CRD - NPA 16/2005

Comment	Response
A. Explanatory Note	
Paragraph	
Cmt. ***ECA***	
Option 2 without having option 3 in mind makes no sense: Otherwise you'd potentially give up the option to operate the UAV in a non-segregated airspace, if the UAV is certified to different criteria than manned aircraft	Noted The Agency agrees that option 3 is the long term solution and propose the following: Create a group to identify building blocks and road map for a comprehensive framework for UAV regulation: The group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop regulatory impact assessment (in particular safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach)
Justification	

Comment	Response
Cmt. ***T. Wilbond*** System Security Security is a system wide issue but given the difficulty typified by the lack of any single agency to direct a systems approach it is necessary to derive an approach that delivers security as a component of safety. Merlin Integrated Solutions believes that security aspects, other than physical security, should be adopted as a safety issue but this may require a change in the EASA view of security. In essence, an air vehicle centric approach coupled with a management system centric approach, both under the direction of EASA, would provide a 'bottom up' approach that delivered effective system security and, hence, contributed to system safety. The use of interface standards and equipment performance standards would define the data communication requirements. The interface standards would be management system centric to allow different UAV systems to be managed by different, single systems. Equipment function and integration standards would be platform centric and this could include an approach that set very low probabilities for interference and capture in flight Attachment 1 to the policy section at page 28 should be amended to reflect the above and security should be considered as a safety issue and introduced as a certification issue in both the air vehicle type certification and the management system type certification. Attachment 2 pages 31 and 32 should be similarly amended.	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Justification

There is no one agency or body that can specify a 'top down' system approach to security for UAV system operations. A platform centric approach security as a component of safety could deliver the necessary standards for achieving a very low probability that a UAV could be 'captured' or interfered with in flight. A separate proposal is that EASA should be responsible for the certification of management systems. Hence, a management system centric approach to security could be harmonised with the air platform centric standards to deliver an overall level of security.

Comment	Response
Paragraph A Explanatory Note, IV, 4, c - Page 8, vii Environmental protection **Cmt.** *UAV DACH* We prefer to keep the same requirements for all jet aircraft. **Justification** There is no sense to define higher requirements for the new types of aircraft, the UAV. For all flying aircraft the same requirements, all have the same regulations and laws.	Noted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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. The exemption for take-off distances below 610 m was brought into Annex 16 in anticipation of development of dedicated standards for STOL (Short take-off and Landing) aircraft. As these never really developed, the action was abandoned. So the reason for extending the annex is because the UAV's are STOL not because they are unmanned. In addition, if it turns out that UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of "larger" UAVs are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements or operational restrictions may have to be taken into consideration (Again, not because they are unmanned, but because of their unusual operational use).
Paragraph A. Explanatory Note, Attachment 2. Section 4.3, page 31/32: **Cmt.** *UAV DACH* The level of autonomy shall address the warning philosophy and its conceptual minimum requirements. Depending on different level of system autonomy the A-NPA shall address the warning philosophy and its conceptual minimum requirements for the entire UAV System. **Justification** The warning philosophy and its concept are highly flight safety related.	Noted Warnings are already covered by existing manned aircraft Certification Specifications paragraph NN.1322). The Special Condition on Human Factor will help clarifying the application of the specifications for warnings to the case of UAV The issue of warning will be added to the outline of the Special condition for Autonomy

Comment	Response
Paragraph **A. Explanatory Note_I.General_1.** ***Cmt.*** ***UAV DACH*** In general UAV-DACH (members see www.uavdach.org) strongly appreciates EASAs effort to establish a solution for the certification of UAV-systems within a short or medium term. EASA considered three options to reach this target, and finally proposed to push the second one: - Option 1: “Do nothing” - Option 2: “Policy” - Option 3: “Comprehensive regulatory framework” Unfortunately, option 1 and 2 do not provide the necessary tools for the operation of civil UAVs in “normal”, non-segregated airspace. However, to develop and certify UAVs for exactly this kind of operation is the major goal for the companies of UAV-DACH. Therefore we feel that option 3 is the only reasonable approach for this target. ***Justification*** With option 2, the “policy”, it may be possible for EASA to issue TCs for certain types of UAVs within short term, but notwithstanding the possibility to operate these aircraft in civil, non-segregated airspace. However, we feel that it is not sufficient to make an isolated (certification orientated) approach to that target. The introduction of UAVs into civil air space needs a more comprehensive approach including operational aspects, “Sense and Avoid”, data link security, etc,. In order to cover our basic needs it would be essential to quickly advance with option 3. Only a comprehensive regulatory framework with standardised procedures for each applicant or company allows for - a smooth further development of future UAV-systems, - a business competition of equal opportunity between the European companies and worldwide with other nations. This framework should include all aspects of UAV certification and operation: - certification of UAV systems - certification of typical UAV-equipment (for example S&A, if certificated separately from the UAV-system) - the necessary national and European regulations for the use of airspace for different types of UAVs, depending of their certification, their physical capabilities and their installed equipment (for example S&A) - licensing aspects - approvals for development (DOA), production (POA) and maintenance (CAO) organisations for UAVs - etc. Therefore our favourite solution would be the comprehensive approach (option 3). Only this approach will give us the necessary background to keep our primary goals, i.e. to fully introduce UAVs into civil controlled airspace.	Noted. The support of UAV-DACH to the approach chosen by the Agency is appreciated. Option 2 is a step towards option 3. The Agency agrees that a comprehensive approach to UAV regulation is necessary.

Comment	Response
Paragraph IV-4-d **Cmt.** *J. Wenstedt* To organize a separate single European independent body from the EASA for testing, evaluating and setting up operational rules for civil UAVs. This organisation should be operating in close accordance with the EASA, whereby the EASA remains responsible for the Eurtopean regulations. This new body would be responsible for : - setting up, testing and evaluating operational standards - suggest, set up, test and evaluate airworthiness/certificationprocesses of UAVs - set up, test and evaluate training conditions for UAV systems This in close co-operation with the EU, memberstates and industry. This new body could be working under very realistic conditions, so as to be able to gain ample experience and be able to get the hard needed experience on operational use of civil UAVs.	Not accepted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Justification This new independent UAV body will be specialized in the UAV operation and certification and beccome Europes UAV institue in time. It will become the one station institue for civil UAV operations. It will be cheaper to run as it will be able to work also for third parties in its various fields of experience.	
Paragraph para IV 4 c ii of the explanatory note **Cmt.** *EADS* To ensure save funcionality of the UAV system configuration control of the ground station has to be taken into account. With a self-contained manned aircraft this is easy as there is only one physical vehicle to consider. Ground equipment as part of a ground segment must be controlled in such a way as to consider them airborn for the purposes of use and maintenance. Guidance should be provided as to afford ground equipment appropriate security so as to maintain its integrity to type, as a system.	Accepted The Agency agrees the the control station is part of the UAV system
Justification The ground station has to be considered as one part of the UAV system. Proper function may have direct influence on the operation and safety of the air vehicle. Ground equipment is liable to easy change by uninitiated personel Therefore the configuration control of the ground station is as important as of the air vehicle.	

Comment	Response
Paragraph - para IV c v of the explanatory note - ° para d of the policy **Cmt.** *EADS* As a first step it is recommended to certify and operate an UAV with the related ground station. In this case the ground station should be certified together with the UAV. This seems to be a straight forward approach with the possibility to have a certification basis for UAV in a relatively short. In addition there are at the moment not many UAV in operation or probably planned for certification in the near future. In a second step the ground station could be certified separately to the air vehicle and should have the possibility to control different UAV. In this case at least a part of the ground station has to be certified with totally separate rules and independent from any air vehicle. This would than alleviate the operation of any UAV and will also reduce the operating cost for the operator if he do not need a separate ground station for each system. At least from the moment on when a higher number of UAV are in operation as there are right now. **Justification**	partially acccepted The independant certification of the control staion is not possible in the present remit of EASA. It may be envisaged in the long term when EASA becomes competent for ATM and aerodromes
Paragraph The A-NPA :purpose and the rationale to use the A-NPA procedure: c ii. UAV system **Cmt.** *UAV Systems Association* The Policy is applicable to the UAV system. System definition. UAVS, representing the consensus position of the UK UAV industry, supports the principle of defining the UAV system but proposes that the term 'Control Station' should be amended to 'Management Station' **Justification** The system definition correctly identifies the key components of the UAV system however increasingly as control of the inherent air vehicle functions is delegated to automatic systems and on board autonomous elements then the function of the ground segment of the UAV system will increasingly become one of overview and management rather than direct control (except in override) This definition also facilitate the determination of the ground element functions when the management station is responsible for the operation of multiple or different air vehicles.	Not accepted The words 'control station' seem more widely accepted .
Paragraph IV 4 c v Issue of certificate of airworthiness (pg 8 of 4) **Cmt.** *UVS Canada* A specific certificate of airworthiness should not be created for a GCS. **Justification** Since the GCS forms a critical part of the flight control system of a UAV, a GCS that is designed to control a variety of UAV should be certified as part of a UAV system that includes each aircraft type. As the number of aircraft or variety of types of aircraft increase, the complexity of the communications and the user interface increases. Adding new aircraft to a system may introduce interactions and potential problems that are difficult to predict.	Accepted This is the proposal contained into the A-NPA

Comment	Response
Paragraph V 4 a. iv. Social (pg 13 of 42) **Cmt.** *UVS Canada* Option 3 states that the UAV operators will need to be qualified. The last comment suggests that the jobs that may be potentially lost to UAV will be replaced by other jobs. Does this suggest that UAV pilots must be trained as regular pilots? Certainly, to operate safely in non-segregated airspace, the UAV pilots should be trained to at least a level equivalent to a civilian private pilot ground school. Additional comment: A key element to fly a UAV is having situational awareness and understanding how airspace is controlled and managed. Whatever training is envisaged must include airspace management. Bill Werny **Justification** Without the luxury of visual cues, the UAV pilot is flying an aircraft in a capacity that equates to instrument meteorological conditions. To safely conduct the flight, it is imperative that the UAV pilot be aware of the conditions that the aircraft may encounter. Further, if the UAV is flying in controlled airspace, the UAV pilot must be trained to interpret and follow ATC instructions.	Noted The policy contained into the A-NPA only addresses UAV certification. Requirements for operators qualifications will be developed in the future when the EASA is competent for Operations and Licensing
Paragraph « Attachment 1- page 16 - Equivalence **Cmt.** *CAA, Belgium* Regulatory airworthiness standards should be set to be no less demanding than those currently applied to comparable manned aircraft nor should they penalise UAV Systems by requiring compliance with higher standards simply because technology permits." Comment: I have reservation about the second part of this statement. - First, specific UAV threat to safety may need better airworthiness as a compensating factor in order to achieve an equivalent level or safety. - Secondly, I doubt that the general public would simply accept a level of safety which is not better than for manned aircraft. The perception of safety by the general public is not based on the nice numbers calculated by multiplying the probability of occurrence by the magnitude of the consequences; otherwise nobody would use a car. Thirdly, historically, if CS23 and CS25 have been developed, it was to take into account what was technologically and economically feasible. If CS23 aircraft were to be constructed as CS25 aircraft, there would be no place left for paying load and/or range. So CS25 aircraft have a higher standard because technology permits. Manned aircraft have a huge weight penalty compared to UAVs at equivalent paying load and/or range. For a same MTOM, this difference in favour of UAVs could be used for additional safety. **Justification** - self explanatory See http://www.psandman.com/ about perception of risk.	Not accepted The concept proposed by the commentator is interesting however principle recalled at the beginning of the comment is similar to the one accepted for Special conditions that are used to introduce new technologies.
Paragraph « Attachment 1- page 16 - Fairness **Cmt.** *CAA, Belgium* Any regulatory system must provide fair, consistent and equitable treatment of all those it seeks to regulate." We are in favour of a regulation based on the existing regulation wherever practicable. The words « based on » does not mean completely identical. Every one will agree that, in some way, the UAV regulation has to be specific because it must address some specific threats to safety. Specific regulation should not be rejected because it would not be politically correct. If specific regulation were not politically correct then we could simply throw away the entire aviation regulation because one could argue that the good old article 1382 of the Napoleonic civil code about civil responsibility is sufficient for any kind of activity. **Justification** self explanatory	Noted Example of specific issues to UAV are those reflected in the generic special conditions included in the Policy.

