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

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**Final report** from the European RPAS Steering Group

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## ANNEX 1

A Regulatory Approach for the integration of civil RPAS into the  
European Aviation System

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**JUNE 2013**





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*Photos - Origin : UVS International Photo Database*

**COVER :**

- 01. LuxCopter - *Luxembourg* - LC-201
  - 02. Delft-Dynamics - *Netherlands* - RH2-Stern
  - 03. Advanced-UAV-Technology - *UK* - AT-200
  - 04. Aurora-Imaging - *Belgium* - Aurea-1800
  - 05. Schiebel - *Austria* - S-100
  - 06. Flying-Robots - *Switzerland* - Swan
  - 07. AeroSystems - *Portugal*
  - 08. Vision-du-Ciel - *France* - cyclvol2
  - 09. Aerovision - *Spain* - Fulmar
  - 10. Aermatica - *Ital* - Anteos-A2
  - 11. Clear-Flight-Solutions - *Netherlands* - Peregrine-Falcon
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**Disclaimer:**

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

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## Executive summary

In order to accommodate and later integrate Remotely Piloted Aircraft Systems (RPAS) into the total civil aviation system on a European scale, the European Commission has, through Directorates General (DG) Enterprise and DG Move, established a European RPAS Steering Group (ERSG) with the objective of developing a European RPAS roadmap (the "Roadmap") aiming at an initial RPAS integration by 2016 and covering not only the regulatory and research & development (R&D) perspectives, but the societal & liability perspective.

This Chapter represents the planned regulatory improvements (the "REG Roadmap").

In order to produce the REG Roadmap, contributions from relevant stakeholders have been collected by EASA from States, industry and relevant organisations such as ASD, EDA, EREA, ESA, JARUS, ULTRA, UVSI, EUROCONTROL and the SJU. The REG Roadmap has also taken into consideration all known ICAO published and planned deliverables on the subject, in order for a good and solid REG baseline roadmap.

The activities already started during 2013, if not earlier. However, possible delays occurring in a specific activity do not mean that the sequence of activities will have to change, but that only the dates will have to be adjusted. Actual planning decisions and assigned resources in fact depend on the individual organisations which contributed, but are not legally bound by this REG roadmap.

The REG Roadmap has been structured to initially provide an introduction and the high level objectives, followed by a work programme required to achieve full RPAS integration. The work programme is organised in four timeframes, linked to the ICAO Global Air Navigation Plan and the Aviation System Block Upgrades (i.e. 2013, 2018, 2023 and 2028), with initial priority on harmonisation of rules to safely open the internal market for light RPAS (i.e. below 150 Kg operating mass) and parallel extension of scope of EASA, paving the way for common rules to be published soon after 2018.

The first two timeframes include a description of the activities in three layers:

- Layer 1: Regulatory Improvements (RI);
- Layer 2: detailed actions to achieve each RI and expected deliverables;
- Layer 3: intentions of the contributing organisations.

The latter two timeframes in this first edition of the REG roadmap are described only in terms of RI.

This REG Roadmap also includes a first analysis of the risks related to the unsuccessful execution of the complete set of identified activities.

With the upcoming demand for the use of RPAS for civil applications, several European States have started to develop and promulgate national regulations to allow the use of light RPAS. These regulations are presently not mutually harmonised. It is therefore urgent and essential that the implementation of this roadmap is addressed at European level, in order to provide on side high and uniform safety for the citizens, while on the other contributing to the development of the internal EU market.

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## 1. Introduction

The Terms of Reference (ToR) of the European RPAS Steering Group (ERSG) calls the development of three coordinated 'Roadmaps' in the fields of R&D, 'complementary measures' and (safety) regulation. Each roadmap should describe:

- clear objective(s) and identification of quick wins notably for the light UAS sector;
- a work programme including milestones, timing, resources and/or funding needs, distribution of tasks among various organisations and any consultation with stakeholders;
- a set of anticipated deliverables (e.g. definition of safety objectives, agreement of concepts of operation for civil RPAS flights, analysis of demonstration projects needed to test different system configurations etc.).

This roadmap includes:

- a taxonomy of the RPAS operations, identical to that used in the R&D roadmap;
- description of the high level objectives to be pursued in four different timeframes aligned with the ICAO Aviation System Block Upgrades: 2013, 2018, 2023 and 2028;
- Regulatory Improvements (RI) to be pursued in each of these four timeframes (layer 1);
- Description of the related regulatory actions, to be progressed by different organisations for the first two timeframes (layer 2) and intentions of said organisations (layer 3);
- Work Breakdown Structure WBS for each Regulatory Improvement in the first two timeframes, to show internal dependencies and sequencing of activities;
- Summary information on the critical dependencies with the work of WG 2 (R&D) & 3 (complementary measures);
- Preliminary analysis of possible managerial risks;
- Glossary/terminology & acronyms (Attachment 1).

## 2. Taxonomy of RPAS Operations

It is envisaged that RPAS will ultimately operate in the airspace and ATM environments, mixed with a variety of manned aircraft (e.g. from gliders and balloons to large airliners) under instrument flight rules (IFR) or visual flight rules (VFR) adhering to the requirements of the specified airspace in which they are operating.

While commercial air transport (CAT) normally flies to move passengers, freight or mail from aerodrome 'A' to aerodrome 'B', following a profile including a climb phase, en-route at relatively high altitude composed by essentially straight segments, descent and landing, RPAS comprise a much wider range of possible operations, in many ways similar to the operations of general aviation, aerial work, rotorcraft, and military or other governmental missions. However for RPAS, able to fly even at few meters from the ground, the roadmap uses the following taxonomy:

1. **Very low level (VLL)** operations (alias non-standard VFR or IFR operations) below the typical IFR and VFR altitudes for manned aviation: i.e. not to exceed 500 ft. above ground level; they comprise:
  - A. **Visual Line of Sight (VLOS)** in a range depending on the aircraft conspicuity, but typically not greater than 500 meters from the remote pilot, in which the remote pilot maintains direct unaided visual contact with the remotely piloted aircraft;
  - B. **Extended Visual Line of Sight (E-VLOS)** where the pilot is supported by one or more observers and in which the crew maintains direct unaided visual contact with the remotely piloted aircraft<sup>1</sup>;
  - C. **Beyond VLOS (B-VLOS)** where the operations are still below 500 ft., but beyond visual line of sight, hence requiring additional technological support.
2. **RPAS operations in VFR or IFR**, above 500 ft. and above minimum flight altitudes; they comprise:
  - A. **IFR (or VFR) operations in radio line-of-sight (RLOS)** of the RPS in non-segregated airspace where manned aviation is present. The key capability of 'detect and avoid' (D&A) is required in relation to cooperative and non-cooperative nearby traffic (otherwise specific procedures and restrictions would apply);
  - B. **IFR (or VFR) operations beyond radio line-of-sight (BRLOS) operations**, when the RPA can no longer be in direct radio contact with the RPS and therefore wider range communication (COM) services (including via satellite) are necessary. In this case COM would typically be offered by a COM service provider, different from the RPAS operator.

The altitudes that are identified for the above mentioned operations are of a generic nature not taking into consideration National differences notified to ICAO or exemptions.

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<sup>1</sup> In both VLOS and EVLOS the remote crew shall be able to also see incoming threats

### 3. Objectives

In November 2012 the 12<sup>th</sup> ICAO Air Navigation Conference (ANC/12) recommended to modernise civil aviation in the next two decades in four different timeframes identified as 'Aviation System Block Upgrades' (ASBU) with four different target dates: December 2013 for ASBU '0'; 2018 for ASBU '1', 2023 for ASBU '2' and 2028 for ASBU '3'. The same time frames are used into this roadmap to identify the objectives, as in the table below:

No.	Objective	Benefits for the light UAS sector	ICAO ASBU	Target date
1	Provide a set of <b>initial</b> common rules to EU Member States (MS) to promote commercial operations of light Remotely Piloted Aircraft Systems (RPAS) in Visual Line-of-Sight (VLOS) and to make possible intra-EU operations	Initial common set of rules to promote opening of the national market in each EU MS for commercial VLOS operations, in non-segregated airspace, which in turn drives the demand for the manufacturing sector. Cross-border also operations possible	<b>0</b>	<b>2013</b>
2	Issue rules for <b>accommodation</b> <sup>2</sup> of the RPAS into civil aviation, including certification of RPAS, personnel competence, RPAS operators and operations for initial IFR/BVLOS (i.e. Beyond VLOS under Instrument Flight Rules) as well as for oversight of communication (COM) service providers. Operations may be subject to limitations, in particular very restricted at aerodromes	Harmonised rules for operation of the RPAS to open the internal EU market, with priority to RPA of 150 Kg or less	<b>1</b>	<b>2018</b>
3	<b>Partial integration</b> of RPAS into civil aviation, through common rules for RPA of any weight and alleviation of restrictions/limitations for any RPAS operation and initial mixed (i.e. manned/RPAS) operations at aerodromes	Common rules for RPAS comprising RPA of any mass, having extended the scope of EASA	<b>2</b>	<b>2023</b>
4	<b>Full integration</b> of operation of RPAS in non-segregated airspace (controlled and uncontrolled) and at aerodromes, including for commercial air transport of freight/mail or dangerous goods	Possibility of designing and operating larger RPAS subject to minimal limitations	<b>3</b>	<b>2028</b>

<sup>2</sup> 'Accommodation' means that civil RPA will be authorised to enter non-segregated airspace, but possibly with some limitations.



## 4. Work programme

The proposed work programme is presented in four sets (one per timeframe/ASBU) of tables, hierarchically organised. For the first two timeframes, the set comprises three layers covering all the items mentioned in the ToR, as summarised in the table below:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) LAYERED STRUCTURE				
Items (required by ERSG ToR)		Covered in roadmap layer		
		1	2	3
		RIs	Actions	Detailed planning
Milestones, deliverables and & timing	Regulatory Improvements (RIs)	Y		
	Deliverables (from individual actions)		Y	
	Detailed planning			Y
	Target dates	Y	Y	Y
Resources	Responsible organisation		Y	
	Focal point (natural person)			Y
	Estimated necessary resources (Full Time Equivalents = FTEs <sup>3</sup> )			Y
Consultation mechanisms				Y

<sup>3</sup> 1 FTE is assumed to be 200 working days (i.e. the effective time which an employee could directly devote to a task, without the indirect administrative overhead and the days-off). In average 200 working days represent 1600 working hours. 0.1 FTE hence represents 160 working hours and therefore 4 weeks (i.e. about 1 man month). 0.01 FTE represents 2 working days.

