OA)

The 'specific' category is a tool to treat particular operations with safety requirements proportionate to the risk posed by drones that are capable of performing a certain operation within certain limitations. The outcome would be an OA defining the limitations under which the particular operation with particular equipment in a given condition is safe. These limitations would be a combination of airworthiness limitations (to ensure the reliability of critical equipment) and operational limitations where certain procedures or pilot training could be used to mitigate the risks.

- Proposal 22:** The competent authority of the State of the operator shall be responsible to issue the OA after the review of and agreement with the operator's safety risk assessment and the Operations Manual in the 'specific' category.

The OA would be valid in all EASA MSs and will be based on an Operations Manual (detailing how the drone needs to be operated, where and under which limitations) in line with the result of the safety risk assessment. Assumption within the risk assessment and the resulting operational limitations and conditions need to be applicable in all other EASA MSs and the limitations and conditions defined by the competent authority need to be complied with.

The minimum safety requirements on the design of the drone and the competence of the personnel including the pilot will be an outcome of the safety risk assessment.

- Proposal 23:** The operation shall be performed according to the limitations and conditions defined in the OA:
- The operator shall not carry out specific operations, unless holding a valid operation authorisation.
 - The operator shall ensure that all involved personnel is sufficiently qualified



and familiar with the relevant operation procedures and conditions.

- Before the initiation of any operation, the operator is responsible to collect the required information on permanent and temporarily limitations and conditions and to comply with any requirement or limitation defined by the competent authority or to request specific authorisation.

Use of certified equipment and approved organisations

When the risks that are posed by a 'specific' operation have to be mitigated by the technical characteristics of the drone, compliance of some functions or system in the drone may be needed to be demonstrated with the applicable CSs or industry standards to ensure safe flight.

In the 'specific' category only a concrete type of operation is authorised while in the 'certified' category the design of a drone is considered appropriate for a variety of operations. It is expected that an operator may start operations under an OA with a drone in the 'specific' category with limited support from the drone manufacturer. When the number and variety of such OAs increases, the drone manufacturer could apply to the Agency to obtain a Type Certificate (TC) for the drone design that the operators could use to support additional OA, while in the 'certified' category compliance of all functions and systems need to be demonstrated with the applicable CSs.

Proposal 24: The operation in the 'specific' category might be performed with drones or equipment that is certified or otherwise approved. The operation might exceed the operational limitations for the certified equipment when specifically authorised and when the operation ensures application of adequate risk mitigations as identified in the OA.

Proposal 25: Operators may voluntarily make use of suppliers or personnel holding certificates or voluntarily apply for a Remote Operator Certificate (ROC) detailing the means on how responsibilities are shared and having adequate privileges to authorise operations.

When the outcome of the operations safety risk assessment results in an unacceptable level of risk, mitigation measures need to be proposed by the applicant of an OA.

Acceptable mitigation measures could be the use of certified aviation equipment in order to ensure the safety of the drone. The operator could also demonstrate its capability by discharging its obligations in an approved organisation within the appropriate scope of approval. For example, an Approved Design Organisation (DOA) could be hired by an operator to demonstrate the airworthiness of the drone as mitigation measures with regard to the safety risk assessment, or an Approved Training Organisation (ATO) could be hired to ensure adequate pilot training.



Proposal 26: Equipment, parts and functionalities might be approved independently from the drone itself and an approval may be granted. The IRs will define the required processes based on the 'European Technical Standard Order (ETSO)' process. The process for release and continuing airworthiness oversight needs to be adapted as equipment might not be installed on certified drones. This might cover ground stations or qualified 'detect and avoid equipment' installed on drones in the 'specific' category.

Use of Remote Operator Certificate (ROC) privileges

A ROC is foreseen in the 'certified' category for high-risk operations of a wider scope that exceed the applicability of the safety risk assessment. Operators holding a ROC could be granted the privilege to authorise their own OAs and later changes in the 'specific' category when their capabilities are assessed and considered appropriate within a given scope. For example, a company doing aerial surveillance with a drone fitted with a camera under a ROC may be granted the privilege to change the drone model or authorise the operation in a different area.

Proposal 27: The IRs define the organisational requirements for the operator to qualify for a ROC and to obtain adequate privileges in order to authorise/modify its own operations.