Comment	Response
Paragraph « Attachment 1- page 17 - Responsibility / Accountability **Cmt.** *CAA, Belgium* The legal basis should be clearly defined in a similar manner as for manned aircraft. This is valid for design and manufacture (including control of suppliers), operation and maintenance of UAV Systems. However, provisions must be made for transfer of command and maybe even for transfer of operator responsibility during a global long flight where they would be transfers between ground control stations. Comment : Transfer of operator is unacceptable because the operator shall be responsible of the airworthiness, which normally implies a pre-flight control. There is no possibility for the second operator to assess the airworthiness of the aircraft during the flight. Downloading parameters will never give a complete picture of the aircraft condition. Furthermore, the second operator will never be sure about what is on board (dangerous goods?), about mass & balance, etc. Otherwise, the CONVENTION ON DAMAGE CAUSED BY FOREIGN AIRCRAFT TO THIRD PARTIES ON THE SURFACE SIGNED AT ROME ON 7 OCTOBER, 1952 , gives an answer which is adequate (for post accident treatment at least) : “Article 3 - If the person who was the operator at the time the damage was caused had not the exclusive right to use the aircraft for a period of more than fourteen days dating from the moment when the right to use commenced, the person from whom such right was derived shall be liable jointly and severally with the operator, each of them being bound under the provisions and within the limit **Justification** Self explanatory	Noted The commentator raises a valid point that will have to be addressed when developing the rules applicable to UAV operators (e.g. organisations that operate UAV)
Paragraph 2. a. Options **Cmt.** *CAA, Sweden* The Swedish CAA recommends Option 2 as an initial approach, and agrees to that a more comprehensive approach (according to Option 3) should be aimed at as a future solution. **Justification** It would not be a realistic approach to suggest a comprehensive regulatory framework, which goes beyond EASAs jurisdiction at this moment. Though we would like to emphasize that EASA must start to develop the requirements concerning airworthiness as soon as possible, since this is already within its authority.	Accepted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Comment	Response
Paragraph 4 a iv Social **Cmt.** *CAA, Sweden* There is a problem for the public to make distinction between model a/c and UAV:s. With stringent rules for UAV:s it is not possible to let the operation of model aircraft free. Model aircraft has also to bee regulated. The development of UAV:s beneath 150 kg will have an impact on public acceptance, and that development is already here. Avoiding regulating or not issue recommendations for UAV beneath 150 kg doesn't help development of UAV above 150 kg.	Noted Several commentators requested that the Agency develops guidelines for the certification of small UAV. The comment is understood however the EASA is 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 regulation based on the work done by the UK-CAA. Because it sees merit in a harmonised approach between Member States, the Agency proposes that Member States agree that EUROCAE WG-73 develops guidelines for certification of such UAV. The guidelines drafted by the joint JAA-EUROCONTROL initiative only address the case of UAV that remain in direct line of sight of their pilot (e.g. crop spraying). However today application for UAV below 150kg envisages operations that would not remain in line of sight of the pilot (e.g. coastal surveillance) and therefore the guidelines need to be updated.
Justification	
Paragraph 4. c vi. Sense and Avoid **Cmt.** *UAV Systems Association* UAVS, representing the consensus position of the UK UAV industry, supports the EASA view on the importance of the Sense and Avoid system to facilitating flight in non-segregated airspace. However, UAVS sees the responsibility of EASA only in determining the intrinsic airworthiness of the installed system, i.e. system design, installation reliability and functionality, in direct correlation to any other on-board sub system. Certification will require evidence that Sense and Avoid interfaces standards are correctly implemented but the technical solution and parameters therein should not be EASA's responsibility. UAVS note the intention of EUCAE WG 73 to address UAV standards and would request that EASA support the need for appropriate interface standards for Sense and Avoid systems to a suitable sponsoring agency or organization.	Noted The Agency will cooperate with the EUROCAE WG-73 and will propose that they work on several tasks as described in this CRD
Justification There is on going confusion in discussing Sense and Avoid requirements, collision avoidance, aircraft and ground separation and miss distance. The issue is also confused by possible levels of required, or optional on board autonomy. Certification specification for Sense and Avoid technology solutions (for which there may be many difference solutions and implementations) should be restricted to issues of airworthiness that affect on board installation, operation and reliability. Overall system performance will of course require subsequent evaluation to provide overall system certification.	

Comment	Response
Paragraph **4. The A-NPA :purpose and the rationale to use the A-NPA procedure: a. Purpose of the A-NPA**	
Cmt. *UAV Systems Association*	
The content of the regulatory impact assessment in particular on its environmental and social aspects (See paragraph 4 a iv and v of the regulatory impact assessment). UAVS has not fully formulated a position of the social impact of UAVs but supports the current UK CAA initiative to open up public debate and consultation on the subject. Whilst always mindful that UAV could attract adverse publicity in the event of a serious mishap, the general and flying public are in all probability unaware of the level of automation and hands off participation in current aviation, over highly populated areas and approaches to airports. In this regards UAV systems could be reliable and have little impact on the public. With regards to flying in non-segregated airspace, but over remote areas and with low population densities and minimal aviation activity, the impact could be similarly light. Negative reaction for the piloting community (essentially from job losses) should not be experienced if they are actually saved boring and dangerous operations or if UAV systems like Sense and Avoid or ground proximity warning systems are migrated into their operations to make them safer.	Noted The comment will be taken into account to improve the the regulatory impact assessment (RIA)
Justification	
Comment only	
Paragraph **4. The A-NPA :purpose and the rationale to use the A-NPA procedure: a. Purpose of the A-NPA:**	
Cmt. *UAV Systems Association*	
The content of the regulatory impact assessment in particular on its environmental and social aspects (See paragraph 4 a iv and v of the regulatory impact assessment). UAVS, representing the consensus position of the UK UAV industry, sees no compelling argument why UAV systems of any type should not conform to their appropriate environmental requirements as they are at present or develop in the future. In predicting the development of the UAV industry and operations UAVS envisages a similar development to that of manned aviation. There will be unique designs for niche markets and undoubtedly the substitution of manned aviation for unmanned systems for example freight albeit in many instances using the same assets only demannned.	Noted The comment will be taken into account to improve the the regulatory impact assessment (RIA)
Justification	
Current market predictions.	
Cmt. *UAV Systems Association*	
The issue of noise certification requirements for UAV (See paragraph h of the Policy). UAVS, representing the consensus position of the UK UAV industry, sees no compelling argument why UAV systems of any type should not conform to their appropriate noise certification requirements as they are at present or develop in the future.	Noted The problem is that ther may be no ICAO requirements for UAV equipped with a turbojet as they may have a take-off distance of less than 610 m
Justification	
The onus is on the UAV manufacturer and operator to comply with extant environmental and noise regulations whether local, regional or international.	

Comment	Response
Cmt. ***UAV Systems Association***	
The issue of certificates of airworthiness in relation with the control station (See paragraph IV c v of the explanatory note and paragraph d of the Policy). UAVS, representing the consensus position of the UK UAV industry, supports the adoption of certification and issue of a certificate of airworthiness for the control station (and change to management station) as a separate system component. It also identifies the need for the establishment of additional interface specifications within the overall UAV system to permit the development of 'plug and play' capability where one management station (control station) can control various types of air vehicle either singularly or as a mixture of different types. The overall UAV system and the effective implementation and operation of the interfaces will require separate certification.	Noted This is not possible without changing the EASA regulation 1592/2002
Justification	
Use of the current manned aviation certification procedures permits multiple manufactures of airframes and subsystems to design and certify systems cost effectively either independently and collectively in the overall aircraft. Different customers/ manufacturers are free to select different avionic and engine fits yet achieve overall certification for their aircraft and operations. This ability should remain open to UAV system integrators, subsystem manufacturers and operators to select various compatible components of their systems, whether air vehicle, management station, communications or the like. This initial certification and re-certification on modification or substitution of components must remain cost effective for the industry to develop.	
Paragraph **A Explanatory Note** **Attachment 1** **a) Equivalent risk**	
Cmt. ***Dassault***	
Dassault Aviation recommends that the paragraph on the "Equivalent risk" be updated to take into account not only civil aircraft but all airspace users. Dassault Aviation recommends to replace the sentence "UAV Operations shall not increase the risk to other airspace users or third parties" by the following one "UAV Operations shall not represent a risk to other airspace users or third parties larger than the risk induced by the today airspace users"	Not accepted The reference for civil UAV should be the other civil aircraft.
Justification	
There might be some ambiguities about the equivalent risk. Increasing the number of UAV operations will increase the risk for the populations, as the risk increases when the air traffic is increasing. UAV will only be one of the components of this traffic. "The service record of the existing UAV fleet.....the same level as the one demanded by civil regulatory authorities for manned aircraft". As there is no people onboard Safety objectives of the UAV will probably be different from the safety objectives of the civil aircraft. So the last part of the sentence should not refer to the demand of civil authorities which are only applicable to civil aircraft but should refer to equivalent manned aircraft.	
Paragraph **A Explanatory Note, IV, 4, c** **Page 8, v Issue of certificate of airworthiness**	
Cmt. ***UAV DACH***	
We prefer to issue a specific certificate of airworthiness for the control station.	Not accepted The independant certification of the control station is not possible in the present remit of EASA. It may be envisaged in the long term when EASA becomes competent for ATM and aerodromes
Justification	
The control station can possibly be used for different types of UAV. Then it is possible to define in this certificate that the control station can be used separate or a UAV can be controlled by several control stations. This is the same as the type certificate of engines. This is a unique element, that because of the requirements it is validly that a special certificate is issued.	