## 5. Regulatory roadmap until 2013

### 5.1 Regulatory Improvements

Only one Regulatory Improvement (RI) is considered probably feasible until end of 2013: i.e. common transposition of amendment 43 to Annex 2 to the Chicago Convention (ICAO) into the Standard European Rules of the Air (SERA). Legally SERA would facilitate intra-EU operations, while inside individual States national rules would continue to apply. However the message would be clear:

- RPAS are aircraft and therefore the system is in principle subject to approval/certification (above the threshold fixed at national level);
- The remote pilots need to be licensed; and
- The RPAS operator carries operational and legal responsibilities, while having the privilege of executing the authorised operations, commercial or non-commercial<sup>4</sup>.

<b>EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)</b>					
<b>REGULATORY IMPROVEMENTS</b>					
<b>Synchronized with</b>		<b>ICAO Aviation System Block Upgrade (ASBU) '0'</b>		<b>ICAO Target date 2013</b>	
<b>Achieved ICAO progress</b>			<b>Regulatory Improvements (RI)</b>		
<b>No.</b>	<b>Deliverables</b>	<b>Target date</b>	<b>No.</b>	<b>Identification</b>	<b>Target date</b>
1	Amendment 13 to Annex 13 (accident investigation for RPAS) to the Chicago Convention	Applicable Nov. 2010	01	RPAS in Standard European Rules of the Air (SERA) <sup>5</sup>	2013
2	Circular 328 on Unmanned Aircraft Systems (UAS)	Published in 2011			
3	Amendment 43 to Annex 2 (RPAS in rules of the air) to the Chicago Convention	Applicable Nov. 2012			
4	Amendment 6 to Annex 7 (registration of RPA) to the Chicago Convention	Applicable Nov. 2012			

<sup>4</sup> Model aircraft used in VLOS exclusively for recreational purposes, and 'flying' toys, are not considered RPAS.

<sup>5</sup> Commission Regulation (EC) No 923/2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Regulations (EC) No 1035/2011, (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010, already endorsed by the Single Sky Committee (SSC).

## 5.2 Regulatory actions and dependencies

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)							
Planned actions for ASBU 0							
Regulatory Improvement (RI)				Enablers			
N.	Id.	Description	Target date	No.	Deliverables	Resp.	Target Date
01	RPAS in SERA	<p>Transposition of amendment 43 to ICAO Annex 2 into the Standard European Rules of the Air (SERA). Amendment 43 allows international operations based on the 'special authorisation' per Art. 8 of Chicago Convention. In this case RPAS need:</p> <ul style="list-style-type: none"> <li>• Approval/certification of the RPAS and its constituents;</li> <li>• Approval of the RPAS operator (even if non-commercial); and</li> <li>• Licensing of the remote pilot.</li> </ul> <p>The transposition would offer a common basis to EU MS to issue said authorisations. The procedure to apply Art. 8 of the Chicago Convention intra-EU would however remain cumbersome in the absence of mutually recognised certifications. Obstacles to the internal EU market would not be completely removed.</p>	2013	01A	Opinion to transpose amendment 43 to ICAO Annex 2 into SERA <sup>6</sup>	EASA	2013
				01B	Adoption of amendment to SERA	DG-MOVE	2014
				01C	Identification of gaps for light RPAS within the existing national regulatory framework and of any differences between existing national regulatory frameworks	ECTL supported by ULTRA	2013
				01D	Proposed set of actions to fill the gaps and reduce differences for light UAS among EU MS	ECTL supported by ULTRA	2013

For this first set of common rules there are no critical dependencies with the R&D and with the 'complementary' roadmap, although studies underway by EUROCONTROL and ULTRA may contribute to better identify the actions needed in later timeframes.

<sup>6</sup> NPA 2012-10 published on 21 August 2012.

## 5.3 Intentions and consultation

### 5.3.1 EASA

#### **Intentions**

EASA has already published NPA 2012-10 in August 2012 to progress action 01A. The NPA announced intention to publish the Comment Response Document (CRD) and the Opinion in 2013.

#### **Consultation**

All EASA NPAs, including 2012-10 mentioned above, can be commented by any individual in the world through the web.

### 5.3.2 EUROCONTROL supported by ULTRA

#### **Intentions**

EUROCONTROL will be undertaking with the support of the ULTRA consortium a regulatory gap analysis. Main focus of this activity will focus on SES regulation and what regulation needs to be adapted and through the identification of regulatory gaps propose new regulation in support of RPAS integration.

#### **ULTRA:**

The ULTRA consortium is undertaking, under the framework of the ULTRA project (funded under EC FP7), a number of activities to assess the integration of Light RPAS in the aviation system and their routine operation in non-segregated airspace. One of these activities is focused on the regulatory and standardization framework for Light RPAS:

- Analysis of the regulatory and standardization gaps affecting Light RPAS and requirements for new/modified regulations and standards to enable the integration of Light RPAS in the aviation system and their routine operation in non-segregated airspace.
- Recommended set of actions to fill the gaps and progress towards a harmonized regulatory and standardization framework for Light RPAS in Europe.

Within the scope of the abovementioned planned work under the framework of the ULTRA project, the ULTRA consortium intends to support EUROCONTROL in fulfilling the actions identified in ASBU 0 layer 2 of the ERSG Roadmap (Regulatory part) as:

- 01C – Identification of gaps for light RPAS within the existing national regulatory framework and of any differences between existing national regulatory frameworks.
- 01D Proposed set of actions to fill the gaps and reduce differences for light UAS among EU MS

#### **ULTRA:**

The available resources to support EUROCONTROL within the frame of the ULTRA work (work package WP1) fall within the budget and corresponding effort included in the Grant Agreement between the European Commission and the ULTRA consortium.

#### **Consultation**

EURIOCONTROL consultation will be executed through the UAS consultation forum

#### **ULTRA:**

Any activity related to the ERSG Roadmap (Regulatory part) will be consulted within the ULTRA Consortium through its decision-making mechanisms (WP1 Consultation, Steering Committee and/or General Assembly).

## 6. Regulatory roadmap until 2018

### 6.1 Regulatory improvements (RI)

Eight regulatory improvements are proposed to be pursued before 2018:

- RI 11 enabling operations (including commercial) of light Remotely Piloted Aircraft (RPA), below 150 Kg operating mass, in VLOS, based on harmonised rules; harmonised rules are based on joint drafting (e.g. in JARUS), adoption by EASA after NPA consultation (for what is applicable also above 150 Kg), possible recommendation for transposition (below 150 Kg), including at ECAC level and adoption at national level;
- RI 12 adding further harmonised provisions to enable E-VLOS operations (i.e. observers);
- RI 13 aiming at harmonised civil/military safety objectives for airworthiness (i.e. to mitigate the risk to persons on the ground) which would enable manufacturing industry to develop platforms potentially purchased by either civil or military customers (damage to equipment, including the RPA, or to third party property is not considered a safety risk, but only an economic risk which can be mitigated through insurance);
- RI 14 aiming at an initial set of rules for VLL/B-VLOS, which is particularly challenging, including for the need to maintain connectivity of the data link at very low level (i.e. below 500 ft);
- RI 15 which is the 'break-through' to initially open, although with limitations, non-segregated controlled airspace (at least classes A, B and C) to RPAS flying under General Air Traffic (GAT) rules. I.e. either civil flights or State flights which elects to fly under GAT; this implies that the Detect and Avoid (D&A) function should be at least able to cope with 'co-operative' intruders (i.e. equipped at least with an ATC transponder); consequently segregated corridors may be necessary to reach said airspace;
- RI 16 aiming at early use of the System Wide Information Management (SWIM) by RPAS, in particular enabling controller-pilot data link communications via ground networks, since, in the case of RPAS, the 'cockpit' (i.e. the remote pilot station) is indeed on the ground;
- In this time frame EASA may produce (RI 17) a dedicated certification specification (CS-UAS) for RPAS, including below 150 Kg, should the legislator have extended the scope of Regulation 216/2008;
- Finally, RI 18 contains actions to enable long range operations beyond radio line-of-sight (BRLOS), typically using SATCOM, which requires proper rules for the oversight of the COM/SATCOM service providers.

A summary of mentioned eight RI is provided in the table below:

**EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED  
AIRCRAFT SYSTEMS (RPAS)**

**REGULATORY IMPROVEMENTS**

<b>Synchronized with</b>	<b>ICAO Aviation System Block Upgrade '1'</b> <b>(Module No. B1-90: Initial integration of RPA info non-segregated airspace)</b>	<b>ICAO Target date 2018</b>
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Assumed ICAO progress			Regulatory Improvements (RI)		
No.	Deliverables	Target date	No.	Identification	Target date
1	Guidance (i.e. ICAO RPAS Manual) for implementation of basic procedures for operating remotely piloted aircraft (RPA) in non-segregated airspace, including detect and avoid.	2014	11	Harmonised Visual Line of Sight (VLOS) operations of light RPA	2014
			12	Harmonised extended VLOS operations of light RPA	2015
2	Amendment Annex 1 for personnel competence	2016	13	Civil/military safety objectives for airworthiness (for RPAS of any mass)	2014 (civil)/ 2017 (civ/mil)
3	Amendment (new Part IV) Annex 6 for RPAS operators and operations; and Amendment Annex 8 for certification/approval of the RPAS and its constituents	2016	14	Initial rules for BVLOS/Very Low Level (VLL) RPA operations	2018
			15	Restricted RPAS en-route operations BVLOS/RLOS/IFR <sup>7</sup>	2016
			16	Early use of SWIM by RPAS (Controller-Pilot data link communication via ground network)	2017
4	Amendment Annex 8 for standardised certification of RPAS intended for international BVLOS operations	2016	17	Common certification specifications (CS) for RPAS of any mass	2018
5	Amendment Annex 10 (e.g. for oversight of command and control data link)	2016	18	Restricted RPAS operations BVLOS/BRLOS/IFR (supported by SATCOM)	2018

<sup>7</sup> This is the 'break-through' to initially open, although with limitations, non-segregated controlled airspace to RPAS flying under General Air Traffic (GAT) rules. I.e. either civil flights or State flights which elects to fly under GAT.