Standard acceptable means and mitigations

The majority of expected operators in the 'specific' category are not a traditional aviation organisation but an SME using a drone or even a small fleet of drones as 'tool' to replace traditional equipment like cranes, or to replace dangerous activities like climbing on industrial infrastructure for inspections.

These users have no experience in performing safety risk assessments and they need simple solutions for standard activities like:

- media use in urban environment;
- industrial inspections;
- precision farming and monitoring;
- infrastructure inspections (power lines, railways, etc.).

Proposal 28: It is proposed that industry and standardisation bodies be requested to provide standard solutions to address the safety risks, e.g. for airworthiness aspects. Together with standard Operations Manuals, the safety risk assessment process would be simplified.



3.4. Higher-risk operation — ‘certified’ category

Certification will be required for operations with an associated higher risk due to the kind of operation, or might be requested on a voluntary basis by organisations providing services (such as remote piloting) or equipment (such as detect and avoid). When unmanned aviation risks rise to a level similar to normal, manned aviation, the operation would be placed in the ‘certified’ category of operations. These operations and the drones involved therein would be treated in the classic aviation manner: multiple certificates would be issued (as for manned aviation) plus some more certificates specific to drones.

The operations in the ‘certified’ category are envisaged for drone operations with a high risk and with a wider scope of operation than the ‘specific’ category.

Examples are international cargo transport operations with large drones, transport of persons or any other operation where the risk assessment process of the ‘specific’ category does not sufficiently address the high risks involved in the operation. The delimitation between ‘specific’ and ‘certified’ category may not be easily expressed in terms of weight as it is related to the applicability of the safety risk assessment process.

The outcome of the ICAO requirements may result in the need for a Certificate of Airworthiness (CofA) and, therefore, could be one of the criteria leading to certification.

Airworthiness, organisational and personal approvals

Proposal 29: In order to operate a drone in the ‘certified’ category, the airworthiness of the aircraft and its compliance with environmental standards shall be ensured in the same way as it is done today for manned aviation by issuing a TC or Restricted Type Certificate (RTC) for the type, and a CofA or restricted CofA for the particular drone.

The TC or RTC might cover the complete unmanned aircraft system including the drone and the components on the ground (like the control station), or may cover only the drone and its airborne systems. When only the drone is included in the TC or RTC, the limitations and conditions for the compatible ground control stations and command and control link including bandwidth, latency and reliability requirements will be established under the TC or RTC.

Proposal 30: The organisations responsible for the design, production, maintenance and training shall demonstrate their capability by holding respectively design, production, maintenance and training organisation approvals when required due to the risk posed by the operation.

Proposal 31: The pilot shall be licensed and the operator shall hold a ROC.

The ROC holder must ensure that all the equipment related to the operation, either airborne or on the ground, has been granted the appropriate design approval and complies with the limitations and conditions of the aircraft TC or RTC and with the requirements for the type of airspace for which approval is requested.



Certification Specifications (CSs)

CSs will be adopted by the Agency covering a broad range of different configurations such as: fixed wing, rotorcraft, airships, balloons. A-NPA 2015-06 on the reorganisation of Part 23 and CS-23¹⁴ could be seen as an example for performance-based CSs.

Proposal 32: CSs will be adopted by the Agency covering a broad range of different drone configurations, defining the safety objectives. They will be supplemented by industry standards endorsed by the Agency to allow for fast reaction on developments and might also cover operational and licensing aspects.

CSs would include requirements for the control station and command and control link. The demonstration of compliance of the equipment (like the ground control station) that could be used with several aircraft types could also be done with an independent approval. There is no fixed lower limit for the 'certified' category, and the CSs shall be proportionate to the risk posed by the drone.

Authority approval and oversight

The responsibilities of the Agency and of the NAAs in the 'certified' category are the same as for manned aircraft.

Proposal 33: It is currently not foreseen to separate the IRs for the 'certified' category from the IRs for manned aviation.

Nevertheless, adaptation of the existing rules will be needed to better accommodate high-risk drone operations and will need to be developed when required.

¹⁴

<http://www.easa.europa.eu/document-library/notices-of-proposed-amendment/npa-2015-06>



4. Best practices

It is recommended to harmonise EASA MS regulations according to the Agency's proposal — especially when regulations have not yet been implemented, prior to the extension of the EU competency below 150 kg. As the proposed regulations have to be complemented by development of standards, the proposal cannot be implemented immediately.

