RPAS ATM INTEGRATION STRATEGY

List of Contents

List of Figures

EUROCONTROL Agency RPAS Strategy

1. Introduction

Unmanned Aircraft Systems (UAS), more specifically Remotely Piloted Aircraft Systems (RPAS), represent a new, growing and significant category of airspace user. The potential use of RPAS for a wide range of both military and civil applications is extensive and expanding, requiring access to different airspace classes.

The Agency has been involved in RPAS for around 10 years. While this was initially more a technology watch of potential developments, it has become more substantial to accompany, and significantly contribute to, the various, often uncoordinated, initiatives from many stakeholders. The RPAS industry is to play a very important role for the European economy and is a significant area of job opportunity. ATM integration is critical to realising this potential and the Agency already plays a key role here.

With the uptake of many parallel European and international RPAS activities (Regulatory, Standardisation, Research and Development) and the increasing requests to develop regulatory and guidance material to support safe and harmonised integration or to provide assistance on all aspects of ATM, the Agency is to reconsider its role and mission on RPAS in an RPAS Agency-wide strategy.

The Strategy is described in a concise way in the sections below.

2. Objective

The purpose of the Agency RPAS ATM Integration Strategy is to describe why, what and how the Agency should contribute to the overall RPAS activities.

The integration of RPAS is based on the following principles:

RPAS

- should be as safe as manned aviation;
- should not deny access to other airspace users;
- will have to meet specific airspace requirements;
- should be transparent to ATC and other airspace users.

The strategy covers RPAS integration through two parallel phases:

Accommodation from the present until 2023

Due to the absence of regulation and industry standards, larger IFR capable RPAS are to be **accommodated** in controlled airspace using FUA/AFUA techniques. This is a daily occurrence in the Mediterranean for military RPAS. This phase of accommodation can easily be maintained due to the relatively low numbers of RPAS operations.

Integration from 2023 onwards

With the availability of regulations, standards and relevant supporting technology RPAS will be able to integrate as any other airspace user when meeting the specific airspace requirements.
The strategy is fully aligned with the ICAO GANP, EU roadmap, SESAR 2020 and the EASA CONOPS.

3. Scope

Safety of ATM is the core business of the Agency. The Agency work related to RPAS will focus primarily on the ATM critical issues related to RPAS integration, but will also consider RPAS improvements and applications which could deliver ATM performance, while monitoring and ensuring that the non-ATM issues are properly identified and timely addressed by the relevant stakeholders.
This ATM approach will further contribute to building a centre of expertise on RPAS necessary to support the development of regulatory, operational and technical provisions required for progressively accommodating and integrating civil and military RPAS as a legitimate category of airspace user in the pan-European ATM environment.

4. State of Play

The present developments are dominated by small RPAS. It is estimated that around 5000 commercial RPAS companies are active within Europe. The regulatory developments are mostly a reaction to the rapid market development and as such are not harmonised. Many RPAS have been sold world-wide estimating at more than 20 million and thereby surpassing the amount of manned aircraft, estimated by ICAO at 200,000.
RPAS are capable of operating in environments more dangerous and closer to obstacles than manned aviation. Also the cost factor plays a significant role. Many applications are to be found in agriculture, security, photo and filming, critical infrastructure inspection, search and rescue and many other areas.
The technical RPAS developments are happening at a much quicker pace that we are used in our conservative manned aviation world. It will be a challenge to marry both worlds to ensure safe and robust integration solutions. Specifically data on the reliability of RPAS are not sufficiently available.
Encouraging is the increase of safety awareness of several RPAS producers introducing new technologies to block entrance of RPAS in no drone zone through geo fencing. Close corporation in this with National authorities is providing promising results.
Many technological solutions are already available however these are not aviation technologies. To allow the use of this will require additional effort from regulators and standards organisation to set the required aviation safety levels.

Although Military and civil RPAS may have totally different operational requirements, the integration challenges are identical. Many military flights are accommodated through FUA/AFUA principles allowing them to operate in controlled airspace as daily occurrence. Application of harmonised ASM procedures will improve the efficiency of the accommodation of requirements for segregation/reservation of airspace.