## 6.2 Regulatory actions and dependencies

This edition of the REG roadmap also identifies the principal regulatory actions which are necessary to achieve the RI listed in the previous paragraph and the organisations responsible to progress them as highlighted in the set of tables below.

### 6.2.1 RI 11 (VLOS)

15 regulatory actions are deemed necessary to progress RI 11. For seven of them drafting and initial issue is under responsibility of JARUS. Since the scope of the JARUS deliverables spans below and above 150 Kg, the JARUS material would be turned into EASA AMC/GM, as listed in the table below:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)							
Planned actions for ASBU 1							
Regulatory Improvement (RI)				Enablers			
N	Ident.	Description	Date	No.	Deliverables	Resp.	Target Date
11	Harmonised Visual Line of Sight (VLOS) operations	Development of harmonised requirements for civil operations of RPAS in non-segregated airspace in VLOS (direct unaided visual contact by the remote pilot). Promotion of subsequent (voluntary and discretionary) implementation of harmonised requirements by European States. Priority will be given to light RPA (<150 kg) which represent the emerging civil market in VLOS, but VLOS operations can be carried out also with heavier	2014 (JARUS)	11A	Harmonised JARUS requirements for remote pilot licence (RPAS of any mass)	JARUS	2013
				11B	Harmonised JARUS requirements for RPAS operators	JARUS	2013
			2017 (EASA AMC/GM)	11C	Harmonised JARUS specifications for Light Unmanned Rotorcraft Systems (CS-LURS <600 Kg)	JARUS	2013
				11D	Harmonised JARUS requirements for RPAS VLOS, including C2	JARUS	2014
				11E	Harmonised specifications for Light Unmanned Aeroplane Systems RPAS (CS-LUAS <600 Kg)	JARUS	2014
				11F	ATM procedures for GAT in VLOS in all airspace classes	ECTL	2014
				11G	Example of OPS Manual for natural persons or SMEs wishing to be certified as RPAS operators	Eurocae WG 93	2014
				11H	Harmonised requirements for	JARUS	2014

		machines, if so wished by the operator. EASA AMC/GM established through the NPA process, building upon JARUS deliverables.			Approved Training Organisations (ATO)		
			11I		Harmonised requirements for Design (DOA) and Production Organisations (POA) organisations for light RPAS	JARUS	2014
			11J		Promote transposition of harmonised requirements at national level in the entire ECAC area	ECAC	From 2013 onwards
			11K		AMC/GM for remote pilot licence (RPAS of any mass)	EASA	2016
			11L		AMC/GM for RPAS operators and ATO	EASA	2016
			11M		(150 Kg < CS-LURS < 600 Kg)	EASA	2016
			11N		AMC/GM for RPAS VLOS, including C2	EASA	2017
			11O		(150 Kg < CS-LUAS < 600 Kg)	EASA	2017
			11P		Guidance material for operations of light RPAS in VLOS	Eurocae WG 93	2014
			11Q		Guidance material for design, production and maintenance of light RPAS	Eurocae WG 93	2015



The sequence of activities is presented in the table below:

WBS RI 11					
2013	2014		2015	2016	2017
Harmonised requirements for remote pilot licence(s) (11A)	Harmonised requirements for Approved Training Organisations (ATO) (11H)		AMC/GM for remote pilot licence (RPAS of any mass) (11K)		
Harmonised requirements for RPAS operators (11B)	Example of OPS Manual for natural persons or SMEs wishing to be certified as RPAS operators (11G)		AMC/GM for RPAS operators and ATO (11L)		
Harmonised specifications for Light Unmanned Rotorcraft Systems (CS-LURS:) (11C)	150 Kg < CS-LURS (EASA) <600 Kg (11M)				
	Harmonised requirements for RPAS VLOS operations, including C2 (11D)	ATM procedures for GAT in VLOS in all airspace classes (11F)	AMC/GM for RPAS VLOS, including C2 (11N)		
	Harmonised specifications for Light Unmanned Aeroplane Systems RPAS (CS-LUAS) (11E)		150 Kg < CS-LUAS (EASA) <600 Kg (11O)		
	Harmonised requirements for Design (DOA) and Production Organisations (POA) organisations for light RPAS (11I)				
Promote transposition of harmonised requirements at national level (11J)					

Although there are actions foreseen in the R&D roadmap, mainly aiming at 'fact finding' on the current fragmented situation, no critical dependencies have been identified for VLOS operations.

Of particular relevance are however the planned studies on security of RPAS, including but not limited, to security of the command and control data link.

On the contrary, it is critical to clarify the insurance requirements for RPAS operators in the frame of Regulation 785/2004.

### 6.2.2 RI 12 (E-VLOS)

Five regulatory actions are deemed necessary to progress RI 12, as listed in the table below:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)							
Planned actions for ASBU 1							
Regulatory Improvement (RI)				Enablers			
N	Identification	Description	Target date	No.	Deliverables	Resp.	Target Date
12	Harmonised extended VLOS operations	Harmonised civil operations of RPA in non-segregated airspace (classes C, D, E, F and G), out of aerodromes and beyond direct unaided visual contact by the remote pilot. The latter supported by one or more RPA observers. Promotion of subsequent (voluntary and discretionary) implementation of harmonised requirements by European States. EASA AMC/GM established through the NPA process, building upon JARUS deliverables.	2015 (JARUS)	12A	Harmonised requirements for RPAS observers	JARUS	2015
			2018 (EASA)	12B	Harmonised requirements for RPAS Extended VLOS RPAS operations (including communications among RPAS crews)	JARUS	2015
				12C	ATM procedures for GAT in extended VLOS in airspace classes C, D, E, F and G	ECTL	2015
				12D	Promote transposition of harmonised requirements at national level	ECAC	From 2016 onwards
				12E	AMC/GM for E-VLOS, including competency of RPAS observers	EASA	2018
				12F	Guidance material for operations of light RPAS in EVLOS	Eurocae WG 93	2016

The sequence of activities is presented in the table below:

WBS RI 12					
2014	2015		2016	2017	2018
	Harmonised requirements for RPAS observers (12A)		AMC/GM for E-VLOS, including competency of RPAS observers (12E)		
	Harmonised requirements for RPAS Extended VLOS RPAS operations (12B)	ATM procedures for GAT in extended BVLOS in airspace classes C, D, E, F and G (12C)			
	Promote transposition of harmonised requirements at national level (12D)				

In addition to the insurance aspects, applicable also to RI 11, critical dependencies exist with the R&D roadmap for:

- Studies on security aspects when the crews are dispersed on the surface in the open air; and
- Human factors, including Crew Resource Management in a totally new environment.

### 6.2.3 RI 13 (safety objectives for airworthiness)

Six regulatory actions are deemed necessary to progress RI 13, as listed in the table below. One action is for EASA to publish an Acceptable means of Compliance (AMC) for the airworthiness safety objectives for RPAS (so called '1309'), building upon the work by JARUS and Eurocae WG 73:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)							
Planned actions for ASBU 1							
Regulatory Improvement (RI)				Enablers			
N	Identification	Description	Target date	No.	Deliverables	Resp.	Target Date
13	Civil/military safety objectives for airworthiness	Manufacturing industry can produce platforms for 'dual-use' (i.e. civil or military, depending on the customer). But to do so harmonised safety objectives (or targets; e.g. 1309) are necessary.	2014/7	13A	Draft RPAS safety objectives for airworthiness (RPA of any weight)	JARUS	2013 Q1
				13B	WG 73 Report on alternative approaches on UAS safety objectives for airworthiness of RPA > 150 Kg and subsequent recommendations	Eurocae	Mid 2013
				13C	WG 93 Report on UAS safety objectives for airworthiness of RPA < 150 Kg	Eurocae	2014
				13D	Decision on AMC for civil UAS safety objectives for airworthiness of RPA > 150 Kg	EASA	2015
				13E	Harmonised European civil-military UAS safety objectives for airworthiness	EDA	2016
				13F	Revision of AMC for civil UAS safety objectives for airworthiness (based on the recommendation for European civil/military harmonisation)	EASA	2017

The sequence of activities is presented in the table below:

WBS RI 13					
2013		2014	2015	2016	2017
Draft RPAS safety objectives for airworthiness (RPA of any weight) (13A)	WG 73 Report on alternative approaches on UAS safety objectives for airworthiness of RPA > 150 Kg (13B)	WG 93 Report on UAS safety objectives for airworthiness of RPA < 150 Kg (13C)	Decision on AMC for civil UAS safety objectives for airworthiness of RPA > 150 Kg (13D)	Harmonised European civil-military UAS safety objectives for airworthiness (13E)	Revision of AMC for civil UAS safety objectives for airworthiness (based on the recommendation for European civil/military harmonisation) (13F)