The subcategories and limitations proposed for the 'open' category are already seen as a good average of the existing national regulations. The absence of some of the proposed technical mitigations (e.g. common standards for information on 'no-drone zones' and limitation areas) for the future 'open' category could be compensated by simple remote pilot qualification programmes or increased distance from critical infrastructure and persons:

- from 0 kg < 4 kg: keep safe distance from persons, do not fly above crowds, do not fly over 50 m above ground unless aviation competence is available;
- from 4 kg < 25 kg: keep minimum 50 m distance from persons or vehicles on the ground, do not operate in congested areas, fly below 50 m above ground unless the pilot has aviation awareness;
- from 25 kg < 150 kg and any operation exceeding the limitation above: establish a safety assessment process¹⁵;
- a minimum distance of 5 km from airfields and other sensitive infrastructure is recommended.

Where suitable regulations for non-commercial operations (e.g. for recreational models) exist that are able to cover the growing number of recreational consumer drone operations, it is recommended to keep the system until EU regulations are applicable.

Suitable means should be implemented to monitor this segment, like a central collection of occurrences. The data should be made available so that the Agency can substantiate the low (and probably medium) risk.

Most important and most effective for the consumer activities are safety promotion activities in order to increase aviation awareness.

Enforcement is a key element to avoid intentional and unintentional misuse of drones. It is recommended to cooperate internationally and to develop training material and establish suitable enforcement measures.

¹⁵ The Swiss CAA (FOCA) developed a specific risk assessment process. The process includes a safety and risk assessment to be approved by the authority, as well as user-friendly templates and guidance material. The Austrian CAA (Austrocontrol) and the French CAA (Direction générale de l'aviation civile (DGAC)) have similar processes with rules tailored to the risk of the operation. These examples of practical approach are the stepping stones the EU could use to develop its rules and processes. Aviation authorities can request more information from JARUS.

5. References

5.1. Affected decisions

Not applicable

5.2. Affected regulations

Not applicable

5.3. Reference documents

- RIGA DECLARATION ON REMOTELY PILOTED AIRCRAFT (drones) 'FRAMING THE FUTURE OF AVIATION', Riga, 6 March 2015
- EASA Concept of Operations for Drones, A risk based approach to regulation of unmanned aircraft
- COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL 'A new era for aviation — Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner'
- European Parliament draft report on safe use of remotely piloted aircraft systems (RPAS), commonly known as unmanned aerial vehicles (UAVs), in the field of civil aviation (2014/2243(INI))



6. Annexes

6.1. Annex I: Overview of the EASA Member States' regulations on drones

To date, 18 EASA MSs have adopted or are going to adopt regulations on small drones. The following table provides a sample of national regulations.

Member State	Drone categories	Categories of permitted operations	Area allowed to be overflown
AT	Below 5 kg maximum take-off weight (MTOW) Between 5–25 kg Between 25–150 kg	visual line of sight (VLOS) only	Undeveloped, Unpopulated, Populated, Densely populated
DK	Below 7 kg MTOW Between 7–25 kg Between 25–150 kg	VLOS only < 100 m above ground level (AGL)	150 m from road and buildings; never over densely built areas
FR	Below 2 kg MTOW Between 2–25 kg Between 25–150 kg	S1 = VLOS < 100 m distance from remote pilot S2 = VLOS, within 1 000 m distance from remote pilot; maximum altitude < 50 m AGL S3 = VLOS, within 100 m distance from remote pilot S4 = observations — 150 m AGL	S1 = unpopulated area S2 = unpopulated area S3 = populated area S4 = unpopulated area
DE	Below 5 kg MTOM: Federal State Above 5 kg: federal competence	VLOS only, < 100 m AGL	
ES	2 main categories: below/above 25 kg	< 2 kg: beyond visual line of sight (BVLOS) & AGL < 120 m < 25 kg VLOS 500 m and AGL < 120 m > 25 kg: subject to the limits imposed by the Civil Aviation Authority (CAA)	< 2 kg: only away from inhabited places < 25 kg: only away from inhabited places > 25 kg: specific conditions
IT	2 main categories: below/above 25 kg CAA may provide simplified procedures for drones < 2 kg	'V70': 70 m (230 ft) max AGL and 200 m radius 'V150': 150 m (500 ft) AGL and 500 m radius	At least 150 m from congested areas and at least 50 m from persons and property