Comment	Response
Paragraph A Explanatory Note, V, 4, a Page 13, iii Environmental **Cmt.** *UAV DACH* In the development of UAVs both effects will happen. But the main effect will be that UAVs will replace existing manned aircraft. With the experience it is no impossible, that niche roles will be created. It is even so that at present time requests are for UAVs, when it is dangerous to use manned aircraft. In this regard both options are of same influence. **Justification**	Noted The comment will be used to improve the regulatory impact assessment.
Paragraph A Explanatory Note, V, 4, a Page 13, iv Social **Cmt.** *UAV DACH* With option 3 are clearly regulated the requirements of UAVs as it is for manned aircraft. There is no special process in the certification of them. For the industry is even given the possibility to develop new aircraft for the use in the role of UAVs. **Justification**	Noted. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Comment	Response
Paragraph A Exploratory Note Paragraph IV 4, c, vii **Cmt.** Dassault Dassault Aviation recommends to use environmental rules applicable to aircraft whatever their take off distance. Note : for light UAV it might be possible to refer to rules applicable to VLJ (Very Light Jet) **Justification** For UAV having a take off distance of less than 610 m Dassault Aviation recommends to use the same rules than for the others UAV . It seems that FAR 36 does not take into consideration such characteristic. Nevertheless this will not solve the problem of the UAV which will not use airport for take off or recovery. Dassault aviation recommends that a "special condition" defines the applicable requirements on the zone used by the UAV for take off and recovery. Cost associated to "noise certification" must be taken into account to define the requirements tests and procedures.	Not accepted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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 UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of “larger” UAVs 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.
Paragraph A Exploratory Note Attachment 2 Import Export **Cmt.** Dassault Dassault recommends to use for UAV certification a method similar to the method used for aircraft. A method based on safety objectives defined by Europe and later harmonized with the other nations. **Justification** We are living in a competitive world and fair competition must be based on the same rules. This is the case for air transport, CS25 and FAR 25 have the same safety objectives. FAA EASA harmonization will be requested, nevertheless before this harmonization, due to the lack of UAV regulation, due to the fact that safety objectives are addressed at the protection of on ground people it must be requested that any UAV operating over Europe will have to be certified in agreement with the safety objectives as defined by the EASA. This is a difference compared to aircraft operation.	Noted The policy actually propose to use a method similar to other maaned aircraft. The Agency agrees that harmonisation is desirable but is f the opinion tat the conventional approach has a higher chance of being accepted worldwide compared to the safety target approach for the reasons developed in the A-NPA. Please see the A-NPA for the discussion about conventional and safety target approaches.

Comment	Response
Paragraph **A Exploratory Note** **Attachment 2 Commonality of standards** **Cmt.** ***Dassault*** Dassault Aviation suggests than the following sentence will be deleted "Under such a system limitations on the frequency and duration of missions may be part of the justification of acceptable airworthiness". **Justification** This sentence is ambiguous, it is true that traffic increase, increases the risk for on ground population. Nevertheless nobody has suggested to limit the number of civil aircraft flights to assume a constant safety objectives for on ground populations. Why would UAV have to do it? The rule must be the same for aircraft and UAVs, no specific limitation in frequency or in duration of missions except, the limitations determined during the certification process by the safety analysis.	Not accepted The Agency agrees that such a method is not ideal but considers it still a way to limit the risk.
Paragraph **A Exploratory Note** **Paragraph V, Para 2a** **Cmt.** ***Dassault*** Dassault Aviation recommends selection of Option 3 : Develop a comprehensive regulatory framework for UAVs **Justification** It is a challenge, but it is the only method that will allow operation of the UAV in non segregated airspace. Sure certification is important, but today there is a first set of adequate regulation to perform the task (i.e.: USAR). It is important that EASA takes the initiative to co-ordinate the development of a comprehensive regulatory framework for UAVs.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with

Comment	Response

Paragraph **A. Explanatory Note**
Chapter V Regulatory Impact Assessment
Section 4 a ii Economics, page 12

Cmt. ***EADS, France***

The method for establishing any Agency fees applicable to the certification of UAV Systems (in particular those related to the instruction of a type certificate) will need to be defined / clarified.	Agreed The comment will be passed to the Agency Department in charge of the fees and charges regulation.

Justification

The Explanatory Note states that “It should be noted that there will be certification costs in these two options (Options 2 & 3 of RIA) In particular the need to obtain a design organisation approval must be pointed out, in particular relative to small organisations”.

The need to obtain a DOA for type certification of an UAV System is commented in EADS MAS-F Item 9 Comment Form.

EASA fees and charges defined by the Official Journal of the European Union for the type certification of manned aircraft are based on :
- fixed charges for new TC Instruction according to product type,
- hourly fees for new TC Instruction for time spent by EASA agents,
- TC holder annual EASA fees (annual fee levied on all holders of EASA TCs and continued airworthiness activities charged at hourly rate for products with less than 50 examples registered world-wide).

The product type in the above calculation (currently based on the certification specification and corresponding MTOW of manned aircraft) being not presently defined for UAV System, the method for establishing Agency fees & charges (in particular fixed charges) will have to be consolidated.

For this purpose, the direct application of manned aircraft current fees & charges by equivalency with similar certification specification and/or MTOW may not be appropriate, considering the principles of the Policy for UAV certification and the specificities of the UAV business such as :
- tailoring of manned aircraft certification specification for the establishment of the UAV System airworthiness requirements,
- establishment of global safety objectives according to different UAV categories (from 150 kg up to xxx tons) ,
- range of potential UAV System manufacturers (small to large size organisations),
- scale of UAV Systems production (small scale production compared to civil manned aircraft).

This will be all the more significant if the Policy adopts a certification specification dedicated to UAV Systems (i.e. CS-UAV) in a future evolution of the regulation.

Comment	Response
Paragraph A. Explanatory Note Chapter IV d) Perspective **Cmt.** *EADS, France* EADS MAS-F recommends that the EASA remit should be extended in order for the Agency to take responsibility for the development of the future comprehensive regulatory framework as defined by Option 3 of the Regulatory Impact Assessment in the A-NPA Explanatory Note. **Justification** Basic Regulation (EC) 1592/2002 of 15th July 2002 defines the Agency's role and responsibilities limited to the regulation of airworthiness and environmental certification of products. As explained in EADS MAS-F Comment Form 3 : (a) the Option 2 approach of the Regulatory Impact Assessment is favoured as a short-term solution (limited to airworthiness and environmental protection requirements), (b) but it is recommended that EASA takes responsibility for initiating the development of the future comprehensive regulatory framework as defined by Option 3 which will address the insertion of UAV Systems in non-segregated airspace. For this purpose, the scope of the Basic Regulation 1592/2002 should be extended to the regulation of air operations, flight crew licensing & training, and interface with airport & ATC operations. In absence of any extension to the Basic Regulation, EADS MAS-F will support the Agency to go beyond its role in order to act as coordinator of organisations involved in the regulation for the insertion of UAV Systems in non-segregated airspace.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Comment	Response
Paragraph A. Explanatory Note Chapter V Regulatory Impact Assessment, Page 9 **Cmt.** *EADS, France* EADS MAS-F agrees with the Agency's consideration of Option 2 of the Regulatory Impact Assessment, which "has been chosen because it provides a realistic short term objective with limited resources and effort" but recommends that EASA take responsibility for the development of the future comprehensive regulatory framework as defined by Option 3. **Justification** (a) A regulation framework is strongly needed to palliate the lack of existing regulations for UAV Systems certification. (b) Out of the three proposed options within the Regulatory Impact Assessment analysis of the A-NPA Explanatory Note, EADS MAS-F concurs with the Option 2 approach as a short-term solution (limited to airworthiness and environmental protection requirements) which will allow the Agency to reply positively to certification applications from the industry. (c) Option 1 (doing nothing) cannot be considered as a real option, as it will in no way support the requirement in (a) above. (d) Option 3 satisfies the ultimate goal of the Policy - supporting the insertion of UAV Systems in non-segregated airspace - but is not considered at the present date as a practical and sensible option as : - it will require a change to the current EASA remit (see EADS MAS-F Comment Form 4), - it will require all operational requirements not covered by airworthiness and environmental protection and identified in Attachment 1 of the Policy to be comprehensively addressed (e.g. security, sense & avoid, qualification & training of UAV pilots and operating personnel, etc.), - it will prevent the Agency from issuing any Policy before years to come.	Noted The Agency highly appreciate the support given by the Commentator
Paragraph A. Explanatory Note, A General **Cmt.** *BMVBS, DE* To develop practical solutions for air navigation service it should be questioned, if the present way of traffic control is sufficient for the safe integration of UAV traffic or if a new definition of the controller future role is required. Should the controller have direct access to the UAV in an emergency case? **Justification** The paper describes the policy for UAV certification. The main criterion through the whole paper is that UAV shall behave like a manned aircraft. Sense and avoid techniques shall mainly assist to guarantee this behaviour. In the future the UAVs shall fly with the same performance like manned aircraft. This works as long the technique performs as designed and the controllers at the ground learn to trust in the performance of the technique. In the case of emergency (even malfunctions) with UAVs we have a new quality of problems. The substitute of the pilot is the UAV Operator. Here it is not clear if he can react and how long the reaction time is. Due to the possible mission distances, direct communication seems technically not possible; the connection via satellite (datalink) is the communication channel. Here arises the problem of the acceptable delay times, especially in critical situations.	Not accepted The responsibility of the control of the UAV must remain with the UAV Operator (e.g. the organisation that operates the UAV) in a similar maner to what exist today with manned aircraft.
Paragraph A. Explanatory Note, A IV, 4, vi, page 8 **Cmt.** *BMVBS, DE* The ANSP are responsible for the definition of the operating criteria for UAV. Based on these criteria the sense and avoid technology shall be defined. But who is the responsible ANSP for the definition of the operating criteria (e.g. Eurocontrol, ICAO, Canso, or national ANSP)? Maybe the operating criteria depend on the technical possibilities. **Justification** Without clear definitions for sense and avoid it is not possible to certify and operate UAV. The process will be delayed without clear responsibilities.	Noted The Authorities in charge of safety regulation of ATM are responsible for defining such criteria. Such criteria should ideally be objective and not technology dependent. However to be practical, it could be possible to start with a technology dependant criteria.

Comment	Response
Paragraph **A. Explanatory Note, Attachment 1, page 17, Transparency** **Cmt.** *BMVBS, DE* Due to the fact that UAV will be piloted via datalink, a new emergency "datalink loss" could happen. For this new emergency case the existing rules and procedures are not adequate. **Justification** In simulations done by the DFS Deutsche Flugsicherung emergency procedures for datalink loss were tested. One result was the controller's demand for a new emergency squawk for datalink loss. This is not in line with the existing rules.	Agreed This is the purposeof the Special Condition for data-link. The text will be clarified to take into account the comment.
Paragraph **A. Explanatory Note, Attachment 2. Section 1., 2. and 3., page 29/30:** **Cmt.** *UAV DACH* The A-NPA should address the technical requirements, which the UAV and/or its onboard system have to comply with in order to achieve an adequate level of airworthiness. E.g. : - Reaching an emergency landing site expresses the philosophy of CS 22 that a minimum glide ratio enables the pilot to do so. In addition to that it requires for UAVs a minimum control capability / authority (i.e. safe and secure data link). Otherwise the option to fly the UAV to an emergency landing-site is just a nice idea. - Definitions for unpopulated and thinly populated areas shall be given, especially for certification procedures applied in Europe. - Handling of warning philosophy and UAV system autonomy including capability for self-failure identification and re-configuration. **Justification** The definition of an acceptable ground victim criteria is rather vague and seems not fully in line with airworthiness aims for third party protection. The applicability of these proposals depends highly on its capability to be transferable into safety assessments and calculations accordingly. If a set of assumptions can be quantified that provide a provable set up for certification purposes, the approach can be discussed further and may become feasible. Unless this is outstanding, the A-NPA can not be fully understood.	Agreed. The purpose of attachment 2 is to compare the safety target approach and the conventional approach. The Agency has selected the conventional approach for normaol AV operations hoxever accepts that the safety target approach could be used for example for operations in remote area. The text of paragraph 3 of the detailed guidance for the policy will be improved to take into account the comment.

