European Aviation Safety Agency

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Background

The European Aviation Safety Agency (EASA) issued on 7 November 2005 the A-NPA (Advance-Notice of Proposed Amendment) 16/2005 on UAV, based on the UAV Task-Force report, which was a JAA and EUROCONTROL joint initiative. The purpose of this A-NPA was to envisage a policy for UAV systems certification and to solicit comments on specific points. This document is still available on the EASA web-site, together with the corresponding report (http://www.easa.europa.eu/ws_prod/r/r_archives.php).

The Comment Response Document (CRD-16-2005) was then published on 06/12/2007 and open for reactions until 06/02/2008. It is still available at the same address as the A-NPA.

Inventory of main issues and replies relative to the A-NPA as published in the Comment response Document

Introduction

The Agency received and analysed comments from 45 organisations and individuals, including authorities such as UK, France (civil and military), FAA, Sweden (civil and military), Italy, Germany; and Stakeholders (e.g. UAV Industry, IFATCA, IFALPA).
The majority of these comments concurred that the option chosen by the Agency to develop a policy for UAV certification within the constraints described in the A-NPA is a step in the right direction.
These comments can be divided between issues that are related to type-certification and have been taken into account in the policy and issues that are not.

Issues related to type-certification that have been taken into account in the policy

Conventional versus safety target approach for certification

The A-NPA presented two main options to address UAV certification:

- A conventional approach using as a starting basis manned certification specifications (e.g. CS-23; CS-25)
- A safety target approach setting an overall safety objective for the aircraft within the context of a defined mission and operating environment.

The Agency had chosen the conventional approach for the general case accepting the use of the safety target in specific cases (e.g. operations in remote areas). The two options were presented for transparency reasons and clarification about the Agency's choice. The purpose of asking comments was to identify if no major issue would result from this choice. In fact, the review of comments reflects a general support to the conventional approach.

Part 21 is applicable for the certification of UAS

To reflect the level of maturity of the civil UAS industry and to facilitate an early introduction of civil UAS operations, alternative procedures already within the scope of Part 21 may be used to either gain type-certification directly or in a stepwise approach.

For direct type-certification, the normal civil regulatory procedure is retained for the routine certification of UAS. The issue by the Agency of a type-certificate will be based upon the applicant demonstrating compliance with a defined type-certification basis and certificates of airworthiness are granted to individual UAS when compliance with the approved type design has been shown.

The alternative approach recognises that some UAS may benefit from a stepwise approach in conjunction with the issue of a restricted TC and/or restricted CofA. Such an option is provided for in the basic regulation, Article 5, paragraph 4. It permits the issuance of a restricted TC and/or restricted CofA by derogation to the requirement for an aircraft to hold a type-certificate, provided the aircraft is operationally constrained and the design conforms to a specific airworthiness specification that ensures adequate safety with regard to its purpose. So, for example, design approval of a UAS intended for operation entirely over remote areas where the risk to third parties on the ground is considered negligible, could be approved under a restricted TC and/or restricted CofA. This alternative may be based on the safety target approach, using an overall target level of safety defined by the Agency, in lieu of a specified airworthiness code.

The two alternatives for selecting the manned CS

In the conventional approach, one issue is the selection of the manned certification specification that will be used as a starting basis for a given UAV certification. Two methods were proposed in the A-NPA and the Agency indicated that it would retain only one after the comments' review:

- One method is based on kinetic energy consideration
- One method is based on safety objectives consideration.

The review of all comments relative to the appropriate method for selecting airworthiness codes indicates that a majority of the commentators prefers the kinetic energy method for the following reasons:

- The method based on safety criteria is not fully justified.
- The selected population density criterion of the safety objectives method does not reflect population densities in several countries of Europe.
- The criteria selected for the lethal crash area of the safety objective method does not reflect a forced landing.
- In addition, the safety objective method leads to unequal treatment of manned and unmanned aircraft of identical maximum take-off mass. Indeed, this method would allow certifying an UAV of 20 000kg using CS-23 when a manned aircraft of the same mass would use CS-25. Such a situation will be difficult to explain to the public.

As a conclusion, and in agreement with these views, the Agency has decided to include in the policy only the kinetic energy method. Nevertheless, a further study of the method based on safety criteria in cooperation with the EUROCAE

WG-73 on UAV is planned.

UAV system safety analysis

The UAV system safety analysis and its detailed objectives were also subject to comments and reactions. This is one of the key issues for UAV. The FAA and the Agency have taken early 2009 the initiative to organise a specific coordination with other Authorities on the issue. The results of an initial meeting in April were discussed in the EUROCAE Working Group.

The results of this initial coordination have been taken into account into the first issue of the policy (for example by removing the definitions linked to system safety analysis). The contents of the policy relative to safety analyses and safety objectives will be improved in due time and the position taken in the policy is clearly an interim one

Design Organisation Approval

The systematic requirement of a DOA (design organisation approval) for the designer in the policy envisaged by the A-NPA was questioned in some comments.

The use of CS-VLA, for example, can be accepted as a starting basis, and designers of CS-VLA aircraft can demonstrate their capability to design by using alternative procedures to DOA instead of a DOA. However, the automatic transposition of this situation to an UAS based on CS-VLA is not acceptable. Nevertheless, the Agency is ready to accept alternative procedures based on an appropriate substantiation by the designer that the UAS is of simple design, including in relation to the level of autonomy, type of datalink used and nature of systems. The policy will therefore be modified accordingly for UAV that would fall under Part 21A.14(b)(1) (e.g. CS-VLA or CS-VLR) as a starting basis following application of the methodology retained to select the Certification Specification.