SE	Below 1.5 kg MTOM or < 150 joule Between 1.5 and 7 kg or < 1 000 joule Between 7–150 kg	S1 = VLOS, below 1.5 kg S2 = VLOS, 1.5 and 7 kg S3 = VLOS, > 7 kg S4 = below line of sight (BLOS) Always < 120 m AGL	Distance drone/persons and property: > 50 m
UK ¹⁶	Below 20 kg MTOM excl. fuel/incl. battery Between 20–150 kg	Max speed: 70 kt; 400 ft AGL < 500 m distance from remote pilot	> 150 m from buildings > 100 m from people

Table 1: Sample of national regulations on drones and key criteria (ad hoc meeting of drone experts of the EASA MSs on 23 June 2015 on the EASA premises in Brussels)

The discussions at the above-mentioned ad hoc meeting can be summarised as follows:

Safety is ensured by a combination of weight limits; operational scenarios; operational limitations and by rules relative to the operations, the pilot and the drone.

Weight limits:

The common principle is categorisation, but lower limits vary considerably (below 1 kg up to 35 kg). On average, the first step is between 2–7 kg and the next one in the order of 20–25 kg.

Operational scenarios:

When most MS limit operations to VLOS, some EASA MSs accept extended VLOS and some accept BVLOS with special permit (e.g. below 2 kg for France). Some EASA MSs have an operation-centric approach; Switzerland has the most advanced risk-based approach using a risk calculation tool and describing the methodology within the applicable regulation.

Operational limitations:

- altitude limitation around 400 ft;
- some EASA MSs impose a limitation for distance from the pilot (~ 500 m);
- nearly all EASA MSs mandate that drones have to give right of way to everything else;
- additionally, most of the EASA MSs require an insurance and impose occurrence reporting.

Rules relative to the operations, pilot and drone:

For small drones, there is limited or no certification. Above 20–25 kg most EASA MSs have some kind of CAA approval for the operator, licence for the pilot, and technical evaluation for the drone. To some EASA MSs everything should be treated according to aviation rules, but it seems they only focus on commercial drone operations and have a very limited number of applications to process.

It seems to be a common understanding that the distinction between commercial/non-commercial operations has no risk effect and private users of consumer products have a limited knowledge of the

¹⁶ Ireland (IE) has adopted similar rules. The EASA MSs not included in Table 1 enjoy an exemption regime where their civil aviation authorities process the applications and additional authorisations from other administrations may be necessary, e.g. to fly with cameras over city centres.



aviation system. Nevertheless, some EASA MSs oppose quite strongly the inclusion of non-commercial drone operations.

From the above, it is quite clear that when there are some common principles, the national regulations are not harmonised. Categorisation, and especially the 'open' category, is the subject of heated discussions. Some challenging issues are: airspace use, toys and consumer products, occurrence reporting, enforcement of the regulations, privacy, etc. The UK is challenging the idea that the 'open' category should be regulated by aviation legislation at all. This idea does not seem to get much support.

Most of the EASA MSs require a third-party liability insurance. Currently, Regulation (EC) No 785/2004¹⁷ does not require insurance for model aircraft of less than 20 kg. The Agency has no remit to require insurance. It recommended, however, that Regulation (EU) No 785/2004 be reviewed to include insurance for drones.

A lesson learned is that prescriptive rules create difficulties due to the fact that the technical area is developing too fast. EASA MSs that have published rules early are now revising them to simplify their systems, and some move towards a more risk-based approach.

As a consequence of such debates, a regulatory framework at EU level including detailed guidance or regulations was strongly requested.