#### 6.2.4 RI 14 (VLL-BVLOS)

Seven regulatory actions are deemed necessary to progress RI 14, as listed in the table below. None of them is under responsibility of EASA:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)							
Planned actions for ASBU 1							
Regulatory Improvement (RI)				Enablers			
N	Identification	Description	Target date	No.	Deliverables	Resp.	Target Date
14	BVLOS/Very Low Level (VLL) RPA operations	RPA can fly in volumes where no manned aviation can safely possible (e.g. in dangerous clouds or flares over industrial chimneys). They can also fly at very low level of in close proximity of obstacles, inside urban areas, or anyway where manned aviation operations, if not prohibited, would be very risky	2018	14A	Harmonised requirement for equipment for BVLOS/VLL	JARUS	2014
				14B	Study on use of VLL (i.e. not above 400 ft) uncontrolled airspace in Europe	EUROCONTROL	2014
				14C	MASPS for BVLOS/VLL equipment	Eurocae	2015
				14D	MOPS for BVLOS/VLL equipment (including VLL C2 and obstacle avoidance and D&A for non-cooperative targets)	Eurocae	2016
				14E	Proposal for common SERA rules to regulate use of VLL airspace	EUROCONTROL/ EASA	2017
				14F	AMC/GM for equipment for BVLOS/VLL	EASA	2018
				14G	Adoption of common rules to regulate use of VLL airspace	DG-MOVE	2018

The sequence of activities is presented in the table below:

WBS RI 14					
2013	2014	2015	2016	2017	2018
	Harmonised requirement for equipment for BVLOS/VLL (14A)	MASPS for BVLOS/VLL equipment (14C)	MOPS for BVLOS/VLL equipment (including VLL C2 and obstacle avoidance and D&A for non-cooperative targets) (14D)	Proposal for common SES rules to regulate use of VLL airspace (14E)	Adoption of common SES rules to regulate use of VLL airspace (14G)
	Study on use of VLL (i.e. not above 400 ft) uncontrolled airspace in Europe (14B)	AMC/GM for equipment for BVLOS/VLL (14F)			

In addition to the insurance requirements, some critical dependencies have been identified with R&D actions:

- Performance (availability, integrity, etc...) of the command and control data link at VLL;
- Human factors;
- Airspace structures, rules and procedures;
- Security;
- Contingency;
- Detect and avoid in relation to weather, terrain and obstacles.

Sufficiently mature technologies for the above are expected in 2018.

### 6.2.5 RI 15 (Initial IFR in controlled airspace)

This is the most ambitious RI comprised in the present edition of this REG roadmap. In fact a complex set of regulatory activities is needed to progress and synchronise, from more technical aspects (e. g. detect and avoid and command and control, not mention related spectrum issues) to legal aspects (e.g. amendment of Regulation 216/2008 to certify also non-commercial RPAS operators, since in fact the risk for third parties is exactly the same, whether the operation is commercial or not). In summary the following 20 regulatory actions (six for EASA) are deemed necessary:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) Planned actions for ASBU 1							
Regulatory Improvement (RI)				Enablers			
No	Ident.	Description	Target date	No.	Deliverables	Resp.	Target Date
15	Restricted RPAS en-route operations (BVLOS/RLOS/IFR) in controlled airspace classes A, B C	Civil operations of RPA based on common EU rules in non-segregated airspace (classes A, B and C), out of major TMAs, beyond direct unaided visual contact by the remote pilot, in direct Radio Line-of-Sight (RLOS) and under Instrument Flight Rules (IFR). Segregated 'corridors' may be necessary to reach such airspace.	2016	15A	Gap analysis of SES Regulations to accommodate RPAS	ECTL	2013
				15B	Target Level of Safety for 'Detect and Avoid' (D&A) in the total aviation system	JARUS	2013
				15C	Target Level of Safety objectives for 'command and control' (C2) in the total aviation system	JARUS	2013
				15D	Legislative proposal to amend Basic SES Regulations	DG-MOVE	2016
				15E	Opinion to amend Basic Regulation 216/2008	EASA	2015
				15F	Legislative proposal to amend Basic Regulation 216/2008 (certification of all CAT and SPO RPAS operators)	DG-MOVE	2016
				15G	Initial CONOPS for Detect and Avoid (MIDCAS)	EDA	2014
				15H	MASPS to allow RPA to operate class A B and C	Eurocae	2014
				15I	MASPS for C2	Eurocae	2014
				15J	MOPS for command and control	Eurocae	2015
15K	Proposed amendments	ECTL	2015				



					to existing SES IRs		
				15L	Adoption amendments to existing SES IRs	DG-MOVE	2016
				15M	AMC/GM for RPAS BVLOS/RLOS/IFR operations	EASA	2016
				15N	Availability of electromagnetic spectrum for command and control and in particular possibility of safely using non-aeronautical spectrum	DG-CNECT	2015 (WRC)
				15O	MOPS for 'detect and avoid' in relation to cooperative intruders	Eurocae	2016
				15P	Opinion on common rules for RPL (above 150 Kg)	EASA	2015
				15Q	Adoption common rules for RPL	DG-MOVE	2016
				15R	ETSOs for command and control	EASA	2017
				15S	ETSOs for 'detect and avoid'	EASA	2017
				15T	ATM procedures for GAT in BVLOS/RLOS/IFR in airspace classes A, B, C	ECTL	2016

The sequence of activities is presented in the table below:

WBS RI 15					
2013		2014	2015	2016	
Gap analysis of SES Regulations to accommodate RPAS (15A)	Legislative proposal to amend Basic SES Regulations (15D)		Proposed amendments to existing SES IRs (15K)	Adoption amendments to existing SES IRs (15L)	
		Opinion to amend Regulation 2016/2008 (15E)		Legislative proposal to amend Regulation 216/2008 (15F)	
Target Level of Safety for 'Detect and Avoid' (D&A) in the total aviation system (15B)	Initial CONOPS for Detect and Avoid (MIDCAS) (15G)	MASPS for D&A (15H)	MOPS for 'detect and avoid' (15O)	AMC/GM for RPAS BVLOS/RLOS/IFR operations (15M)	
				ETSOs for 'detect and avoid' (15S)	
				ATM procedures for GAT in BVLOS/RLOS/IFR in airspace classes A, B, C (15T)	
Target Level of Safety objectives for 'command and control' (C2) in the total aviation system (15C)	MASPS for C2 (15I)	MOPS for command and control (15J)	Electro-magnetic spectrum (15N)	ETSOs for command and control (15R)	
			Opinion on common rules for RPL (15P)	Adoption common rules for RPL (15Q)	

In addition to insurance, the following critical dependencies have been identified with R&D activities:

- Interoperability & compatibility requirements;
- Concepts and technologies, including various levels of automation, for insertion into non-segregated controlled airspace;
- Performance requirements (i.e. availability, continuity, integrity and timeliness of the command and control data link) and procedures (i.e. lost link) for C2;
- Flight plans for RPAS;
- D&A able to cope with cooperative intruders;
- Human factors including psychological aspects for recruitment of Remote Pilots;
- Security of C2.

Sufficiently mature technologies for accommodation of RPAS into non-segregated airspace classes A, B and C, under IFR, are expected to be available in 2016.

#### 6.2.6 RI 16 (Early use of SWIM)

Three regulatory actions are deemed necessary to enable the early use of SWIM by RPAS:

EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)							
Planned actions for ASBU 1							
Regulatory Improvement (RI)				Enablers			
N	Identification	Description	Target date	No.	Deliverables	Resp.	Target Date
16	Early use of SWIM by RPAS (Controller-Pilot data link communication via ground network)	System Wide Information Management (SWIM), being developed by SESAR JU, will allow all actors of ATM, whether in flight or on the ground, to participate to a common network for information exchanges. RPAS can participate to SWIM by directly connecting the RPS to the ground network supporting SWIM, based on specific procedures	2017	16A	Technical standards for use of SWIM by RPS	Eurocae	2015
				16B	AMC for use of SWIM by RPS	EASA	2017
				16C	Procedures for interactions between RPs and ATM via SWIM	EUROCONTROL	2017

The sequence of activities is presented in the table below:

WBS RI 16		
2015	2016	2017
Technical standards for use of SWIM by RPS (16A)		AMC for use of SWIM by RPS (16B)
		Procedures for interactions between RPs and ATM via SWIM (16C)

### 6.2.7 RI 17 (CS-UAS)

Four regulatory actions are envisaged to:

- develop CS-UAS (for large RPA above 600 Kg) and to possibly better harmonise the airworthiness process between the civil and military community;
- extend the scope of Regulation 216/2008 and related rules to RPAS comprising RPA of any mass, on the understanding that:
  - below a certain threshold to be determined (e.g. 20-25 Kg or other criteria) there would be no formal airworthiness processes, but only safety assessment of the system, under responsibility of the RPAS operator; and
  - that design approvals to RPAS comprising RPA, above said threshold but below 150 Kg operating mass, would continue to be issued by competent authorities at national level, even when based on common and proportionate rules developed by EASA;
  - actions 15E and 15F above, already cover the development of an EASA Opinion to amend Regulation 216/2008 and subsequent legislative proposal;
  - extension of the scope of EASA CS-LURS and CS-LUAS below 150 Kg would be progressed in the subsequent timeframe 2019-2023, after adoption of the legislative proposal by the legislator.

## EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)

### Planned actions for ASBU 1

Regulatory Improvement (RI)				Enablers			
N	Identification	Description	Target date	No.	Deliverables	Resp.	Target Date
17	Airworthiness processes and Certification Specification (CS) for RPAS including for large RPA (> 150 Kg)	In addition to the enablers provided by actions 11 and 12, certification specifications for RPAS whose RPA MTOM is greater than 150 Kg are necessary, as well as harmonisation of the airworthiness processes. Scope of Regulation 216/2008 would be extended below 150 Kg	2018	17A	Common certification specification for large RPAS (above 150 Kg) <sup>8</sup>	EASA	2018
				17B	Recommendation for harmonised processes for airworthiness approvals (below 150 Kg)	JARUS (to be confirmed)	2014
				17C	Harmonized military certification specification (EMACC*) for AW approvals	EDA MAWA	2014
				17D	Harmonized military processes for AW approvals (EMAR 21**)	EDA MAWA	2014

\* European Military Airworthiness Certification Criteria

\*\* European Military Airworthiness Requirements

#### 6.2.8 RI 18 (BRLOS)

12 regulatory action are necessary to enable the use of SATCOM for command and control of civil RPAS. In particular, while implementing rules for certification of the related service provider are already available (i.e. regulation 1035/2011), these providers are not covered by current definition of COM service providers (today limited to providers of communications for ATC). Therefore, also Regulation 216/2008 required amendment.