Comment	Response
Paragraph **A. Explanatory Note, Attachment 2. Section 4.2, page 31** **Cmt.** ***Euro UAV ICB*** The ICB recommends to add a new consideration “Security, Protection and Authorisation requirements” to the section in Policy, Attachment 2.	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.
Justification Security, Protection and Authorisation of the communication link are highly flight safety related. The ICB recognizes that the corresponding technical requirements have not been included by the EASA within the Policy as: - Security, Protection and Authorisation requirements are currently outside the Agency remit, - Even if such matters are under consideration, there is currently no mature Security, Protection and Authorisation requirements specification document to directly support the Policy. The Euro UAV ICB deems that a specific working group should be set up to support adequate consideration of these matters within the Policy and would be ready to participate, under EASA responsibility.	

Comment	Response
Paragraph A. Explanatory Note, Attachment 2. Section 4.2, page 31: **Cmt.** *UAV DACH* Security, Protection and Authorisation requirements for the communications link shall be addressed. The A-NPA shall address the technical requirements which the UAV and/or its onboard system have to meet in order to achieve a reasonable level of Security, Protection and Authorisation for the UAV System. **Justification** Security, Protection and Authorisation of the communication link are highly flight safety related.	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.
Paragraph A. Explanatory Note, Attachment 2. Section 4.3 and 4.4, page 31/32: **Cmt.** *UAV DACH* The level of autonomy shall address the warning philosophy and its conceptual minimum requirements. Depending on different level of system autonomy the A-NPA shall address the warning philosophy and its conceptual minimum requirements for the entire UAV System. **Justification** The warning philosophy and its concept are highly flight safety related. The A-NPA does not account for human errors in the operation of UAVs. However, like for manned aircraft, human errors in the operation of UAVs are quite possible (for example in-flight by the UAV-pilot, or already during the mission planning by the ground crew). These human errors may, depending on the specific functions of the considered UAV, effect its safety of operation. A lack of experience with human errors in the operation of UAVs does not mean, that they do not exist. Contrary to manned aircraft, the different sources for potential human errors in the operation of UAVs, and their impact on the safety, have still to be identified.	Noted Warnings are already covered by existing manned aircraft Certification Specifications paragraph NN.1322). The Special Condition on Human Factor will help clarifying the application of the specifications for warnings to the case of UAV The issue of warning will be added to the outline of the Special condition for Autonomy

Comment	Response
Paragraph **A. Explanatory Note, IV,4. c Section vi, page 8:** ***Cmt.*** *UAV DACH* The A-NPA should address the technical requirements, which the UAV and/or its onboard system have to meet. ***Justification*** The current A-NPA does not address technical requirements for Failure identification & Management, Data Link Security and Protection. For manned Aircraft, the pilot fulfills these tasks. W. r. t. UAV such tasks need to be identified more precise and realized by technical functions. The UAV-certification Standard should describe such technical functions. If there would be no uniform description for higher functionality of the UAV, a meaningful and comprehensive approach to certification of the UAV would not be possible.	Agreed The policy for UAV certification relies on the use of manned aircraft Certification Specifications taylored for UAVpurposes and complemented by Special Conditions and a system safety analysis applicable to the whole of the UAV system. These specifications contains the technical criteria requested by the commentator..

Comment	Response
Paragraph **A. Explanatory Note, IV,4., c Section vi, page 8:** **Cmt.** *UAV DACH* The current A-NPA does not address technical requirements for Sense and avoid, although Sense and avoid is a mandatory item for each UAV operating in non-segregated airspace. The A-NPA should address the technical requirements which the UAV and/or its onboard system have to meet. **Justification** For manned Aircraft, the task for sense and avoid is part of the pilot's workload. As such the sense-and-avoid aspect can be sufficiently treated by operational regulation. Since a pilot is not onboard of a UAV per definition, the fulfillment of this requirement has to be prescribed by the proposed technical UAV-Standard. Production of UAVs for flying under non-segregated airspace conditions (civil market) implies a high risk for any manufacturer as long as there is no distinctive requirement list against which a UAV can be designed. The same high cost risk applies to any (civil) UAV-Operator.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
Paragraph A. Explanatory Note_I.General_1 **Cmt.** *UAV DACH* It's a major step forward for the EC, that EASA took over the action of defining a policy for the certification of UAV systems. **Justification** As comments on this proposed policy are required, the UAV DACH working group on certification issues took this opportunity to forward the following comments on behalf of the UAV DACH.	Noted The Agency highly appreciate the support given by the Commentator
Paragraph A. IV 4. C. - Paragraph ii. UAV System **Cmt.** *FAA, Certification* Paragraph ii. UAV System We agree that the conventional definition of an aircraft must be adjusted to address the unique architecture of an Unmanned Aircraft System (UAS). The UAS for purposes of Type Certification must include the unmanned aircraft, ground station, and any ground based or airborne systems or equipment necessary for the operation of the unmanned aircraft. **Justification** The non-aircraft based equipment is required to conduct safe operation of the unmanned aircraft and therefore must be considered part of the airworthiness certification effort.	Accepted The policy already reflects this comment
Paragraph A. IV 4. C. iii. a. **Paragraph a. UAV Airworthiness and certification** **Cmt.** *FAA, Certification* While we agree with the stated Conventional Approach, which employs the existing regulations that have an accepted level of safety, the Safety Target method will be difficult to apply in the UAS case as an umbrella approach. As you are aware based on JAA research, UAS are being utilized in various industries (civil and governmental) for diverse missions. And furthermore it seems evident by the diversity of their utilization that the industry will gradually discover even more uses for the UAS. This in our opinion significantly limits the use of the Safety Target method which being a top down approach depends on a defined mission. While we may design a UAS to a specific safety objective a change in the mission profile may significantly affect continued airworthiness. However, the safety target method may be applied to UAS as a limited approach. For UAS manufacturers and their potential customers who want limited/restricted access to the NAS for a defined mission the safety target approach is less burdensome and therefore ideal. For those UAS operators who want unrestricted access to the NAS similar to a manned aircraft the conventional approach, which has proven its worth and achieved an acceptable level of safety, is ideal. It is also recommended that the Conventional Approach paragraph clarify that while defined airworthiness codes avoid any presumption of the purposes for which the aircraft will be used in service, this only applies within a specific Part (e.g. Part 23, 25) and not across all rules. Clearly Part 25 – Transport Category – aircraft are designed for a different purpose than Part 23 aircraft. **Justification** See paragraph 2	Accepted The safety target approach is intended to be used in exceptional cases (e;g. operations in remote area)

Comment	Response
Paragraph A. IV 4. C. iii. c Paragraph c. Conclusion **Cmt.** *FAA, Certification* Following due consideration of the pertinent issues, the Policy is based on the existing civil certification procedures for the routine certification of UAV Systems, using defined codes of airworthiness requirements to gain type-certification and the granting of Certificates of Airworthiness to individual UAV when compliance with the approved type design has been shown. The above referenced sentence implies that UAS may be certified using existing airworthiness standards. While we have agreed with applying the existing certification methodology to UAS (the conventional approach) we further recognize that the existing standards are inadequate to address all technological and operational aspects of the UAS. We don't feel that it was EASA's intention to imply this but the above sentence without further clarification may give this erroneous impression. It should be clarified that for the unmanned specific technological and operational aspects, while applying the 'conventional approach', the certifying authority will need to develop special conditions, or other airworthiness criteria which will find an equivalent level of safety to similar existing manned airworthiness standards or address issues that do not previously have any standards. **Justification** See paragraph 2 above	Accepted The policy already reflects the comment and the quoted sentence will be improved for clarity purposes.
Paragraph A. IV 4. C. iii. c. Paragraph c. Conclusion **Cmt.** *FAA, Certification* Following due consideration of the pertinent issues, the Policy is based on the existing civil certification procedures for the routine certification of UAV Systems, using defined codes of airworthiness requirements to gain type-certification and the granting of Certificates of Airworthiness to individual UAV when compliance with the approved type design has been shown." The above referenced sentence implies that UAS may be certified using existing airworthiness standards. While we have agreed with applying the existing certification methodology to UAS (the conventional approach) we further recognize that the existing standards are inadequate to address all technological and operational aspects of the UAS. We don't feel that it was EASA's intention to imply this but the above sentence without further clarification may give this erroneous impression. It should be clarified that for the unmanned specific technological and operational aspects, while applying the 'conventional approach', the certifying authority will need to develop special conditions, or other airworthiness criteria which will find an equivalent level of safety to similar existing manned airworthiness standards or address issues that do not previously have any standards. **Justification** See paragraph 2 above	Accepted The policy already reflects the comment and the quoted sentence will be improved for clarity purposes.
Cmt. *FAA, Certification* "So, for example, approval of a UAV designed and operated specifically for arctic surveys and constrained to operate entirely over a very remote area where the risk to third parties on the ground is negligible, could be approved under a restricted certificate of airworthiness, and this may be based on the safety target approach." The above referenced sentence ignores the fact that while the area in question may be remote for population, it does not address the fact that air traffic density may not be remote or sparse. Include the "remote" definition to mean population and air traffic as factors where a restricted certificate of airworthiness could be issued. **Justification** In most air-to-air collision scenarios the size of the UAS is inconsequential because even a small UAS colliding with a manned transport aircraft could be just as catastrophic as a midair between a transport sized UAS and a manned transport. The most important mitigating element in many such cases, the human pilot, is missing from the UAS and this increases the risk level. While the UAS may be operating in a remote region this has no control over manned aircraft which may also choose to operate there or a scenario where there is a lost link condition and the UAS is out of control and may enter airspace being used by manned aircraft.	Accepted The policy already reflects the comment and the quoted sentence will be improved for clarity purposes.

Comment	Response
Paragraph **A. IV 4. C. v. Paragraph v. Issue of Certificate of Airworthiness** **Cmt.** *FAA, Certification* When one or several control stations control one UAV this is not a problem, as the certificate of airworthiness can cover several identical control stations for one flying vehicle. The situation is different when only one control station controls two or more UAV. In such case, should the control station be included in the two certificate of airworthiness or should a specific certificate of airworthiness be created for the control station? The latter seems difficult to achieve under the EASA Basic regulation as it currently stands." To remain consistent with manned aircraft operations and determine an equivalent level of safety one ground control station should only be allowed to control one unmanned aircraft during any given flight operation – takeoff to landing. Any other way would severely burden the regulatory system with additional (new and novel) operational and safety considerations including human factors.	Agreed The policy will be modified to reflect the comment. Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework
Justification	

Comment	Response

Paragraph **A. IV 4. C. vi.**
Paragraph vi. Sense and Avoid

Cmt. *FAA, Certification*

While we agree that in the manned aircraft world 'sense and avoid' standards are considered operational the fact that in UAS a very important mitigating element, the human pilot, is not onboard must be considered. In a UAS the sense and avoid' function may be partially or fully autonomous dependant upon technology to perform its function. This unique and novel change may demand that we consider the 'sense and avoid' system as an airworthiness requirement.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

In manned aircraft the human pilot complies with the 'sense and avoid' function whereas in the case of a UAS a remotely located human pilot may still comply with assistance from an onboard system or it may be fully autonomous. Being that the 'sense and avoid' function now requires assistance from technology for compliance and may face a time lag and is susceptible to command and control link dependability it is recommended that this be considered as an airworthiness item not simply operational.