¹⁷ Regulation (EC) No 785/2004 of the European Parliament and of the Council of 21 April 2004 on insurance requirements for air carriers and aircraft operators (OJ L 138, 30.4.2004, p. 1)



6.2. Annex II: Data protection and privacy

The ‘Article 29 Data Protection Working Party’ (*Art. 29 WP*) was set up under Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data¹⁸, it has advisory status and acts independently. It is composed of a representative of the supervisory authority(ies) designated by each EU MS, a representative of the authority(ies) established for the EU institutions and bodies, and a representative of the European Commission. *Art. 29 WP* has issued the opinion 01/2015 on privacy and data protection issues relating to the utilisation of drones:

‘Among others, the opinion also addresses recommendations to European and national policy makers for the strengthening of a framework that guarantees the respect for all fundamental rights at stake, not only data protection, by also introducing specific rules ensuring a responsible use of drones (which must necessarily include respect for private areas). Furthermore, WP29 calls on policy makers for the introduction of data protection aspects among the key features of national provisions regulating the commercial use of drones (in connection with pilot qualification and training, among airworthiness and certification requirements, while issuing/revoking operating licenses and aerial work permits), calling for a strict cooperation between Data Protection Authorities and CAAs.

WP29 also recommends manufacturers and operators to embed privacy friendly design choices and privacy friendly defaults as part of a privacy by design approach and to involve a Data Protection Officer (where available) in the design and implementation of policies related to the use of drones and to promote the adoption of Codes of conduct that can help the various industry stakeholders and operators to prevent infringements and to enhance the social acceptability of drones. Specific recommendations for the use of personal data collected by means of drones for law enforcement purposes are also set out. In particular, law enforcement data processing carried out by means of drones should, as a rule, not allow for constant tracking and technical and sensing equipment used must be in line with the purpose of the processing.’

The European Data Protection Supervisor (EDPS) also issued an opinion (dated 26 November 2014) on the Communication from the Commission to the European Parliament and the Council on ‘A new era for aviation — Opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner’¹⁹. The following extract of the opinion provides a good summary of it:

“10. Whenever personal data is processed by RPAS operated in the EU, the EU legal framework for data protection applies in principle. Together with other requirements (including aviation safety rules, certification/type-approval, health etc.), the respect of data protection requirements and the right to private and family life will enhance the development of the market of RPAS within the EU in compliance with the fundamental rights of the individuals concerned. In fact, only those RPAS that will have integrated data protection and privacy in their design will be well regarded by society at large, that is, not only by data protection authorities, not-for-profit fundamental rights organisations and associations but also by the public at large.

¹⁸ More information can be found at: http://ec.europa.eu/justice/data-protection/article-29/index_en.htm.

¹⁹ The full Opinion of the European Data Protection Supervisor is available at: https://secure.edps.europa.eu/EDPSWEB/webdav/site/mySite/shared/Documents/Consultation/Opinions/2014/14-11-26_Opinion_RPAS_EN.pdf



11. The EDPS therefore welcomes that the Communication not only underlines the expected social and economic benefits but also identifies privacy, data protection and security as key elements with which to ensure compliance for the dissemination of RPAS. Their added value to activities such as agriculture, journalism or infrastructure monitoring is obvious but it is crucial to ensure that, whenever they imply the processing of personal data, their use complies with data protection law. As stated in the Commission's Communication, compliance with data protection requirements will preclude that their capacities 'represent a threat to citizens' privacy'.

12. This Opinion identifies several situations where RPAS process personal data and where controllers are, therefore, subject to the existing applicable data protection framework. It responds to the consultation of the EDPS on the Communication and aims at ensuring that further legislation on the subject takes data protection fully into account. It also aims at raising awareness of the public at large (manufacturers, controllers and data subjects) in this regard.

13. This Opinion does not aim at analysing all the data protection requirements that should be met for operating RPAS. This may be the subject of guidance by the national data protection authorities, by the Article 29 Working Party or even by the EDPS in its supervisory role if RPAS were to be used by EU institutions and bodies to process personal data."



6.3. Annex III: Frequency spectrum

Aviation, being a global and interoperable sector, requires a harmonised allocation and use of spectrum. Two main international institutions have a role in regulating this at international level: the International Telecommunication Union (ITU) and ICAO.

The ITU is a specialised agency of the United Nations (UN) and is responsible for issues that concern information and communication technologies. ITU coordinates the shared global use of radio spectrum and assists in the development and coordination of worldwide technical standards. The ITU is active in areas including aviation. It also organises the World Radio-communication Conference (WRC) to review the use of the radio-frequency spectrum. The Conference is held every three to four years. The last one was held in 2012. The next one will be held in November 2015. UN MSs attend these WRCs.