4.1 Main players

There are several main poles of activity when considering RPAS ATM integration. The role the Agency plays in each of them is highlighted below:

- ICAO: the ICAO work that started in a task force was elevated to a panel in 2014. The ICAO GANP ASBUs already include modules on RPAS integration
    - EUROCONTROL is a member of the panel thanks to its recognised expertise and positive contribution to the task force. The main focus of the work is on international traffic and as such we are supporting the development of the relevant SARPs.
    - ICAO only deals with IFR International operations for RPAS

- Joint Authorities for Rulemaking on Unmanned Systems (JARUS): although an informal arrangement, it groups the coordination of the efforts of now more than 40 Regulators/States and EASA members1.
    - EUROCONTROL is a full member and manages the secretariat, leading the C2 data link Work Group and has the seat of General Secretary of this body.
    - JARUS fills the gap that ICAO is not considering; however JARUS only develops regulatory proposals. JARUS has developed the three categories approach which has now been adopted by EASA.

- European Commission (EC): the political Riga Declaration on RPAS has set the ambition for addressing the issues listed by the EC in the Communication published at the end of 2014. In turn, the European Parliament is preparing a Resolution. RPAS is also the subject of sponsored activities from e.g. DG RTD, DG GROW, the JRC and the GSA.
    - The Agency provides expertise on request to DG MOVE, GROW, RTD, MARE and ECHO.

- European RPAS Steering Group (ERSG): informal coordination platform for EC, EASA, SJU and EUROCONTROL.
    - The Agency provides regular updates on its activities with the overall aim to avoid duplication of effort in the total RPAS integration effort.

- EASA: chairs JARUS. Regulatory activities are underway including the development of the EASA CONOPS, addressing three specific categories, but are limited so far to considering RPAS of 150 kg or more.
    - MoC between EASA and EUROCONTROL for RPAS is under development.

1 JARUS members, in addition to the majority of the European States, also include China, Russia, Australia, US, South Africa, Brazil, India, Israel, Japan and UAE.

- SJU: there was no RPAS project in the SESAR 1 work programme, but SJU was requested to conduct a “Definition Phase” to list current activities and define a roadmap. As a result RPAS R&D is now fully embedded into SESAR 2020 DOW.
    - The Agency has been a main contributor to the R&D roadmap and definition phase.

- EDA and NATO: while having a natural focus on military applications, their experience and the result of their activities are valuable inputs to address the civil and civil-military aspects of RPAS.
    - The Agency has a unique ATM civil and military expertise and programmes of cooperation with NATO and EDA.

- States: some have published national regulations. Many others are preparing a regulation and/or have already requested the advice and support of the Agency.
    - The Agency provides the bigger ATM perspective and best practices. It also helps the States to organise the RPAS community and share our expertise with the ANSP on specific integration aspects.

- ITU: involved in allocating frequency spectrum for the various satellite transmissions from/to RPAS.
    - The Agency aims at avoiding negative impact on the aviation frequency band.

- EUROCAE: standardisation of RPAS has started with 2 working groups, WG93 dedicated to light RPAS and WH 73 dedicated to large IFR.
    - The Agency is a member of the leadership team of both WGs and provides technical expertise.

The Agency’s main role is to ensure that the ongoing developments do not negatively impact our present operations and allow this new industry to reach its maximum capacity.

4.2 Current type of operations

For operations below 500 ft, which are already occurring in many States, Visual Line of Sight (VLOS) operations are already embedded in the day to day operations (max 500ft agl). The Beyond VLOS operations (still below 500ft agl but outside man’s range of vision) are only conducted in a limited amount of States due to the technical requirements that are essential. As we have a risk based approach, flying BVLOS and below 500 ft is already possible in three European States in remote areas with low traffic (Figure 1).