Comment	Response
Paragraph A. IV_4_a._1st **Cmt.** *Rheinmetall Defence Electronics* This bullet requires a comment on the method of selecting the relevant certification code, and refers to the attachments. One approach is called the conventional approach; the other is called the safety case approach. While explaining both approaches on pg. 6 and 7, EASA refers to Attachment 2 and secondly concludes that a safety case approach is hard to justify and the conventional approach is flexible enough to deal with UAV systems. If this will be the preferred way to select the relevant certification code, it should be taken into account from EASA to use the so called safety case approach for issuing restricted certificates of airworthiness. **Justification** This approach includes nearly all the factors that are known today to verify if a certain system may be operated safely under a set of assumptions or restrictions. Especially for research projects, such an approach combined with a safety case analysis will lead to a quantitative result that may prove a certain decision.	Agreed The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach lead to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. It should be noted hoevere that a UAV desined and used exclusively for research purposes would be an Annex II UAV and would be regulated by National Authorities.
Paragraph A. IV_4_a._1st. **Cmt.** *UAV DACH* If comments of the public are required, EASA should have kept and should keep a neutral position on both approaches. **Justification** This bullet requires a comment on the method of selecting the relevant certification code, and refers to the attachments. One approach is called the conventional approach; the other is called the safety case approach. While explaining both approaches on pg. 6 and 7, EASA refers to Attachment 2 and secondly concludes that a safety case approach is hard to justify and the conventional approach is flexible enough to deal with UAV systems. These statements are expressing some kind of a prejudgment of the safety case approach.	Not accepted The Agency has tried to present both options and its evaluation in a objective way. The Agency expressed also the view that it has chosen the conventional approach. This was done for transparency reasons to indicate the position of the Agency and not leave the impression that choices were still fully open. The prupose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach.

Comment	Response

Paragraph **A. IV_4_c_iv**

Comment	Response
Cmt. ***UAV DACH*** EASA should not ask for a public vote on only one possible way to certify a UAV system but to get inputs under what circumstances which of the two proposed ways would be the preferred way to justify if a UAV system would be safe to operate.	Not accepted Paragraph IV 4 C iv of the explanatory note is about the selection of the method to select the relevant manned Certification Specification. Therefore this is within the context of the conventional approach chosen by the Agency (see previous comment). The comment mixes the two point. For the sake of clarity the two points will be taken in turn: Conventional versus safety target approach Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach. Method for selecting the relevant manned Certification Specification: In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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.

Comment	Response
	• 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

EASA wants to keep only one method. As to be seen on page 7, there will be UAV systems that may not be covered by existing or conventional standards of certifying aerial vehicles.
For example this will be the case, if the traditional approach requires a CS-E certified engine for a UAV of 150 kg MTOW. Neither the size of such an aircraft may allow the use of such an engine, nor will the remaining mass allow the design of an aircraft that corresponds to existing requirements.
If now the applicant wants to convince the authority that he found a solution outside conventional Certification Standards the safety target approach could become the best way to show that the possible solution is in line with the safety records of conventional solutions.

Paragraph **A. IV_4_c_vi**

Cmt. ***UAV DACH***

Airworthiness in the conventional way has the meaning that a product receives a certificate which indicates that the use of such a product according its manuals of operation and according the law will not be harmful to third parties- regardless if they are in the air or on the ground.	Accepted The policy proposes to taylor the selected manned certification specification and to complemant it by special conditons covering notably the data-link and by a system safety analysis addressing the whole UAV system. This allows to tzake into accoun the specificities of UAV compared to manned aircraft. The point mentioned by the commentator in the justification and relative to maneuvers following link-loss will be included in the special condition for data-link

Justification

For UAV systems, sense and avoid does not completely cover the problem. A safe, secure and reliable data link is one of the most necessary elements of a UAV system to become certified. In conjunction with this, all those functions of the flight management system to make sure that the aircraft is not up to lose the link or to regain the link after a “link-loss” should be subject of a type certification.
Who, if not EASA will have to certify, that the UAV will not carry out maneuvers like climbing to a higher flight level to regain a lost link? As such a maneuver, what is nearly a common procedure of UAV systems flying in reserved airspace, may become a serious problem to other airspace users so called “third parties in the air”.
As such a procedure is not covered by the traditional way of discussing “sense and avoid” problems, EASA may see, that collision avoidance may become a theme within the remit of EASA.

Comment	Response
Cmt. ***UAV DACH*** The headline “sense and avoid” doesn’t cover the whole problem of situational awareness. For this reason we recommend that EASA becomes responsible for the standardization of technical solutions to allow every pilot in command to become aware of the situation his aircraft is in and may react according operational rules. ***Justification*** We fully understand EASA’s position that defining procedures for airworthiness may not include defining rules for collision avoidance. Nevertheless, the procedures a pilot will have to follow to avoid a collision are mostly based on the detection of a foreign object. For this reason a worldwide set of common standards for technical solutions to enhance the visibility of aircraft has found its way into certification standards. (I.e. position lights). The way the pilot will have to react if he discovers a certain picture of green, red and white lights is written in operational rules.	Accepted The idea of equip UAV with devices or special painting to assit its recognition by manned aircraft is supported; It should be noted that present manned certification specifications already contains criteria for navigation lights. These lights will be acceptable as a first step. The Agency will ask the EUROCAE WG-73 to study what could be such devices and this may lead to modifications to the policy in the future.

Comment	Response
Paragraph **a. Purpose of the A-NPA**	

Comment	Response
Cmt. ***UAV Systems Association*** The method to select the relevant certification code applicable to a similar manned aircraft (See paragraph IV c iv of the explanatory note; paragraph d of the policy and paragraph 1 of attachment 2 to the Policy). UAVS, representing the consensus position of the UK UAV industry, notes the EASA preference to adopt a single means of determining certification requirements and supports the adoption of the conventional approach to determine appropriate manned certification specifications. These codes should be appropriate to LTA, fixed and rotary wing types and should seek to conform the ICAO requirements to permit the greatest potential opportunities for the industry UAVS also supports the method of using Kinetic Energy within the weight categories expressed as the basis of determining a suitably applicable code.	Accepted. Conventional versus safety target approach: Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach. The method for selecting the relevant manned certification specification: In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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.

Comment	Response
	• In addition the safety objective method leads to unequal treatment of manned and unmanned aircraft of identical maximum take-off mass: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

There are supporting arguments for both approaches and indeed they are actually complementary, but in supporting the conventional method UAVS members arrived at the majority conclusion we are where we are and there is not a compelling case to start off in different direction just because the air vehicle hasn't got a man onboard in the cockpit. Some of the future fleets of UAVs may be adaptation of existing manned platforms. Avionic and subsystems may be both unique to UAV systems or shared with manned aviation. To permit cost effective utilisation and certification it is logical to adopt a system that readily permits this cross fertilisation. Adopting manned certification specifications from the outsets means that the industry has a starting point now on which build.

The use of Kinetic Energy within the proposed weight limits permits the ready adoption of existing manned platforms for UAV operations with known certification standards. Additionally the manned aviation world will have confidence in developing UAV system as they are using an accepted methodology of showing safety compliance and in the first instant many of the assessors will only be familiar with manned requirements.

Paragraph **A. V_4_a_ii**

Cmt. ***UAV DACH***

We highly support attachment 4 that clearly shows the need of requirements "below" CS 23 for Light UAV systems.	Noted. The conventional approach complemented by the kinetic energy method for selecting the relevant manned certication specification (CS) allows to select CS-VLA for example.

Justification

As to be seen in the picture, the proposed range of possible certifications standards which are based on CS 23 does not cover Light UAV Systems. As written in comment UAVDACH 4, there is no sense in the requirement to use CS-E certified engines with a weight of nearly the complete aircraft.

Comment	Response

Paragraph **A.V.5. Explanatory note - Regulatory Impact Assessment - Summary and Final assessment**

Cmt. ***Boeing Research & Technology***

Option 3 is the ultimate goal and option 2 is a step to reach the option 3. EASA should be the coordinator in the development of a global regulatory framework for UAVs and even if option 3 requires a very intensive development effort, EASA should work on option 2 with the vision to reach the option 3.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

The main justification to reject the option 3 with respect to option 2 is: it will require a very intense development effort. The option 2 must be only one of the main steps in the long process to achieve the development of a comprehensive regulatory framework for UAVs. The first paragraph of the document, A.I.1 mentions: "... and is a first step towards more comprehensive UAV regulation". This idea should be more specify in this chapter, A.V.5, indicating, for example, that option 2 is the first step towards the option 3: the development of a regulatory framework for UAVs.

Comment	Response
Paragraph age 8, vi Sense and avoid **Cmt.** *UAV DACH* This explains why the safety and environmental objectives of the Policy are limited to people on the ground and to the design of the UAV system. The requirements for sense and avoid equipment shall be defined in the regulations. **Justification** Does the above text explain that the sense and avoid are not for the security of people on ground? Also a collision is a danger for people on ground, because the collided aircraft will crash to ground. Sense and avoid is a very important equipment for a UAV because the pilot is not on board.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
Paragraph All **Cmt.** *UAV DACH* For better identification of the paragraphs which may become subject of comments, further documents should be divided such that references like IV, 4, a 2nd, bullet, iii are not necessary. **Justification** Better identification.	Accepted. The numbering of the A-NPA will not be changed for ease of reference. Only the modifications of substance agreed in this CRD will be done. The A-NPA together with the comment response will be used as documents that explain the rationale behind the policy. The numbering of the policy wil be reviewed and if appropriate modified to make it more user friendly.
Paragraph Attachment 1 b) **Cmt.** *ECA* It is surprising that Flight Crews, as the actors having potentially to live with UAV's in their airspace, are referred to as 'other airspace users', while and the ATS-Providers, for whom the operation of a UAV is likely to be absolutely transparent in terms of the appearance on the radar-screen and the voice-communication are referred to as the stakeholders to which the UAV-operators should adapt . **Justification**	Accepted The text of attachment 1 wil be improved.
Paragraph Attachment 1 Guiding principles for UAV airworthiness regulation Section “Transparency” **Cmt.** *EADS, France* The statement “The provision for an Air Traffic Service (ATS) to a UAV must be transparent to the air traffic controllers and other airspace users” is a sound guiding principle for supporting the development of a comprehensive regulation for UAV Systems certification, specifically when regulating the insertion of UAVs in non-segregated airspace. Although it is expected that both the UAV Industry and the standardization & certification organisations will follow as close as possible this principle for the design & development of UAV Systems, specific arrangements due to UAVs specifics cannot be ruled out at the present time. **Justification** A) It is acknowledged that the insertion of UAVs in non-segregated should not bring a significant impact on ATC infrastructure and equipment, instructions, rules of work, personnel workload, resources or qualification. B) Some arrangements may however have to be carefully defined with ATC in order to UAV specificities such as emergency procedures (e.g. in case of adverse operating conditions, command & control data link loss, return home flight), complementary ATC training or phraseology complements.	Noted The Agency assumes that the Authorities responsible for ATM safety regulation and the Air Navigation Service Providers will take this considerations into account.