ICAO aims to protect aeronautical frequency spectrum for all radio communication and radio navigation systems used for ground facilities and on board aircraft. Therefore, ICAO defines its position at WRCs addressing all radio-regulatory aspects on aeronautical matters on the agenda. The ICAO Position for the ITU WRCs is developed with the assistance of the Aeronautical Communications Panel (ACP) Working Group F (frequency). EASA MSs and international organisations are requested to make use of the ICAO Position, to the maximum extent possible, in their preparatory activities for the WRCs at national level.

At EU level, the Network Manager (NM), as one of its functions described in Commission Regulation (EU) No 677/2011²⁰, will also perform the central function for the coordination of radio frequencies. NM is cooperating with the ICAO regional (EU) Frequency Management Group (FMG). DG MOVE can directly liaise with ICAO (in coordination with NM) to promote a Commission position.

The Directorate-General for Communications Networks, Content & Technology (DG CONNECT) has the role of counsellor to the Conférence européenne des administrations des postes et des télécommunications (CEPT) in which EASA MSs (but also other States such as the Russian Federation) are represented. CEPT coordinates its MSs' position to be submitted to the ITU.

With this in mind, the way in which the Commission's position on the use of aviation frequencies can be represented at WRC is threefold: through ICAO, through CEPT (both entities will promote the Commission's position to the corresponding MSs), and directly through the EASA MSs.

At national level, frequency managers and/or Air Navigation Service Providers (ANSPs) are in charge of ensuring that the regulation is followed by spectrum users by providing access to it and monitoring its use.

²⁰ Commission Regulation (EU) No 677/2011 of 7 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions and amending Regulation (EU) No 691/2010 (OJ L 185, 15.7.2011, p. 1).



6.4. Annex IV: Outlook — an ATM concept of operation

In the proposed 'open' category drones are separated from manned aircraft by operating in direct visual line of sight of the pilot and by limiting the maximum altitude. In the 'specific' and 'certified' categories the drones can be separated from manned aircraft or they can share the same airspace when the drones comply with the same requirements as manned aircraft. When the number of drones sharing the airspace with manned aircraft increases, an ATM concept of operations will be needed to be developed to adequately integrate these new airspace users ensuring that the capability of the ATM system is adequate and the level of safety of the manned aircraft is not affected.

The key research areas for the integration of drones in non-segregated airspace are as follows:

- detect and avoid,
- airspace and airports access,
- command and control (C2) communications,
- human factors,
- contingency,
- security,
- autonomy.

This will require a significant amount of further research to be performed in particular by SESAR and EDA. Cooperation will be necessary to increase synergies and avoid work duplication. Factors to be taken into account could be the following (non-exhaustive list):

- Transfer of drones from one control station to another: some drones have a significant range and the transfer from one control station to another needs to be considered. The present SESAR experiments have already shown that such transfer should not coincide with the transfer from one Air Traffic Control (ATC) sector to another.
- Operational control of several drones from one control station: this is a real possibility and would lead to formation flights, with coordinated flights of the various drones for example to extinguish efficiently a fire or for crop-spraying.
- ATC and operational control done by the same person: this would be an extension of the previous case, but will carry new risks and pose new liability issues;
- Communications with ATC with an acceptable time of latency.
- Full autonomy and cooperative operations (e.g. operation in swarms, network-centric operations).
- Extreme endurance (several days, even months) at very high altitude (20 000 m): how to maintain the necessary vigilance to face emergencies.
- Development of a drone traffic management system in response to a fast-expanding number of small drones flying at low level, in particular in urban environment (e.g. Unmanned Aerial System (UAS) Traffic Management (UTM) system under development at NASA).



This will require a significant amount of further research and development to be performed in particular in the context of SESAR and EDA. Cooperation will be necessary to increase synergies and avoid work duplication. Integration of drones in non-segregated airspace will require from ANSPs and operators:

- minimum navigation, communication and surveillance performance standards;
- adaptation of the infrastructure;
- new procedures;
- adapted training.

The ATM/ANS aspect of the Concept of Operations for Drones, or a separate ATM/ANS Concept of Operations for Drones, will need to be established with high priority and should address short-, mid- and long-term perspectives. However, these perspectives should be based on the development of the drone market and on the development of the related technologies. These should be carefully monitored and the planning should be adapted accordingly.