The mentioned 12 regulatory actions are summarised in the table below:

<sup>8</sup> The airworthiness processes until 2018 are defined in current edition of Part 21

## EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)

### Planned actions for ASBU 1

Regulatory Improvement (RI)				Enablers			
N	Identification	Description	Target date	No.	Deliverables	Resp.	Target Date
18	Restricted RPAS operations BVLOS/BRLOS/IFR (supported by SATCOM) <sup>9</sup>	Amendment 43 to ICAO Annex 2 makes it possible to consider the RPA, the RPS and the integrated RPAS aeronautical products. The airworthiness processes have to be amended to implement this concept in the EU. In this context provisions for safety oversight of COM SPs for C2 need to be promulgated.	2018	18A	Legislative proposal to amend Basic Regulation 216/2008 (separate approval of RPA, RPS and C2 service)	DG-MOVE	2016
				18B	Rules on certification of pan-European SATCOM service providers for command and control	EASA	EC Regulation 1035/2011 entered into force 07 Nov. 2011 <sup>10</sup>
				18C	CONOPS on C3 for RPAS	Eurocae	2013
				18D	Study on certification requirements and performance standards of SATCOM links for UAS C2/ATC/S&A	ESA	2014
				18E	Initial C2 requirements validation from first demonstration of C2 operation via satcom (DeSIRE)	ESA/EDA	2014
				18F	Comprehensive C2 requirements validation from second demonstration of C2 operation via satcom	ESA/EDA	2017
				18G	Opinion to introduce RPAS specific airworthiness processes (Part 21-RPAS)	EASA	2017

<sup>9</sup> to be synchronized with R&D roadmap for demonstration of C2 over SATCOM, including in-orbit

<sup>10</sup> <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:271:0023:0041:EN:PDF>

				18H	Study on latency requirements for ATC communications over SATCOM C2	ECTL	2017
				18I	MOPS for C2 over SATCOM	Eurocae	2017
				18J	Adoption of Part 21-RPAS	DG-MOVE	2018
				18K	Decision on AMC/ETSO on approval of C2 via SATCOM	EASA	2018
				18L	Certification of the pan-European SP of C2 via SATCOM	EASA	2018

The sequence of activities is presented in the table below:

WBS RI 18							
2011	12	2013	2014	15	16	2017	2018
					Legislative proposal to amend Basic Regulation 216/2008 (18A)	Opinion to introduce Part 21-RPAS (18G)	Adoption of Part 21-RPAS (18J)
		CONOPS on C3 for RPAS (18C)	Study on certification requirements and performance standards of SATCOM links for UAS C2/ATC/S&A (18D)			Study on latency requirements for ATC communications over SATCOM C2 (18H)	Decision on AMC/ETSO on approval of C2 via SATCOM (18K)
			Initial C2 requirements validation from first demonstration of C2 operation via satcom (18E)			MOPS for C2 over SATCOM (18I)	
							Comprehensive C2 requirements validation from second demonstration of C2 operation via satcom (18F)
Rules on certification of pan-European SATCOM service providers for command and control (18B)							Certification of the pan-European SP of C2 via SATCOM (18L)

The critical dependency with R&D roadmap is for the definition of performance requirements for C2 via SATCOM, including in terms of availability, continuity, integrity and timeliness, which is expected by 2017.



## 6.3 Intentions and consultation

### 6.3.1 EASA

#### Intentions

EASA Rulemaking Programme 2013-16 includes Rulemaking Tasks RMT.0229 and RMT.0230, to be activated in the near future, aiming at producing rulemaking deliverables for RPAS operators, operations and remote pilots.

The Terms of Reference (ToR) for such RMTs should be adopted at beginning of 2014. Subject to approval by the Regulatory Advisory Group (RAG = the competent authorities of the States participating to EASA), by the Safety Standard Consultative Committee (SSCC) and by the Agency' Rulemaking Director, the ToR may include development of:

- Implementing Rules (ref. action 15N) and AMC (15P) for remote pilots, subject to availability of recommended harmonised requirements produced by JARUS;
- AMC for RPAS operators (15Q) and operations (15R), equally subject to availability of recommended harmonised requirements produced by JARUS;
- ETSOs for the airborne and ground constituents of 'command and control' (C2; ref. action 15S) and of 'detect and avoid' (D&A; 15T) subject to availability of Eurocae MOPS;
- AMC for use of SWIM by remote pilot/remote pilot stations, equally subject to availability of industry standards;
- AMC/ETSO for use of SATCOM for C2, also subject to availability of industry standards.

Same ToR may also include development of an Opinion (15E) to amend Basic Regulation 216/2008 to:

- a) Extend the scope of the common rules to RPAS comprising and RPA of any mass, but leaving to Member States the responsibility of issuing design approvals below 150 Kg;
- b) Establish separate certification of the RPA, the RPS and the RPAS in line with amendment 43 to Annex 2 to the Chicago Convention;
- c) Introduce certification of RPAS operators, whether commercial or non-commercial;
- d) Introduce certification of COM service providers for command and control;
- e) Establish specific essential requirements for RPAS and related organisations, personnel and operations.

RMT.0235 should also be activated, aiming at development of:

- Airworthiness safety objectives (ref. action 13D) for RPAS subject to availability of Eurocae report on the matter and subsequent revision to harmonise with the MIL community (13F) subject to initiative by EDA;
- One or more Certification Specifications (CSs) for RPAS comprising an RPA with MTOM of 150 Kg or more.

#### Consultation

The EASA Rulemaking Programme and ToR for all Rulemaking Tasks are adopted after consultation of RAG and SSCC.

All EASA NPAs are widely open to comment by any individual in the world through the web.

### 6.3.2 EDA

#### **Intentions**

The EDA UAS/RPAS Air Traffic Insertion activities include the provision of harmonised European Airworthiness Requirements and the undertaking of demonstration projects on selected technical topics with regard to military priorities. These priorities are determined under consideration of immediate and short term demand for military operations.

The projects aim on the demonstration of acceptable system solution for integrated UAS/RPAS operations as well as the provision of technical and operational standard proposals and recommendations.

The UAS/RPAS aspects will be implemented through the Military Airworthiness Authorities (MAWA) forum.

The demonstration projects will be undertaken in the framework of a Joint Investment Program Unmanned Aircraft Systems under the Management of EDA pMS.

All activities are determined to harmonise military regulations with civil aviation safety requirements and regulations and are intended to be carried out in close cooperation with aviation safety authorities and stakeholders.

#### **Consultation**

Topics related to ERSG roadmap tasks will be coordinated through consultation in the MAWA forum, the JIP UAS Management Committee and Stakeholder Advisory Groups to dedicated projects under the JIP UAS.

### 6.3.3 EUROCAE

#### ***Airworthiness Safety Objectives (13B)***

#### **Intentions**

*Eurocae is a recognized European standard organization gathering members of Industry, Research Centers and Authorities. The Working Group WG73 was established to deliver consensual standards and guidance material to ensure the safety and regularity of unmanned aircraft (UA) Systems and their operations in non-segregated airspace.*

Eurocae WG73, through its "1309" Focus team, shall deliver to the ERSG a report presenting alternative approaches on UAS safety objectives for airworthiness of RPA > 150 Kg and subsequent recommendations.

While some overall principles have been proposed regarding System Safety Objectives, there is no firm and detailed criteria yet which have been consensually agreed that would allow conducting System Safety Assessment in a similar way that is performed in the case of manned aircraft Type Certification.

The purpose of the Eurocae WG73 report will be:

- on one hand, to sum up the results of the debates and reviews that have been taking place over the past years within Eurocae WG73 involving various participants from Industry, Research Centers and Authorities
- on the other hand, to provide a set of recommendations to the official bodies, namely the EASA and European Commission RPAS Steering Group that could support

the establishment of a specific UAS AMC 1309 to be included in a future set of UAS Type Certification requirements.

This report shall tackle Top Level Issues such as failure severity definition and probability requirements or Airworthiness and Operational interrelation aspects. For each of these issues, on-going potential alternative approaches and rationales shall be identified and subsequent recommendations be established.

In addition Eurocae WG 93 (light UAS) intends to provide the following deliverables:

<b>Document type</b>	<b>Document title</b>	<b>Due date (of final working group draft)</b>
OSD, SPR, INTEROP	Safety, Performance and Interoperability requirements for VLOS operations	Q3 2013
MASPS	Command, Control and Communications MASPS for VLOS operations	Q3 2013
FINAL REPORT	EUROCAE WG93 BVLOS Operations – Scenario Capture	Q4 2013
FINAL REPORT	EUROCAE WG93 VLOS Operations – Guidance to Regulators	Q4 2014

### **Resources**

Eurocae members work on a voluntary basis. Notwithstanding the preparatory work of these past years through the various working group meetings, three to four working sessions (each 1 or 2 days) from October 2012 till March 2013 involving up to 10 members of the WG73 1309 Focus Team are considered necessary to review the progress of the report until the establishment of its final draft version to be submitted to the approval of the WG73 Plenary Session currently scheduled in March 2013. In between, individual members will invest their own efforts to prepare their inputs and comments to the on-going draft versions of the report. The timely delivery of any planned Eurocae deliverables heavily depends on the available resources.

### **Consultation**

The consultation is as per Eurocae working rules i.e. first establishment of a working version agreed at subgroup level, then submittal of this version for comments by the entire WG73 and approval at the Plenary Session. The report is then submitted to Eurocae Secretarita which launches a last broader consultation through its members until approval of the Technical Council.

### **6.3.4 EUROCONTROL**

#### **Intentions**

EUROCONTROL will undertake the identified tasks to ensure full ATM integration considering the existing ATM performance requirements. Through the maintenance of existing guidance material and related studies EUROCONTROL will continue to support the Integration effort. When required EUROCONTROL will use the expertise that is available within the agency and it's member States.

The work that will be undertaken by EUROCONTROL is aimed at ensuring that the RPAS integration will not negatively impact manned aviation.