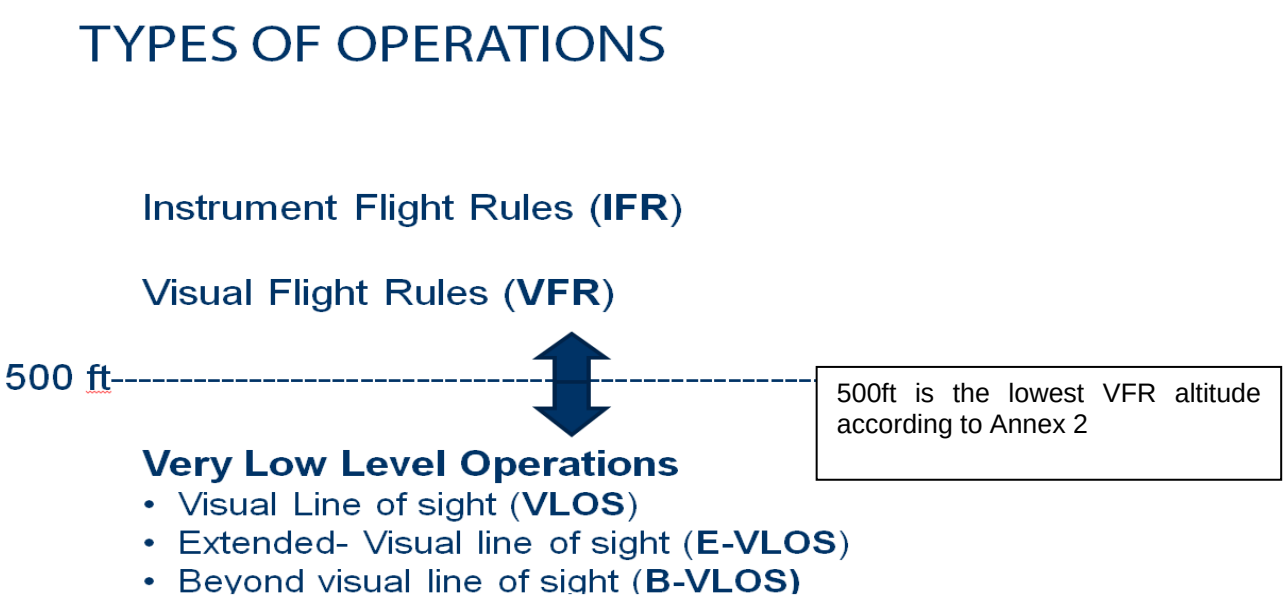

Figure 1

The 500 ft division was merely used to enable further progress in the development of ICAO standards. In many States manned aircraft are allowed to operate below the Annex 2 lowest VFR altitude (500ft). Theoretically the RPAS operator should be capable of avoiding potentially dangerous situations during VLOS. As it is envisaged that the smaller RPAS will operate above 500 ft requiring mixing with small manned aircraft, this will require significant changes to the Rules of the Air, as well as technical mitigations.

4.1.1 Identified issues

The issues are many in terms of potential impact on the ATM systems and operations; in particular on the nature of the services needed and the conditions under which to use them, or on the ATM/CNS infrastructure.

The following issues (figure 2) have particularly been pointed out:

- the prevention of collisions and the associated “see and avoid” function;
- the required performance specifications of the communication link between the RPAS and its remote pilot (Command and control – C2 – link), the consequences of a loss of C2 link and the impact on aviation spectrum strategy;
- the impact of slow speed low performance RPAS on airspace capacity;
- the impact of RPAS integration on ATM systems, operational and training procedures;
- the necessary effort for the RPAS world to live up to the appropriate level of safety culture to enable RPAS integration in the GAT;
- impact on the ATM/CNS infrastructure, such as possible overload of 1090 MHz
- safety incidents at and around airports
- security, including cyber security.

Maintaining an inventory of knowledge, issues and projects will enable the extent to which those issues still require attention and action to be documented. The ATM areas of impact are the following:

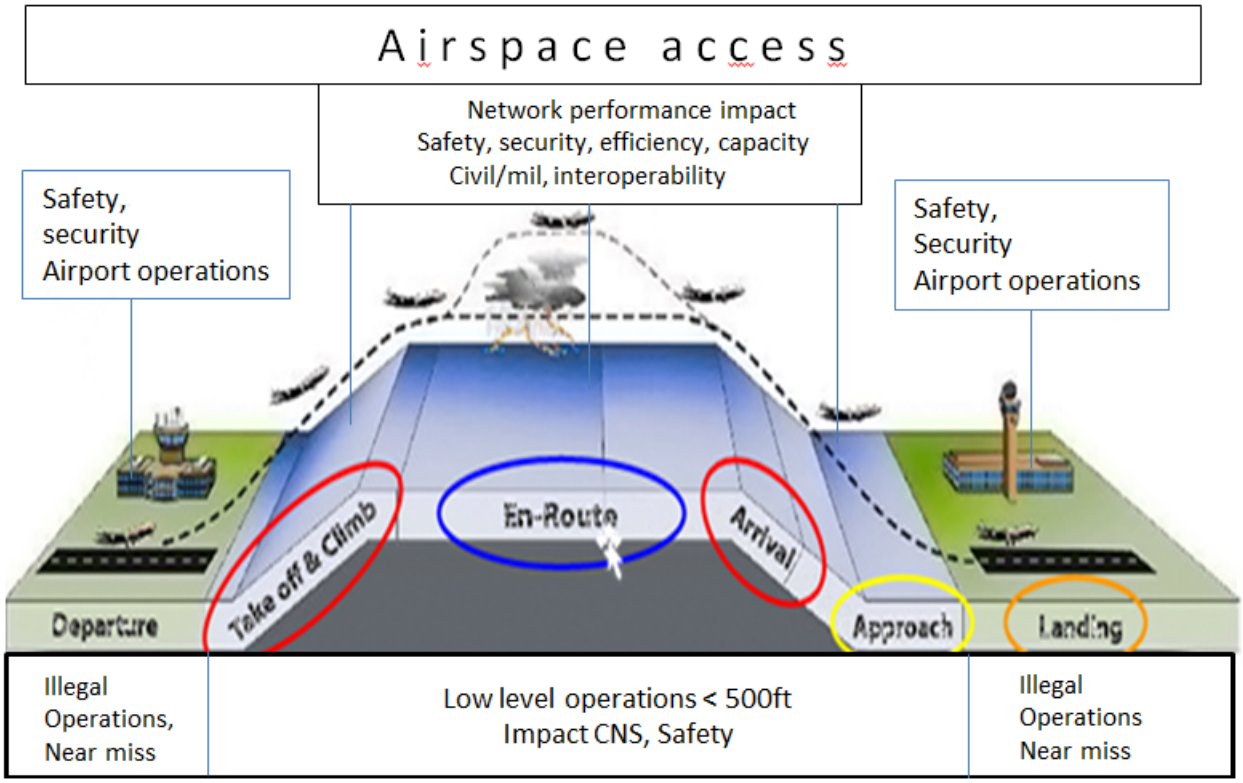

Figure 2

4.1.2 Agency added value

The state of play clearly demonstrates that the Agency not only can, but should contribute to the RPAS-related work and is in a unique position to do so. This is directly about EUROCONTROL being proactive on interoperability and safety of ATM on a pan-European scale, supporting R&D and standardisation, using its experience and expertise on coordination of complex topics.

4.1.3 Agency ambition

Our ambition is to contribute to ATM integration and development of RPAS for the benefit of our stakeholders whilst maintaining ATM safety.
It is EUROCONTROL's role to develop robust ATM solutions to ensure that manned aviation, specifically in the network and airports, is not negatively impacted by this new airspace user. To enable this, EUROCONTROL needs to be involved in all the different domains related to RPAS integration. It is essential to keep an overall perspective including the small RPAS developments as some technical developments might negatively impact the CNS infrastructure.

5. Agency activities

A key word is cooperation, both external and internal, all the more justified by the fact that RPAS, as a new category of airspace user, is impacting all ATM domains.
The Agency strategy in this respect is the following.

5.1 R&D

European RPAS R&D needs have been addressed by the ERSG roadmap. This roadmap (current version dated 2013) needs to be updated regularly and should provide a solid basis for R&D work.

The priorities of our military stakeholders and the main missions and concerns of the Network Manager lead us to focus EUROCONTROL's efforts on the accommodation / integration of "big" certifiable RPAS in controlled airspace, in the SESAR 2020 framework
EUROCONTROL's R&D must not dig into dedicated RPAS technical solutions but it must fill those gaps of ATM interest.