Comment	Response
Paragraph **Attachment 1 to explanatory note – Guiding principles (Page 16)** **Cmt.** *CAA, UK* Scope Of UAV Certification The principles of Equivalence (UAV Operations shall not increase the risk to other airspace users or third parties) and Transparency (The provision of an Air Traffic Service to a UAV must be transparent to the air traffic controllers and other airspace users) in this section accord with our view (CAA Civil Aviation Publication 722) that UAV operation is expected to be transparent to ATS providers. Suggest the Transparency paragraph should include the additional words: "The UAV-p will be required to comply with any ATC instruction or request for information made by an ATS unit in the same way and within the same timeframe as would the pilot of a manned aircraft."	Accepted The Agency will ask the EUROCAE WG-73 on UAV to review this issue and to consider if there is a need for the development of an additonal special condition into the policy.
Justification	
Paragraph **Attachment 1 to policy** **Cmt.** *ECA* ECA does not understand why the Security of the Flight Control Link does not fall under airworthiness approval. Hijacking of a manned aircraft also does not fall under airworthiness,but the construction of the Phase II-door to prevent it certainly does. The means to prevent the hijacking of a UAV is certainly an airworthiness-task, given that other participants in the air would possibly be endangered too by a hijacked UAV.	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.
Justification	

Comment	Response
Paragraph **Attachment 2 4.2 Communications** ***Cmt.*** ***ECA*** As stated above, ECA thinks that security of the UAVcommunications link is an airworthiness criterium,A	Noted The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not mandate security requirements. However if security systems are mandated by the appropriate authority or installed voluntarily, they should not impact safety: EASA would have to address that. The group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.
Justification Uplink/downlink shall be securely protected and continuously monitored against unlawful interference.	
Paragraph **Attachment 2 4.4** ***Cmt.*** ***ECA*** In addition to the statement under 4.3, again the substitution of clues should be mentioned, therefore: A	Agreed. This point will be added into the special condition for the human machine interface.
Justification substitution of pilot-clues like visual display, acceleration, noise to enhance situational awareness of the UAV-pilot	
Paragraph **Attachment 2 (Page 18)** ***Cmt.*** ***BMVBS, DE*** Why is the Safety Target approach facilitated when UAV operators are all under the direct control of a single entity, which is the sole customer as well?	Noted The point was made having military operations in mind where it is assumed that the military authorities have an almost total control on the whole UAV operation.
Justification	

Comment	Response
Cmt. ***BMVBS, DE*** It is said that the complexity of that task would be compounded by the prospect of the various operators using markedly different philosophies to compile their safety cases. We agree that that would be a big problem. But we also think that one could agree on a method to be used by everybody who wants to apply for certification. In Europe the first step is already made by the requirements on Safety Assessments in ESARR4.	Not accepted When it is accepted that ESARR 4 deals with the ATM system as whole (including te airborne system) and that a UAV system can be considered to a certain extent as an ATM system, the Agency considers that ESARR4 only deals with the risks to ATM issues and not wtih other risks such as protection of people on the ground.
Justification 	
Paragraph **Attachment 2 4.3 first bullet** ***Cmt.*** ***ECA*** The human machine interface has to substitute clues which the UAV-pilot does not get while sitting in the vehicle: visual clues, noise, vibrations, accelerations. Therefore the intent of this bullet point has to be widened to: I	Agreed. Considering such substitute clues will be added into the special condition for the human machine interface.
Justification Human machine interface (substitution of pilot-clues like visual display, acceleration, noise, possibility of UAV pilot intervention)	
Paragraph **Attachment 2 to explanatory note: (Page 18)** ***Cmt.*** ***CAA, UK*** Selection Of Most Suitable Safety Assessment Approach This attachment is too dismissive of what is termed the 'safety target approach' It may be that the other approach is more suitable in this case but the perceived deficiencies of the safety target approach are overstated.	Not Agreed This comparison was established by the task force resulting from the joint initiative from JAA-EUROCONTROL on UAV that included representatives from Industry and Authorities. The new element introduced by EASA was that a safety target approach is not compatible with the EASA framework that uses certification specifications as means of compliance with the essential requirements put in place by the Regulation 1592/2002 that created the EASA framework. The Agency accepts the use of the safety target for the operation in remote areas and in segregated airspace: this would result in the issue of restricted certificate of airworthiness for the UAV system. A review of the safety target approach could be performed by the group that is proposed to be put in place to develop the road map towards option3
Justification 	

Comment	Response
Paragraph **Attachment 4 to the explanatory note (Page 23) Further explanations on the two proposed alternative for selecting the appropriate manned certification specification** **Cmt.** *CAA, UK* Population density and lethal area in the probability targets is not supported. This has been proposed before for other kinds of aviation and rejected. The level of account that the regulators are prepared to take of population density and lethality and its effect on the exposure to risk of 3rd parties on the ground is already embodied in the existing JARs and FARs and Advisory texts where different probability levels are specified for single engine aircraft, large twins, turbine twins, and Large aeroplanes. The presence or otherwise of persons on board is relevant to this. (Remember that as stated in the preamble to ICAO Annex 8 the Annex 8 requirements are aimed primarily at the protection of 3rd parties). We should adopt the same approach for UAVs as for manned aircraft. Effectively, where control of the aircraft has been lost the probability of impact with a person on the ground must be assumed to be 1.	Accepted This reply is presented either as accepted when the comment supports the kinetic energy method and not accepted when the comment supports the safety objectives method. In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification	

Comment	Response

Paragraph **Attachment 4 to the explanatory note and B Policy for UAV system certification in general**

Cmt. ***BMVBS, DE***

In general the comments as to para. IV.4.c.iv. and V.4.a.ii. applies here in general: 1) The Kinetic Energy method is not supported. 2) It is strongly recommended to keep a CS-UAV as simple and straight forward as possible. Efforts should be undertaken to cove all UAVs of a type (e.g. fixed wing, rotary, or air ship) one can think of today in one CS regardless of its size, weight and number of engines taking into account all relevant parts of existing CS.	Not accepted Comment 1 In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Comment 2: It is not obvious how one Certification Specification could be used for all UAV when there are several CS for manned aircraft.

Justification

1) The Kinetic Energy method assumes the loss of control of the UAV which results in a crash and consequently the risk of loss of property and life on the ground. Additionally it contradicts the “safe flight and landing” approach of other CS. It is assumed that the safe flight and landing approach will lead to an acceptance by politicians and the public. 2) The text in its current version is not transparent and does not serve its need.

Comment	Response
Paragraph Attachment 4 to the explanatory note, NAVDROC-study **Cmt.** ECA ECA does not see the rationale of changing the application of CS 23/CS 25. Firstly, it makes no difference if you collide with 5,7 tons UAV or 5.7 tons manned aircraft. However, flight crew could fight for their lives (and the lives of their passengers/people on ground) processing a whole spectrum of clues (eg. view, accelerations, vibrations, sound/noises), whereas a UAV-pilot (or a possible automatic recovery control-function) might not have all the clues necessary to avoid air-to-air- or air-to-ground-collision. In this respect, ECA would even consider decreasing the maximum weight for applying a CS-UAV23 regulation rather than increasing it, as the additional inherent safety of a CS-25-certified vehicle lowers the probability of a catastrophic failure.	General comment Accepted The Agency believes that the two methods proposed for selecting the relevant manned CS will not leave to equivalent results therefore there is a need to make a choice. This is illustrated by the increased application of certification specification-23 as mentioned by the commentator. The purpose of the consultation was to get further information to allow the Agency to make an informed decision. The review of all comments relative to the appropriate method for selecting airworthiness codes indicate 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 does not reflect population densities in several countries of Europe. The criteria selected for the lethal crash area does not reflect a forced landing. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Reducing the applicability of CS-23 Not accepted Reducing the applicability os CS-23 is an interesting concept but it is not in line with the principles behind special conditions that is incorporated into Part-21 to deal with among others new technologies
Justification	

Comment	Response

Paragraph **Attachment 4 to the explanatory note, page 24**

Cmt. ***CAA, Belgium***

The graph (under Further information on the 'Safety Objectives' method) suggesting that boundaries between CSVLA and CS23 and between CS23 and CS25 should be shifted to higher masses when applied to UAVs. : Comment : First of all, this graph is completely misleading as the horizontal axis graduation is not at all linear. Second, we do not support this idea. CS23 aircraft are of a lower standard than CS25 aircaft because otherwise there would be no useful « paying load » and/or range (fuel mass). UAVs do not need a lot of equipment: - no cockpit (pilot seats, control wheels, pedals, buttons on radio equipment, displays, oxygen masks and other safety equipment, trim wheels, steering wheels, power levers, wind shield [including heating and wipers], lighting, headsets, alarms, etc…and, of course, no pilots, no documentation, no luggage, no catering) - no pressurisation equipment (bleed air system, heating/refrigeration, outflow valve, regulation and safety, oxygen reserves, heavy doors, etc…); no fuel consumption penalty - the structure must not resist to differential pressure. - No cabin floor is needed. As a consequence, UAVs of the same MTOM as manned aircraft would have a much larger paying load/range. The electronic equipment necessary for remote control/remote vision is quite small in comparison and most aircraft have already an autopilot [including the necessary actuators] and an FMC. Electronic equipment tends to become smaller and smaller anyway. The logic would then to substantially lower the mass boundaries between the codes instead of elevating them.(Especially the boundary between CS23-UAV & CS25-UAV) Proposal : certify all real multi-engine under CS-25UAV and set boundary between CS-23UAV(limited to single and dual single) and CS-25UAV at 5000kg	General comment: Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Proposal made byt he commentator: Not accepted Reducing the applicability os CS-23 is an interesting concept but it is not in line with the principles behind special conditions that is incorporated into Part-21 to deal with among others new technologies

Justification

See also our other comments

Comment	Response
Paragraph **Attachment 4 to the explanatory note, page 24 -** ***Cmt.*** ***CAA, Belgium*** The graph (under Further information on the 'Safety Objectives' method) . Comment : Light multi-engine manned aircraft without performance called "dual single" continue to exist for historical reasons and should not be designed any more. As regard dual-single UAVs, only design giving no asymmetric thrust in case of engine failure should be authorised (e.g. push pull) [It may be interesting to shut down one engine to gain range.] ***Justification*** Self explanatory	Noted The point raised byt he commentator is not specific to UAV.