### **Consultation**

EUROCONTROL will use its established UAS consultation mechanism

### **6.3.5 EUROPEAN CIVIL AVIATION CONFERENCE (ECAC)**

#### **Intentions**

The Directors General of the Member States of the European Civil Aviation Conference have agreed in principle that the organisation might provide a forum, in close liaison with the European Commission and the European RPAS Steering Group, in which proposals might in due course be considered for the safety regulation of RPAS below 150kg. Such proposals are being developed by the Joint Authorities for Rulemaking on Unmanned Systems, in the context of the EU initiative to establish a strategy for RPAS in Europe.

#### **Consultation**

Once they are ready for submission, the proposals for the safety regulation of RPAS below 150kg will be circulated to ECAC Directors General by the ECAC Secretariat, for their review. The responses will be collated, and any necessary discussion facilitated, again by the ECAC Secretariat.

### 6.3.6 JARUS

#### **Intentions**

JARUS is a group of experts from the National Aviation Authorities (NAAs) and the European Aviation Safety Agency (EASA).

Its purpose is to recommend a single set of technical, safety and operational requirements for the certification and safe integration of Unmanned Aircraft Systems (UAS) into airspace and at aerodromes. This requires review and consideration of existing regulations and other material applicable to manned aircraft and the drafting of specific UAS guidance material to cover the unique features of UAS.

The material will be made available to interested parties such as, ICAO, EASA, NAAs and industry, for consideration and use.

The objective of JARUS is to provide guidance material aiming to facilitate each authority to write their own requirements and to avoid duplicate efforts.

If endorsed by the authorities, this harmonised guidance, both technical and operational, would facilitate the validation process of foreign certificates

The primary output of JARUS will be recommended certification specifications and operational provisions, which can be used during the approval process of a UAS. The work of JARUS will take into account emerging ICAO standards, recommended practices and guidance material on the matter.

The following will be products produced by the various working groups:

- Guidance Material;
- Provisions for commercial and corporate UAS operations;
- UAS Certification Specifications;
- Systems safety assessment (AMC 1309) for all categories of unmanned aircraft and related systems;
- Provisions for Detect and Avoid/Sense and Avoid (DA/SAA);
- Provisions for Command and Control (C2) data link, including oversight of the related Communication (COM) Service providers;
- Provisions governing organizations involved in the design, production, operation and continuing airworthiness of unmanned aircraft systems;
- Provisions for remote pilot licensing and personnel competence

#### **Consultation**

The deliverables of each working group, once agreed within that working group, will be provided for public consultation at least once.

The JARUS plenary meeting, as the highest institution of JARUS, has the final competence to agree or disagree with the working group's intent to go for the public consultation. Once the plenary meeting agrees, the start date of the consultation will be defined and the deliverable will then first be sent, together with the respective meeting minutes, to the individual JARUS members.

The standard consultation period is 90 days, but the working group can decide to propose a different consultation period.

All deliverables will be published for public consultation on the JARUS webpage: [www.jarus-rpas.org](http://www.jarus-rpas.org).

Comments to the published deliverables can be provided on the JARUS webpage by using the online comment form.

All comments and proposed alternative text will be read and considered by the working group before the next version is published, but no commitment can be given to answer every comment individually. This will be beyond the JARUS resources.

The final version, once agreed by the working group, will be presented to the JARUS plenary together with a request to publish the deliverable on the JARUS webpage.

The JARUS plenary meeting has the final competence to agree or disagree with the publication.

Once published on the JARUS homepage, the deliverables are available to interested parties such as, ICAO, EASA, NAAs and industry, for consideration and use.

## 7. Regulatory roadmap until 2023

### 7.1 Regulatory Improvements

The present first edition of the REG roadmap is not detailed for the timeframes until respectively 2023 and 2028. For them only the possible regulatory improvements (RI) are identified, but not the specific necessary regulatory actions.

In particular nine RIs are identified for the period 2019-23:

- RI 21 to improve RPAS procedures for en route (continental and oceanic) operations, mixed with manned traffic;
- RI 22 to improve RPAS arrival and departure procedures in terminal areas, again mixed with manned traffic;
- RI 23 for complete integration of RPAS into SWIM;
- RI 24 aiming at initial procedures enabling RPAS to taxi, take-off and land at aerodromes used also by manned traffic;
- RI 25 to consolidate, after the first years of experience, the implementing rules on RPAS operators and operations, including for command and control;
- RI 26 for possible revision of the requirements for RPAS equipment (e.g. ADS-B? ACAS-X? else);
- RI 27 to possibly amend the initial airworthiness processes for design and production organisations only involved in RPAS, as well as extending the scope of EASA CSs below 150 Kg and revise them;
- RI 28 for the evolution of the requirements on detect and avoid, depending on the progress of the technology, but possibly also incorporating 'privacy by design' (e.g. not downlinking wide-band high resolution video images, but only synthetic information as necessary to avoid obstacles and other traffic);
- And finally RI 29 aiming at the development of specific medical requirements for RPAS remote pilots.

A summary of said RIs is provided in the table below:

## EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS)

### REGULATORY IMPROVEMENTS

<b>Synchronized with</b>	<b>ICAO Aviation System Block Upgrade '2' (Module No. B2-90: RPA integration in traffic)</b>			<b>ICAO Target date 2023</b>	
Assumed ICAO progress			Regulatory Improvements (RI)		
No.	Deliverables	Target date	No.	Identification	Target date
1	Improve the remotely piloted aircraft (RPA) access to non-segregated airspace (PANS-ATM)	2019	21	Improve RPAS procedures en-route (continental and oceanic)	2020
			22	Improve RPAS procedures in terminal areas (arrival and departure)	2021
2	Standardize the C2 link failure procedures and agree on a unique squawk code for C2 link failure	2019	23	Integration of the RPS into the ground ATM information network (SWIM)	2020
3	Refine the RPAS operational procedures	2020	24	Initial RPAS procedures at aerodromes (taxi, take-off and landing)	2022
4	Refine communication performance requirements	2020	25	Implementing rules on RPAS OPS and operators (including C2)	2022
5	Integration ADS-B and RPAS	2021	26	Revision of requirements on RPAS equipment	2023
6	Improvement of the remotely piloted aircraft systems (RPAS) approval/certification processes	2022	27	Amendment of Part 21-RPAS and of related CSs	2023
7	Further development of 'detect and avoid'	2023	28	Revision requirements on 'detect and avoid'	2023
8	Development of specific medical and psychological requirements for remote pilots	2023	29	Integration of remote pilots into Part MED	2023



## 8. Regulatory roadmap until 2028

### 8.1 Regulatory Improvements

Equally, for the timeframe 2024-2028 this edition of the REG roadmap only contains regulatory improvements, but not detailed list of regulatory actions. Eight RIs are envisaged:

- RI 31 for possible revision of CSs and AMCs for RPAS based on the accrued experience;
- RI 32 aiming at possibly harmonising the rules for State non-MIL operations, which are believed to constitute a significant part of the market and possibly at establishing common rules for RPAS operations by public entities at EU level, not under jurisdiction of any Member State (e.g. FRONTEx);
- RI 33 for 'file and fly' intra EU, where the 'special authorization' per Article 8 of the Chicago Convention would be granted through the mere acceptance of the flight plan, which presents particular challenges not from the technical, but from the political and legal point of view;
- RI 34 aiming at possibly enhancing the ETSOs on detect and avoid.
- RI 35 for the revision of link failure procedures, including for automatic position reporting after the command and control failure;
- RI 36 for the revision of the rules for command and control via COM service providers different from the RPAS operators (ground networks and/or SATCOM);
- RI 37 for revision of the separation criteria among RPAS and between RPAS and manned traffic; and
- Finally RI 38 for integration of new surveillance techniques in RPAS (e.g. ADS-B).

A summary of mentioned RIs is provided in the table below:

**EUROPEAN REGULATORY ROADMAP FOR REMOTELY PILOTED  
AIRCRAFT SYSTEMS (RPAS)**

**REGULATORY IMPROVEMENTS**

<b>Synchronized with</b>	<b>ICAO Aviation System Block Upgrade '3'</b> <b>(Module No. B3-90: RPA transparent management)</b>			<b>ICAO Target date 2028</b>	
<b>Assumed ICAO progress</b>			<b>Regulatory Improvements (RI)</b>		
<b>No.</b>	<b>Deliverables</b>	<b>Target date</b>	<b>No.</b>	<b>Identification</b>	<b>Target date</b>
1	Standards for access to most airspace for selected RPAS without specific authorization or experimental aircraft waiver	2028	31	Revised CSs (and related AMCs) for RPAS	2028
			32	Safety regulation of State non-MIL and public EU flights	2026
			33	'File and fly' (i.e. 'special authorization' per Art. 8 Chicago Convention granted to intra-EU flights through simple acceptance of flight plan)	2028
2	Technology improvements for D&A	2028	34	Revised ETSOs for D&A	2028
3	Standardized C2 link failure procedures	2028	35	Revised link failure procedures including for automatic position reporting after C2 failure	2028
4	New special purpose transponder code for C2 link failure	2028			
5	Capability for automatic position reporting to ATC, for C2 link failure over high seas	2028	36	Rules for 2 <sup>nd</sup> generation of C2 via SATCOM	2028
6	Revised separation criteria and/or handling procedures (i.e. moving airspace)	2028	37	Revised RPAS separation criteria	2028
7	ADS-B-in on most RPA classes	2028	38	AMC for integration of ADS-B-in on RPAS	2028

## 9. Integrated overview of the R&D and regulatory tasks

The following tables provide an integrated overview of the R&D and regulatory tasks to be undertaken and their interactions