The SESAR 2020 programme foresees 40M€ of work dedicated to RPAS.
The main bulk work is located in PJ 13 (Air Vehicle Systems), PJ 03A (Integrated Surface Management), PJ10 (Separation Management En Route and TMA) and PJ 11 (enhanced Air and Ground Safety Nets).

EUROCONTROL's R&D activities will focus mainly on RPAS integration issues affecting the other priorities of the Agency R&D work programme, as well as areas where the contribution of the Agency is unique and providing key added value. The current intention is therefore to participate in kind in the following areas:

- Detect and Avoid, specifically interoperability with ACAS- x
- Impact on AIS/AIM and MET information provision (processes and systems) to support RPAS Operations
- Use of RPAS for MET data collection
- Update of the EUROCONTROL validation infrastructure to support concept validation with RPAS
- Impact on the CNS infrastructure
- Long term innovative research addressing low level RPAS operations (<500ft)

An analysis is underway to investigate the possibility to conduct additional work in the following areas:

- ATM performance requirement and spectrum for Command and Control (C2) link
- Security
- Airspace and Airport access (use of RPAS in support of airport operations)
- Network performance requirements
- RPAS benefits to the Aviation system (bird control, hull inspections etc.)

The possibility of setting up/coordinating experiments pulling together several different kinds of RPAS player (RPAS manufacturers, Civil and Military, ANSPs, NM) on common R&D projects should also be explored with the objective to create RPAS integration teams with all the different relevant skills.
This analysis has to take into account the limited S2020 budget on RPAS (€20M today) and the limited remaining time before finalising our proposal.

5.2 Operations

On the operational side, from our Network Manager perspective, the priority should be to protect the GAT flows from the risks induced by the increasing number of small RPAS, to preserve the CNS network infrastructure against radio-congestion, and to ensure the consistency of RPAS CNS with the aviation spectrum strategy.
The following points need to be covered:

- Development of an RPAS ATM CONOPS, which will support the creation of a level playing field within the Agency directorates and our Member States.
- Participate in the assessment of the possible impact of RPAS operations on current operations, ATM tools and CNS techniques and of possible mitigation options.
- Safety risks linked to increasing number of small RPAS operations near important GAT flows including airports.
- Need to preserve 1090 kHz frequency from too many transponder equipped RPAS; more generally need to protect CNS network infrastructure from small RPAS congestion.
- Development of common ASM guidelines for harmonised management of RPAS operations within segregated/reserved airspace structures
- Need to manage the impact of integrating slow and low performance RPAS on controlled airspace capacity.
- Cyber risk management for RPAS in ATM + link to EACCC.

5.3 Regulations and standards

On the regulation side we need to continue our support to key international regulatory bodies (JARUS and ICAO mainly) to consolidate and showcase EUROCONTROL's global expertise in RPAS field. We also need to fulfil the specific request for support from our Member States in the limits defined by the Support to States policy. We will consider the following priorities:

- Continue active coordination within the European RPAS Steering Group.
- Maintain current participation in international fora such as ICAO, EASA, JARUS, European Conference of Postal and Telecommunications Administrations (CEPT) and ITU panels developing RPAS regulations and standards with a link to ATM, until the first mature set of documents is published. Participation should be based on clear roles and responsibilities ensuring equality between partners and recognition of EUROCONTROL's contribution.
- Facilitate the involvement of military stakeholders in JARUS activities.
- Continue close cooperation with the Air Traffic Service Providers, Radio Regulators, IATA, ESA, standardisation organisations, EDA and NATO
- Increase involvement of CMIC in data, security and airspace management issues.

5.4 Support to States

The States are in need of support as demonstrated by the many requests received. The Agency should continue to help them by providing:

- Generic overview on the state of play regarding RPAS integration
- Best practices of RPAS integration
- Generic guidance material necessary to ensuring the coordinated pan-European deployment of system improvements (gate-to-gate) for the implementation of the SES.
- Expertise coherence with military requirements as and when appropriate.

There is also room to support States or operators on non-ATM regulation aspects by making use of the Agency’s expertise in all domains connected to ATM. EUROCONTROL is often in a unique position to help bridge the various policies and streams of work and to express aviation users' requirements including RPAS.
In 2016 the Agency will also provide a three-day GEN RPAS course providing an in-depth overview of the RPAS integration issues.