Comment	Response
Paragraph **Chapter IV (The A-NPA: background, purpose and specific issues)** **Section 4 c vi) The A-NPA : purpose and the rationale to use the A-NPA procedure - Selected issues – Sense and avoid, page 8**	

Comment	Response
Cmt. ***EADS, France*** A. EADS MAS-F agrees with the A-NPA proposal in which : (a) the Sense & Avoid requirements are considered to be addressed by a future comprehensive regulatory framework (Regulatory Impact Assessment Option 3), (b) the current version of the Policy will be limited to airworthiness and environmental protection requirements. B. It is suggested to remove or clarify the sentence proposing that "the fact that the TC does not address "Sense & Avoid" should be reflected by a statement in the aircraft flight manual".	Agreed Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification A. The Policy should ultimately address the Sense & Avoid requirements to support the insertion of UAVs in non-segregated airspace. Sense & Avoid requirements have not been included by the Agency within the current version of the Policy as : • Sense & Avoid requirements are outside the Agency remit, • there is currently no mature Sense & Avoid requirements document to directly support the Policy. Consequently, two options can be considered : a) Sense & Avoid requirements to be defined within the current Policy (including the risk that no Policy will be issued in absence of such	

Comment	Response
requirements definition), b) Sense & Avoid requirements to be defined within a future more comprehensive regulation allowing UAVs to fly in non-segregated airspace. EADS MAS-F does not support option a), as it will prevent the Agency to issue any Policy before years to come. Option b) should then be adopted for the time being. B. Rationale for requiring that “the fact that the TC does not address “Sense & Avoid” should be reflected by a statement in the aircraft flight manual” is not understood. A) Intentions of the Agency have been made clear according to the Explanatory Note : “It should not be interpreted that EASA views the collision avoidance of lesser importance than the protection of people on the ground”. B) It is recognized that National Authorities are currently responsible for operational regulations pertaining to UAVs and that, according to the current EASA remit, the definition of appropriate Sense & Avoid requirements is outside the scope of the current version of the Policy. C) In conclusion, rationales given by the Agency on the importance placed by EASA on the Sense & Avoid issue and the decision not to consider this issue as part of the current Policy do not seem to require any further justification (e.g. statement in the flight manual).	

Comment	Response
Paragraph **Explanatory Note - IV The A-NPA: background, purpose and specific issues §4 The A-NPA :purpose and the rationale to use the A-NPA procedure c) Selected issues – vi) Sense and avoid**	

Comment	Response
Cmt. ***Euro UAV ICB*** The ICB acknowledges that the current Policy will not address the Sense & Avoid issue in a first instance as : (a) this issue is currently outside EASA remit, (b) there is currently no mature Sense & Avoid requirements specification document available to be reviewed and/or potentially included to the Policy, (c) Option 2 of the Regulatory Impact Assessment is considered as a short term solution. The Sense & Avoid issue is however recognised by all ICB participants as the cornerstone of the future regulation allowing UAVs to fly in non-segregated airspace, and shall be addressed within the scope of Regulatory Impact Assessment Option 3 as part of a future comprehensive regulatory framework (dependent on EASA remit evolution – see "ICB Item 3 – EASA Role").	Agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification The Sense & Avoid issue is however recognised by all ICB participants as the cornerstone of the future regulation allowing UAVs According to the current EASA remit (limited to airworthiness and environmental protection requirements), it is understood that the definition of appropriate Sense & Avoid requirements is outside the scope of the current version of the Policy. In absence of operational requirements (in particular Sense & Avoid requirements), the Policy will not allow UAVs to fly in non-segregated airspace. Nevertheless, the Policy is considered by the ICB as a first step towards the certification of UAV and will allow the Agency to :	

Comment	Response
- palliate the current lack of regulation for UAV Systems certification, - reply positively to certification applications from the industry.	

Paragraph **Explanatory Note Section IV para 4 b (Page 5)**

Cmt. ***CAA, UK***

Scope Of UAV Certification The A-NPA approach reflects recognition that a total system approach should be taken to UAV certification eg. Including ATM and airport operations. This accords with the CAA position published in (CAA Civil Aviation Publication 722 Chapter 4 para 1) that the scope of design and production standards required for certification of civil UAVs are applicable to the whole UAV system 'including components of UAVS remote from the aircraft that support or can affect the airworthiness of the UAV.' We support this approach and suggest that the wording below should be added to further clarify the policy. 'Where any function is essential to, or can prejudice, continued safe flight and landing of the UAV, that function, (including equipment remote from the UAV), shall be considered as part of the aircraft for the purposes of the validity of the certificate of airworthiness.'	Accepted The proposed additonal sentence is already included in the policy (See paragraph e general Considerations). Therefore no addition will be made to explanatory Note section IV paragraph 4 b

Justification

Comment	Response
Paragraph **Explanatory note** **Paragraph 4 a purpose of the A-NPA** **Method to select the relevant certification code** ***Cmt.*** ***Dassault*** Dassault Aviation recommends to use Alternative II ***Justification*** "Alternative I" try to establish a correspondence between UAV and civil aircraft and so don't take into consideration the fact the UAV (uninhabited) safety objectives are no longer oriented to protection of onboard people but to the protection of the people on ground. "Alternative II" is the method recommends : - to define the UAV categories (it will not be possible to have only one category from 150 kg to 500 tons) - to determine for each category the global safety objective The coefficients of the method will have to be confirmed and approved. More justifications and details are provided in the annex Annex : SL2006-08 EASA A-NPA Alternative comparison.doc	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Cmt. ***Dassault*** Dassault Aviation recommends to use Alternative II ***Justification*** "Alternative I" try to establish a correspondence between UAV and civil aircraft and so don't take into consideration the fact the UAV (uninhabited) safety objectives are no longer oriented to protection of onboard people but to the protection of the people on ground. "Alternative II" is the method recommends : - to define the UAV categories (it will not be possible to have only one category from 150 kg to 500 tons) - to determine for each category the global safety objective The coefficients of the method will have to be confirmed and approved. More justifications and details are provided in the annex Annex : SL2006-08 EASA A-NPA Alternative comparison.doc	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph **Explanatory note IV.4.c.iv and Attachment 4** **Policy, paragraph (d) and appendix 1 to attachment 2**	

Comment	Response
Cmt. ***DGAC, France*** The selection of the applicable CS for UAV should be based on the same weight criteria as manned aircraft, without requirements that would not be applicable to UAVs (Cabin safety part for example).	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. The point raised about public perception relative to the method using safety objectives is also agreed. Concerning the applicablity of the methods using safety objectives to operations in remote areas and outside segregated airspace, the Agency agrees that the safety target method could be used and that it would lead to the issue of restricted certificates of airworthiness.
Justification The overall objective should to set up guidelines to help authorities (EASA and NAA depending on 150kg criteria) to go through case by case examples with industry and set up practices which could satisfy everybody, before to set up certifying rules which might become inapplicable. The permit to fly process allows for this aim and on a temporary basis until alternative certification could be set up. The principles of Alternative I, with the possibility for very specific applications to go to Alternative II, might be useful to accept alleviations to the applicable CS. Although the proposed alternatives have some value their impact on the coherence of the airworthiness codes does not appear clearly. Basically if one of these two methods was considered appropriate to define the applicable certification specifications for UAV, the question is whether similar method should not also be used for manned aircraft, which may lead to a complete review of all existing CS.	

Comment	Response
Alternative I (impact energy method) As presented by EASA in 2.b last paragraph, of Appendix 1 to attachment 2, the weakness of the energy impact method is that it may not give a clear answer in a number of cases leading to legal uncertainty and endless discussions between the authority and the Authority. It may however be useful to decide to apply on a specific matter the appropriate paragraph of a lower CS. Alternative II (safety objectives method) Alternative II raises issues as currently presented. First, safety figures can not be derived as simply from actual figures on ground victims due to the flying machines as light & transport aircraft; notably because when a pilot realizes he's losing control of his aircraft, he will try to his possible extend to avoid inhabited areas where survivability post impact is worst due to more obstacles on the ground, and thus limit the number of victims on the ground. In addition, operation of a number of UAV will be quite different from manned aircraft (such as surveillance at low altitude). Therefore, computed target figures may be biased. Second, the diagram in attachment 4 of the explanatory note seems to define a CS-UAV23 up to 25000kg ! DGAC disagree to redefine the weight thresholds as the public on ground would not understand from their point of view why authorities would protect them differently based on the fact the aircraft is with or without a pilot onboard. It may be hard to explain to the public that after an accident that an ATR 42 UAV was not certified the same way as a manned ATR 42 but as a manned Beech 1900. It is DGAC impression that it would be even worse as general public is probably not ready to fly without a pilot in the cockpit, even if today many phases of a flight can happen without pilot intervention (on transport aircraft). The approach might be interesting nevertheless to certify UAVs which would be operated in very remote uninhabited areas. In such a case, the certification exercise should lead to document those limitations in the flight manual which is an approved certification document. If a user decides to use his UAV elsewhere with the condition not met, it would be under his responsibility and he could not rely on the certificate issued from the authorities.	

Paragraph **Explanatory note Paragraph IV 4 d Perspective … The Agency would be ready to go beyond its role if requested & Paragraph V 2. options**

Cmt. ***Euro UAV ICB***

EASA has to " propose a policy for the certification of UAVs" in agreement with its role (option 2) and to initiate and promote activities "to develop a comprehensive regulatory framework for UAVs" (option 3).	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

The purpose of this regulation must be to allow UAV operations in the controlled Airspace. This means that all aspects of the flight of UAV must be addressed (System certification, Environmental protection, operational approvals, ATM & Airport interfaces, Crew qualification, Security of Operations). EuroUAV ICB recommends that EASA takes the lead of all these activities and coordinates them with the other concerned bodies.

Comment	Response
Paragraph **Explanatory Note part IV para 4 c vi (Page 8)**	

Comment	Response
Cmt. ***CAA, UK*** Ambiguity over ATM-Related Functions The paper, and particularly this section, is ambiguous about the status of the UAV collision avoidance function in the certification context. The first part of this paragraph links the anti-collision function of Sense And Avoid (S&A) systems with the need to avoid noise-sensitive areas – this linking of collision avoidance and environmental issues is unhelpful. It also suggests that the operating criteria for S&A systems should be developed by those responsible for air navigation services. The design, production installation & correct functioning of the equipment would then become a type design approval issue. This is a similar approach to current TCAS systems but, in the context of the anti-collision function of a S&A system, is not consistent with the 'Total System ' approach to UAV certification outlined earlier. The same paragraph then explains that the objectives of the policy are 'limited to people on the ground' ….but later asserts that the S&A criteria would complement the intrinsic level of safety & environmental protection and 'would allow preventing collision with other aircraft (and minimize annoyance') ? If the 'Total System' approach outlined in the explanatory note is to be followed, the ATM-related UAV functions which allow timely compliance with Separation Provision instructions and Collision Avoidance functions need to be included in the airworthiness certification process. This ambiguity should be removed and the situation clarified. The integrity of external UAVS elements including the ground control station and command data links, together with the performance and characteristics of any onboard 'Sense & Avoid' sub-system should be a key consideration in determining the worthiness of a UAV to operate in the airspace of each nation state. The certification burden on airworthiness authorities would be reduced if a system of Performance and Integrity categories could be developed for UAV control systems and Sense & Avoid sub-systems. This could, for example, allow certification to include the classes of airspace within which the UAV would be permitted to operate dependent upon the Performance and Integrity category which could be met by the designer. If required, a similar approach could be taken to the population density over which a UAV would be permitted to operate. (This would require population density mapping to be available to the UAV operating authority) There are parallels here with current arrangements in UK for the operation of aircraft under Permit To Fly arrangements and which are prohibited from overflying any congested area of a city, town or settlement.	Noted The total system approach is seen as the ideal one. However the Agency can not follow it today due to the present EASA remit. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) The Agency's views relative to sense and avoid can be clarified as follows: Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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

Comment	Response
	segregated airspace covering the zone of the UAV operation, the UAV remaining constantly in line of sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Paragraph **Explanatory Note pt IV para 4 c iii c (Page 7)**

Cmt. ***CAA, UK***

Comment	Response
Selection Of Most Suitable Safety Assessment Approach The A-NPA concludes that the safety target approach only has a limited use in the context of exceptions and gives the example of a UAVS which is only to operate over very remote areas. Perhaps a more suitable title for this approach would be the 'Safety Management ' approach. This approach has been adopted for the certification of ATM systems which are charged with the ICAO Annex 11 objective of preventing collisions between aircraft. The adoption of this approach is a key EUROCONTROL Safety & Regulatory Requirement (ESARR 3) The appendix (Chapter 7) points out the Role of ESARR 4 in approaching the Hazard identification and risk assessment in ATM as a function of safety management. We believe this approach should be seen as complementary to the 'conventional' design standard approach in certain key areas – such as the certification of UAVS elements which provide or contribute to a separation or collision avoidance function.	Partially agreed Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.