Operation VLL/VLOS	Very low level (VLL) operations (alias non-standard VFR or IFR operations) below the typical IFR and VFR altitudes for manned aviation: i.e. not to exceed 400 ft above ground level; they comprise <b>Visual line of sight (VLOS)</b> in a range not greater than 500 meters from the remote pilot, in which the remote pilot maintains direct unaided visual contact with the remotely piloted aircraft							
	2013	2014	2015	2016	2017	2018	2023	2028
Objectives	<b>Accommodation</b> of VLL/VLOS into civil aviation, including <b>harmonised</b> requirements on certification of RPAS, personnel competence, RPAS operators and operations. Operations may be subject to limitations, in particular very restricted at aerodromes.				Further <b>integration</b> for RPA of any mass and alleviation of restrictions/limitations			<b>Evolution</b> of operation and removal of the threshold of 150 Kg from Regulation 216/2008
Major regulatory milestones	Harmonised requirements for VLOS remote pilot licence (VRPL) and VLOS operations and operators (deliverables 11A, 11B, 11D)	Endorsement of harmonised requirements by ECAC (Del. 11J)	National regulation in place in most MS, based as far as possible on harmonized requirements in order to contribute to the Single Market for RPAS in Europe					Removal of the threshold of 150 Kg from Regulation 216/2008 (Regulatory Improvement 31)
		ATM procedures for GAT in VLOS in all airspace classes (Del. 11F)						
		Harmonised certification specifications (Del. 11C, 11E, 13C, 13D)	Harmonised European civil-military UAS safety objectives for airworthiness (Del. 13E)					
Necessary R&D enablers	In flight demonstration of best practices (activity 14)							
	Awareness for security (Activity 1)	C2 requirements for use in urban areas (Activity 2)		C2 technology available on the market				

<b>Operation VLL/ E-VLOS</b>	<b>Very low level (VLL)</b> operations (alias non-standard VFR or IFR operations) below the typical IFR and VFR altitudes for manned aviation: i.e. not to exceed 400 ft above ground level; they comprise <b>Extended Visual Line of Sight (E-VLOS)</b> where, beyond 500 meters, the pilot is supported by one or more observers, in which the crew maintains direct unaided visual contact with the remotely piloted aircraft							
	2013	2014	2015	2016	2017	2018	2023	2028
Objectives	<b>Accommodation</b> of VLL/VLOS into civil aviation, including <b>harmonised</b> requirements on certification of RPAS, personnel competence, RPAS operators and operations. Operations may be subject to limitations, in particular very restricted at aerodromes.						Further <b>integration</b> for RPA of any mass and alleviation of restrictions/ limitations	<b>Evolution</b> of operation and removal of the threshold of 150 Kg from Regulation 216/2008
Major regulatory milestones			Harmonised requirements for RPAS observers and operations (Del. 12A, 12B)	National regulation in place in most MS, based as far as possible on harmonized requirements in order to contribute to the Single Market for RPAS in Europe				
			ATM procedures for GAT in extended VLOS in airspace classes C, D, E, F and G (Del. 12C)					
Necessary R&D enablers	In flight demonstration of best practices (activity 14)							
		C2 requirements for use in urban areas (Activity 2)	Human factors for E-VLOS (activity 3)	C2 technology available on the market				

<b>Operation VLL/ BVLOS</b>	<b>Very low level (VLL)</b> operations (alias non-standard VFR or IFR operations) below the typical IFR and VFR altitudes for manned aviation: i.e. not to exceed 400 ft above ground level; they comprise <b>beyond Visual Line of Sight (BVLOS)</b> which could have a range of several kilometres							
	2013	2014	2015	2016	2017	2018	2023	2028
Objectives	<b>Accommodation</b> of VLL/VLOS into civil aviation, including <b>harmonised</b> requirements. Operations may be subject to limitations, in particular very restricted at aerodromes.						<b>Further integration</b>	<b>Evolution</b> of operation
Major regulatory milestones					Proposal for common SES rules to regulate use of VLL airspace (Del. 2017)	Adoption of common SES rules to regulate use of VLL airspace (Del. 14F)		
		Harmonised requirement for equipment for BVLOS/VLL (Del. 14A)	MASPS for BVLOS/VLL equipment (Del. 14C)	MOPS for BVLOS/VLL equipment (Del. 14D)	National regulation in place in most MS, based as far as possible on harmonized requirements in order to contribute to the Single Market for RPAS in Europe			
Necessary R&D enablers	In flight demonstration of best practices (activity 14)							
	Studies, simulations, prototyping, modelling, etc. on human factors (activity 12)							
	Impact assessment on airspace and aerodromes (activity 10)			Requirements for D&A for BVLOS (activity 6)		D&A prototype validation (activity 6)	D&A technology for BVLOS available on the market	
			Spectrum requirements for C2 (activity 8)	C2 prototype validation (activity 8)		C2 technology for BVLOS available on the market		

Operation IFR (or VFR)/ RLOS	RPAS operations in VFR or IFR, above 400 ft and above minimum flight altitudes; they comprise IFR (or VFR) operations in radio line-of-sight (RLOS) from the RPS in non-segregated airspace where manned aviation is present. The key capability of 'detect and avoid' (D&A) is required in relation to cooperative and non-cooperative nearby traffic (otherwise specific procedures and restrictions would apply)								
	2013	2014	2015	2016	2017	2018	2023	2028	
Objectives	initial common rules to facilitate special authorization	Accommodation into civil aviation, including certification of RPAS, personnel competence, RPAS operators and operations for initial IFR/BVLOS/RLOS (i.e. Beyond VLOS under Instrument Flight Rules). Operations may be subject to limitations, in particular very restricted at aerodromes, which would not prevent initial integration in en-route non-segregated airspace by 2016					Further integration	Evolution of operation	
Major regulatory milestones	Gap analysis of SES Rules (Del. 15A)		Proposed amendments to existing SES IRs (15J)	Adoption amendments to existing SES IRs (15K)					
	Proposal to amend SES and 216/2008 Regulations (Del. 15D, 15E)		Availability of e.m. spectrum for C2 (Del. 15L)	ATM procedures for GAT in BVLOS/RLOS /IFR (Del. 15U)					
	TLS for D&A and C2 (Del. 15B, 15C)	1 <sup>st</sup> ed. MASPS for D&A and C2 (Del. 15G, 15H)	1 <sup>st</sup> ed. MOPS for D&A and C2 (Del. 15I, 15M)	Guidelines for RPAS operations and operators (Del. 15Q, 15R)	ETSOs for D&A and C2 (Del. 15S, 15T)	CS for RPAS (above 150 Kg) (Del. 17A)			
			Opinion on RPL (Del. 15N)	Adoption common rules RPL (Del. 15O)					
Necessary R&D enablers	In flight demonstration of best practices (activity 14)								
	Requirements for detectability solutions (activity 4)		Availability of technology for detectability						
	Requirements for access to airspace and use of aerodromes by RPAS (activity 9)				Availability of technology for airspace and aerodrome access				
	Development and requirements for D&A and C2 (activity 5, 7); Studies, simulations, prototyping, modelling, etc. on human factors (activity 12); Requirements for security (activity 13)						Availability of technology for D&A and C2		
	Requirements for contingency procedures (activity 11)								

<b>Operation IFR (or VFR)/BRLOS</b>	<b>RPAS operations in VFR or IFR</b> , above 400 ft and above minimum flight altitudes; they comprise <b>IFR (or VFR)</b> operations <b>beyond radio line-of-sight (BRLOS)</b> , when the RPA can no longer be in direct radio contact with the RPS and therefore wider range communication (COM) services (including via satellite) are necessary. In this case COM would typically be offered by a COM service provider.							
	2013	2014	2015	2016	2017	2018	2023	2028
Objectives	<b>initial</b> common rules	<b>Accommodation</b> into civil aviation, including certification of RPAS, personnel competence, RPAS operators and operations for initial IFR/BVLOS/RL0S (i.e. Beyond VLOS under Instrument Flight Rules) as well as for oversight of communication (COM) service providers. Operations may be subject to limitations, in particular very restricted at aerodromes, which would not prevent initial integration in en-route non-segregated airspace by 2016.					Further <b>integration</b> for RPA of any mass and alleviation of restrictions/limitations	<b>Evolution</b> of operation and removal of the threshold of 150 Kg from Regulation 216/2008
Major regulatory milestones	Legislative proposal to amend Basic Regulation 216/2008 (separate approval of RPA, RPS and C2 service)(Del. 18A)	certification requirements and performance standards of SATCOM links for UAS C2/ATC/S&A (Del. 18D)			C2 requirements validation (Del 18F, 18 H) MOPS for C2 over SATCOM (Del. 18I)	AMC/ETSO on approval of C2 via SATCOM (Del. 18K)		
Necessary R&D enablers	In flight demonstration of best practices, including C2 via SATCOM (Del. 18E and activity 14)							
	Development and requirements for C2 (activity 7); Studies, simulations, prototyping, modelling, etc. on human factors (activity 12)							

## 10. Managerial risks

The following major risks have been identified:

<b>Risk Item</b>	<b>Label</b>	<b>Probability (H, M, L)</b>	<b>Impact (H, M, L)</b>	<b>Possible mitigation</b>
1	Fragmentation of national regulations on RPAS	H	H	Promote participation to JARUS activities by all ECAC Member States
2	Delays in regulatory actions	H	H	<ul style="list-style-type: none"> <li>• Fund at least partially standardisation activities by industry</li> <li>• Request commitment at DGAC level to provide resources for joint drafting</li> </ul>
3	Lack of commitment by States to transpose harmonised provisions	H	H	Involve DGAC at EU and ECAC level to recommend and monitor implementation
4	Absence of joint governance of the actions	H	M	Define and implement appropriate governance mechanisms led by EC/ECAC
5	Lack of commitment by EASA	H	M	Maintain synchronisation between the REG roadmap and EASA Rulemaking Programme
6	Lack of consultation with stakeholders	M	M	Monitor consultation mechanisms in particular by JARUS
7	Differences with respect to ICAO standards	L	H	Maintain awareness of ICAO developments and take into account any amendment to the Annexes to the Chicago Convention in relation to RPAS
8	Lack of commitment by EC	L	H	Formally adopt the REG roadmap