Certificate of airworthiness and control stations

There seem to be only one view fully in line with the present regulation: a certificate of airworthiness covering one flying vehicle-one control station. The policy will be modified to clarify this point. Since this leads to operational limitations, the policy may be re-evaluated in the future taking into account experience gained. It must be noticed however that the existing regulatory framework will then need to be modified.

Environment

There is no principal reason to distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, as regards noise, the best solution at the moment might be to stick with the requirements of ICAO Annex 16, Volume I, having in mind that possible additional requirements for jet aircraft with take-off distances below 610 m have to be taken into account.

In addition, if it turns out that UAV, due to their special mission, cause additional annoyance to people, certain measures will have to be taken. If, for example, a reasonable number of «larger» UAV are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements and/or operational restrictions may have to be taken into consideration.

Which acronym: UAV or UAS?

The policy presented by the A-NPA uses the acronyms UAV and UAV system, which corresponds to the Agency policy's approach of UAV as a system. However, other bodies such as FAA or the EUROCAE WG-73 use UAS for Unmanned Aerial Systems. Therefore, the Agency will align with other important partners and modify the policy accordingly.

The way forward for the issues within the EASA remit

The Agency has reviewed the reactions received from five Manufacturers; one Association of Manufacturers; one Research Establishment; two Authorities and one Pilot Association. It has also shared the draft with the FAA and the EUROCAE WG. The formal EASA internal consultation has started and the policy should be adopted in May or June 2009

Issues that have not been taken into account in the policy

'Sense and avoid'

Many comments regret that EASA certification does not address 'sense and avoid'. However, although EASA recognises it as a critical issue for safety and operations, the criteria for 'sense and avoid' should be defined by the Authorities responsible for the safety regulation of ATM. When such criteria are developed, they can be complemented by specifications developed by standardisation bodies such as EUROCAE to help certifying the necessary equipment. Once such specifications will be available, EASA will be able to certify the systems.

The Agency also accepts that, to a certain extent, the certification specifications (CS) deals with 'anti-collision': anti-collision lights are specified in CS; pilot compartment view is also addressed and minimum crew considerations also take into account collision avoidance. These specifications reflect the concept of 'see and avoid'.

It is therefore expected that during the tailoring of manned certification specifications, such paragraphs will be taken into account: aircraft lights should be installed and the UAV crew should be provided with means or procedures to obtain a certain amount of situational awareness. However this will not achieve the necessary criteria to operate in non-segregated airspace: the limitations of the 'see and avoid' concept are well known even for slow aircraft.

The consequence of not considering 'sense and avoid' as part of the airworthiness certification will be a limitation to operate in segregated airspace only. This situation will be reflected by a statement in the flight manual indicating that operations are limited to segregated airspace only unless mitigating measures to the absence of 'sense and avoid' certification have been accepted by the Authority responsible for a specific airspace. Examples of such measures could be: a NOTAM creating a segregated airspace covering the zone of the UAV operation, the UAV remaining constantly in line of sight of its pilot. The policy will be modified to clearly request the existence of a statement in the flight manual.
In addition, the Agency will request the EUROCAE WG 73 to start developing a Special Condition based on criteria of the recently adopted EUROCONTROL specification for the use of military UAV as operational air traffic outside segregated airspace.

Total system approach as proposed by Sweden

Sweden has proposed a total system approach (TSA) that reflects the constantly increasing integration of the Aviation system. It is introduced to a certain extend by the set of

regulations implementing the Single European Sky. Total system approach is also reflected in Agency's opinion on ATM. The development of a comprehensive framework for UAV should follow a total system approach.

Security

Many comments regret that EASA certification does not address Security issues.
Unfortunately, although security is a key issue for UAV, the Agency cannot mandate security requirements. However, if security systems are mandated by the appropriate authority or installed voluntarily, they should not impact safety. In such case, EASA would have to develop specifications so that safety is not impacted. For example, some failure cases of encryption devices could impact control commands.
The Agency draws the attention of the commentators to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to essentially aeronautical air borne systems. UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Coordination with military working group on UAV

Several commentators stress the importance of the coordination between civil and military activities on UAV. It has been suggested that the code developed by the French military Authorities (USAR: Unmanned Systems Airworthiness Requirements) could also be used for civil purposes.
The Agency acknowledges that USAR/ STANAG 4671 has been developed using a methodology closely related to the one described in this policy. At an applicant's request, the Agency may accept USAR version 3 as the reference airworthiness code used in setting the type-certification basis, provided that:

- the applicable airworthiness code identified from application of the methodology in Appendix 1 of this policy does not indicate that safety standards in exceed of CS-23 (single engine) are required, and
- the safety targets included in the system safety analysis reflect the ones resulting from the application of this policy.

UAS below 150 kg

Several commentators requested that the Agency develops guidelines for the certification of small UAV. EASA is however only competent for UAV above 150 kg Maximum Take-Off Mass (MTOM). Member States are competent for UAV below that limit and are expected to regulate the activity of such UAV and therefore complement the Agency's efforts. It is worth noting that the report of the joint JAA-EUROCONTROL initiative on UAV proposes a model for such a regulation based on the work done by the UK-CAA.
The Agency is participating in JARUS (NAA group) primarily focusing on developing the regulatory basis for small UAS (<150kg), with the objective of enabling mutual acceptance by all member states and EASA

Conclusion

The Agency is committed to finalise the policy for UAV systems certification and to cooperate and contribute to the development of a comprehensive UAV regulatory framework, which is a key issue to the safe a successful development of this activity. Furthermore, the extension of EASA's scope will allow us to address in the medium term most of the issues related to UAS regulation.
As an example a rulemaking task MDM.030 has been included into the Agency rulemaking programme to develop implementing rules for the operation of UAS, corresponding acceptable means of compliance/ guidance material and airworthiness codes; This task should start in 2011 and end in 2014
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