## Attachment 1 GLOSSARY of TERMS

Acronym	Term	Meaning	Source
AMC	Acceptable means of compliance	non-binding standards adopted by EASA to illustrate means to establish compliance with Regulation (EC) No 216/2008 and its Implementing Rules	Par. 2 of Annex I to Commission Regulation (EU) No 965/2012 of 5 October 2012
//	Accommodation	Limited RPAS access to non-segregated airspace via special procedures and mitigations. These include permits to fly, restricted airworthiness certification processes and the use of airspace to segregate RPAS operations from manned operations. Such operations are considered on a case-by case basis to ensure that today's non-standardized RPAS performance and operational features do not adversely affect safety or efficiency. As RPAS research, rulemaking, and policy developments enable an increase in integrated operations, the need for accommodation will decline significantly	Adapted from par. 3.4 of FAA CONOPS for integration of UAS into NAS  (v2.0; September 2012)
//	Aircraft	Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface	ICAO Annex 7
//	Aircraft — category	Classification of aircraft according to specified basic characteristics, e.g. aeroplane, helicopter, glider, free balloon.	ICAO Annex 1
//	Autonomous aircraft	An unmanned aircraft that does not allow pilot intervention in the management of the flight	ICAO Circular 328 (superseded by 'autonomous operations')
//	Autonomous operation	Any system design that determines and implements changes in operation of the aircraft and precludes any person from affecting the normal operations of the aircraft. Autonomous does not include traditional autopilot, flight management systems, or similar systems where the	FAA CONOPS for integration of UAS into NAS (v2.0; September 2012)

Acronym	Term	Meaning	Source
		pilot-in-command can either directly or indirectly affect changes, or where the pilot-in-command must confirm changes to the operations prior to occurring. In addition, contingency actions pre-programmed into a system are not considered under this definition, e.g., actions that occur only during failures of some part of the system.	
BVLOS	Beyond Visual Line of Sight	Beyond Visual Line of Sight	UK CAA CAP 722 – 5 <sup>th</sup> edition – August 2012
BRLOS	Beyond Radio Line of Sight	Beyond Radio Line of Sight	//
//	Certificate	any approval, licence or other document issued as the result of certification	Art. 3(g) EC Regulation 216/2008
CS	Certification specifications	technical standards adopted by EASA indicating means to show compliance with Regulation (EC) No 216/2008 and its Implementing Rules and which can be used by an organisation for the purpose of certification <b>NOTE:</b> this does not exclude that other organisations adopt such standards beyond the scope of Regulation 216/2008	Par. 18 of Annex I to Commission Regulation (EU) No 965/2012 of 5 October 2012
CA	Collision avoidance	Sense and Avoid function where the UAS takes appropriate action to prevent an intruder from penetrating the collision volume. Action is expected to be initiated within a relatively short time horizon before closest point of approach. The collision avoidance function engages when all other modes of separation fail	FAA CONOPS for integration of UAS into NAS (v2.0; September 2012)
C2	Command and control link	The data link between the remotely piloted aircraft and the remote pilot station for the purposes of managing the flight	Amdt 43 to ICAO Annex 2
CAT	Commercial air transport operation	an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration	Art. 2.1 Commission Regulation (EU) No 965/2012
//	Commercial operation	any operation of an aircraft, in return for remuneration or other valuable consideration, which is available to the public or, when not made available to the public, which is performed under a contract between an operator and a customer, where the latter has no control over the operator	Art. 3(i) EC Regulation 216/2008
//	Congested area	means in relation to a city, town or	Par. 23 of

<b>Acronym</b>	<b>Term</b>	<b>Meaning</b>	<b>Source</b>
		settlement, any area which is substantially used for residential, commercial or recreational purposes	Annex I to Commission Regulation (EU) No 965/2012 of 5 October 2012
//	Crew member	A person assigned by an operator to duty on an aircraft during a flight duty period	ICAO Annex 6
D&A	Detect and avoid	The capability to see, sense or detect conflicting traffic or other hazards and take the appropriate action	Amdt 43 to ICAO Annex 2
ER	Essential requirements	Provisions establishing the acceptable level of protection of public interests, adopted by the EU legislator and expressed in terms of the results to be achieved	Adapted from Art. 3.1 of Decision No 768/2008/EC of 9 July 2008 on a common framework for the marketing of products.
//	Evolution	Once RPAS operations are integrated, unmanned aviation evolves alongside manned flight as policies, regulations, procedures, training, and technologies are routinely updated to meet the needs of the aviation community	Adapted from par. 3.4 of FAA CONOPS for integration of UAS into NAS (v2.0; September 2012)
EVLOS	Extended Visual Line of Sight	Extended Visual Line of Sight	UK CAA CAP 722 – 5 <sup>th</sup> edition – August 2012
//	Flight crew member	A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period	ICAO Annex 6
//	Flight recorder	Any type of recorder installed in the aircraft for the purpose of complementing accident/incident investigation. In the case of remotely-piloted aircraft, it also includes any type of recorder installed in a remote pilot station for the purpose of complementing accident/incident investigation.	ICAO Circular 328
//	Flight time — aeroplanes	The total time from the moment an aeroplane first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight	ICAO Annex 6
//	Flight time — helicopters	The total time from the moment a helicopter's rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight,	ICAO Annex 6

<b>Acronym</b>	<b>Term</b>	<b>Meaning</b>	<b>Source</b>
		and the rotor blades are stopped	
FP	Flying pilot	A person who operates the flying controls of an aircraft and is responsible for the flight trajectory of the aircraft	ICAO Annex 6
//	Handover	The act of passing piloting control from one remote pilot station to another	ICAO Circular 328
//	Instrument flight time	Time during which a pilot is piloting an aircraft solely by reference to instruments and without external reference points	ICAO Annex 1
//	Integration	The establishment of RPAS performance requirements provides operators a means to integrate operations in non-segregated airspace. Assisted by external industry organizations, competent authorities develop policy and publish regulations, standards, and procedures that enable routine RPAS operations	Adapted from par. 3.4 of FAA CONOPS for integration of UAS into NAS (v2.0; September 2012)
//	Light RPAS	Any RPAS whose RPA has an operating mass of no more than 150 kg	Adapted from UK CAA CAP 722 – 5 <sup>th</sup> edition – August 2012 and Annex II Reg. 216/2008
//	Lost link	The loss of command and control link contact with the remotely-piloted aircraft such that the remote pilot can no longer manage the aircraft's flight	ICAO Circular 328
//	operating site	a site, other than an aerodrome, selected by the operator or pilot-in-command or commander for landing, take-off and/or external load operations;	Par. 84 of Annex I to Commission Regulation (EU) No 965/2012 of 5 October 2012
//	Operational control	The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of safety of the aircraft and the regularity and efficiency of the flight	ICAO Annex 6
//	Operator	A person, organization or enterprise engaged in or offering to engage in an aircraft operation. Note: In the context of remotely piloted aircraft, an aircraft operation includes the remotely piloted aircraft system.	Amdt 43 to ICAO Annex 2
//	Pilot (to)	To manipulate the flight controls of an aircraft during flight time	ICAO Annex 6
PiC	Pilot-in-command	The pilot designated by the operator, or in the case of general aviation, the	ICAO Annex 6

<b>Acronym</b>	<b>Term</b>	<b>Meaning</b>	<b>Source</b>
		owner, as being in command and charged with the safe conduct of a flight	
RLOS	Radio line-of-sight	A direct electronic point-to-point contact between a transmitter and a receiver	ICAO Circular 328
//	Remote crew member	A licensed crew member charged with duties essential to the operation of a remotely-piloted aircraft, during flight time	ICAO Circular 328
//	Remote pilot	A person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time	Amdt 43 to ICAO Annex 2
RPS	Remote pilot station	The component of the remotely piloted aircraft system containing the equipment used to pilot the remotely piloted aircraft	Amdt 43 to ICAO Annex 2
//	Remotely-piloted	Control of an aircraft from an RPS which is not on board the aircraft	ICAO Circular 328
RPA	Remotely piloted aircraft	An unmanned aircraft which is piloted from a remote pilot station	Amdt 43 to ICAO Annex 2
RPAS	Remotely piloted aircraft system	A remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other components as specified in the type design	Amdt 43 to ICAO Annex 2
//	RPA observer	A trained and competent person designated by the operator who, by visual observation of the remotely piloted aircraft, assists the remote pilot in the safe conduct of the flight	Amdt 43 to ICAO Annex 2
//	Segregated airspace	Airspace of specified dimensions allocated for exclusive use to a specific user(s)	ICAO Circular 328
SUA	Small Unmanned Aircraft	Any unmanned aircraft, other than a balloon or a kite, having a mass of not more than 20 kg without its fuel but including any articles or equipment installed in or attached to the aircraft at the commencement of its flight.	UK CAA CAP 722 – 5 <sup>th</sup> edition – August 2012
SPO	Specialised operation	Any commercial operation other than commercial air transport and any non-commercial operation where: (a) the aircraft is flown close to the surface to fulfil the mission, (b) aerobatic manoeuvres are performed; (c) special equipment is necessary to fulfil the mission; (d) task specialists are required; (e) substances are released from the aircraft during the flight; (f) external loads or goods are lifted or	EASA Opinion 02/2012

<b>Acronym</b>	<b>Term</b>	<b>Meaning</b>	<b>Source</b>
		towed; (g) persons enter or leave the aircraft during flight; or (h) the purpose of the mission is to display an aircraft, to advertise or to participate in a competition	
TA	Traffic avoidance	The result of the RPAS crew applying detect and avoid technology to maintain safe distance ('well clear') from other airborne traffic (analogous to the visual requirements for manned aircraft to "see and avoid")	Wording adapted from FAA CONOPS for integration of UAS into NAS (v2.0; September 2012)
UA	Unmanned aircraft	An aircraft which is intended to operate with no pilot on board	ICAO Circular 328
UAS	Unmanned aircraft system	An aircraft and its associated elements which are operated with no pilot on board	ICAO Circular 328
VLOS	Visual line-of-sight operation	An operation in which the remote pilot or RPA observer maintains direct unaided visual contact with the remotely piloted aircraft	Amdt 43 to ICAO Annex 2