Justification

Comment	Response
Paragraph Explanatory Note V **Cmt.** *Israel Aircraft Industries Ltd* - The choice of Option 2 is fully supported, as a necessary step even if not yet sufficient - However, it is recommended that EASA, together with all other stakeholders, also takes the initiative of setting a more comprehensive set of rules that will to allow UAV operations with even a minimum set of operational restrictions. - While the Sense and Avoid issue is recognized as a key issue, it is proposed to also apply the “option 2” approach within “option 3” and operating rules so that UAV operations can be defined with some minimum operational restrictions using the state of the art technological features. **Justification** - Whatever the case, UAV Manufacturers will have to initiate some form of UAV Type Certification and it is thus of utmost importance that the “rules of the games” be known to them as soon as possible. - owever, the ultimate aim is to operate UAVS with even a minimum set of operational restrictions. - he “Sense and Avoid” issue is recognized as one of the issues that need be treated at three interrelated levels : technological, legal, and ATM environment. - There are, as of today, some “state of the art” UAV features in term of ATC interface and minimizing the risk of air collision. It should thus be possible to define a comprehensive first stage policy (“option 2” within “option 3”) covering all airworthiness and operational aspects (RVSM Temporary Leaflet is an example of EASA policy where all airworthiness and operational aspects are covered in the same paper) that would allow some kind of civil UAV operations before full integration in the Airspace, considering state of the art and before all three above interrelated factors concerning Sense and Avoid are fully solved.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with

Comment	Response

Paragraph **Explanatory Note**
Paragraph IV 4, c, iii, a)

Cmt. ***Dassault***

Comment	Response
Dassault Aviation suggests that the text be reviewed to not oppose the two approaches but to use both these methods to built an efficient set of regulation for UAV	Noted. Attachment 2 to the explanatory note already recognise that the two methods are not fully exclusive due to the existence o paragraphs NN;1309 into certification specifications. Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.

Justification

Opposing "conventional approach" to "the safety target approach" seems not appropriate.
1. The conventional approach is not directly applicable to the UAV because as explained in the text conventional approach is based on experience and today there is no experience on UAV certification.
2. The conventional approach used safety objectives for justification of the system. Advisory materials of 1309 paragraph, clearly define safety objectives and this for each category of aircraft.
3. The safety objective method might be a means for the conventional method to set objectives and also to define the different categories..
It seems inappropriate to conclude in an explanatory note that a method is inadequate when the purpose of the A-NPA is to select one of these methods.
We recommend a pragmatic approach using a method based on the combination of both methods.

Comment	Response

Paragraph **Explanatory note**
Paragraph 4 a
Purpose of the A-NPA

Cmt. ***Galileo Avionica SpA***

We recommendation is to use ALTERNATIVE I.

Accepted

In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments:
- One method is based on kinetic energy consideration
- One method is based on safety objectives consideration.

The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner.
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: as explained above, 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..

The Agency concurs with these comments and will include in the policy only the kinetic energy method.

However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

The Alternative II seems to be more oriented to the complexity of machine instead of the “size” of the UAV . The final report of JAA/Eurocontrol as report in para 5.2 “Equivalence”: Regulatory standards should be set to be no less demanding than those currently applied to comparable manned aircraft nor should they penalize UAV systems by requiring compliance with higher standards simply because technology permits.

Comment	Response
Paragraph Explanatory Note Paragraph IV d Perspective **Cmt.** *Dassault* Dassault Aviation recommends that EASA takes the lead all the aspects of UAV certification, operations and use and coordinates them with the other concerned bodies. **Justification** The approach used for aircraft certification and operation is not directly applicable to the UAV world. Based on the today technology it is possible to operate UAV in a totally autonomous mode. For such systems it will no longer be possible to separate what is relevant to certification from what is relevant to operations. Three years ago when the JAA / Eurocontrol task force has been created, there was a large consensus in the industry and also at the national authority level that the group will have to address all the UAV aspects. (System certification, Environmental protection, operational approvals, ATM & Airport interfaces, Crew qualification, Security of Operations).	Noted. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with

Comment	Response
Paragraph Explanatory note Paragraph IV c) Conclusion **Cmt.** *Galileo Avionica SpA* .. ..Any proposal to depart from the estabilished system in favour of Safety Target approach…	Partialy accepted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.
Justification The utilization of UAV without people onboard is strongly conditioned by specific missions in specific areas of globe (es. patrolling of uninhabited or scarcely inhabited areas). In these cases the safety target approach should be not obstructed in particular for light UAV (until 500 Kg MTOW) and small organisations for which the “conventional approach” should be economically not favorable for the high certification costs.	
Paragraph Explanatory Notes Section V 3 (Page 10) **Cmt.** *CAA, UK* Ambiguity over ATM-Related Functions ATM should be included in the ‘sectors concerned’, as operation of UAVs even in segregated airspace has an impac	Accepted The regulatory impact assessment wil be modified.
Justification	

Comment	Response
Paragraph **Explanatory Notes Section V para 3 (Page 10)** ***Cmt.*** ***CAA, UK*** Missing word in second sentence – insert 'be' between 'to' and 'around'. ***Justification*** 	Agreed For the record, the explanatory note will be modified as suggested.
Paragraph **Explanatory Notes Section V para 4 a i (Page 10)** ***Cmt.*** ***CAA, UK*** Option 1 comment on 'no/limited effect on safety' should be changed to read 'limited effect on safety' ***Justification*** 	Accepted The regulatory impact assessment will be modified as proposed.
Paragraph **Explanatory Notes Section V para 5. a (Page 14)** ***Cmt.*** ***CAA, UK*** Sentence dealing with Option 3 says…' and would allow UAV to fly in non-segregated airspace' – this has yet to be proven technologically and is therefore too sweeping. Suggest change 'will' to 'it is hoped will' or 'may'. ***Justification*** 	Accepted the regulatory impact assessment will be modified as proposed.
Paragraph **Guiding principles for UAV airworthiness regulation Responsibility / Accountability (pg 17 of 42)** ***Cmt.*** ***UVS Canada*** Re: "This is valid for design and manufacture (including control of suppliers), operation and maintenance of UAV Systems." This suggests that only the equivalent of an aircraft maintenance engineer (AME in Canada, A&P in the US) may work on a UAV. Q. What type of training will be required to perform routine maintenance on a UAV? Will training by the manufacturer be required? ***Justification*** 	Noted The policy indicates that continuing airworthiness for UAV will be done in accordance to Part-M

Comment	Response
Paragraph I.1, IV.4.a. and 4.b. 1st bullet **Cmt.** *BMVBS, DE* It is highly appreciated that EASA initiated by this A-NPA the debate on the develop a policy for the certification of UAVs. This effort should be pursued. However, it is premature to use this A-NPA yet as a short term certification basis for applicant's request for certification of UAVs. In that context it is not clear what is meant by … allowing EASA to respond positively to UAVs certification request." **Justification** Beforehand the political and societal acceptance for the operation of UAVs in non-segregated airspace needs to be sought.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) The benefit of the policy will be to allow using UAV in segregated airspace to to help demonstrating to an Air Navigation Service Provider that a given UAV has an intrisic safety.

Comment	Response
Paragraph IV 1 (a) **Cmt.** *TRC AB, Sweden* The EASA remit, as defined by EC Regulation 1592/2002, covers the airworthiness and environmental regulation of unmanned aircraft with a maximum take-off mass of 150 kg or above, which are not excluded by Article 1(2) or Article 4(2) and Annex II of that document. Regulation of excluded unmanned aircraft is then the responsibility of National Authorities.	Noted The comment adequately describes the responsibilities of the Agency and of the National Authorities. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation.
Justification The term UAV is not yet introduced in the Regulation 1592/2002. The need for particular regulatory development in order to support the introduction of UAV Systems capable of flying in non-segregated airspace, should be recognized. Therefore, EASA should draft and submit an Opinion about amendment to Regulation EC) No 1592/2002 to the Commission including: The concept of the Total Aviation System (TAS) approach A global definition of “aeronautical product” The Term “System worthiness”, complementary to Airworthiness A set of UAV System definitions Recognition of the UAV System integrator, being the applicant and future holder of the UAV Materiel System Certificate (MSC) A set of essential requirements for UAV System Elements other than unmanned aircraft. Tasking of EASA for the purpose of co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	

Comment	Response
Paragraph **IV 1 (a) EASA remit:** ***Cmt.*** ***SAAB*** The EASA remit, as defined by EC Regulation 1592/2002, covers the airworthiness and environmental regulation of unmanned aircraft with a maximum take-off mass of 150 kg or above, which are not excluded by Article 1(2) or Article 4(2) and Annex II of that document. Regulation of excluded unmanned aircraft is then the responsibility of National Authorities.	Noted The comment adequately describes the responsibilities of the Agency and of the National Authorities. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation.
Justification The term UAV is not yet introduced in the Regulation 1592/2002. The need for particular regulatory development in order to support the introduction of UAV Systems capable of flying in non-segregated airspace, should be recognized. Therefore, EASA should draft and submit an Opinion about amendment to Regulation EC) No 1592/2002 to the Commission including: A global definition of “aeronautical product” The Term “System worthiness”, complementary to Airworthiness A set of UAV System definitions Recognition of the UAV System integrator, being the applicant and future holder of the UAV Materiel System Certificate (MSC) A set of essential requirements for UAV System Elements other than unmanned aircraft. Tasking of EASA for the purpose of co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	

Comment	Response
Paragraph **IV 4 (b)**	

Comment	Response
Cmt. ***TRC AB*** Ideally the UAV issue should be treated using a Total System Approach; A Total Aviation System approach has been the driving force in Sweden when the Swedish UAV Vision was developed by the Headquarters' of the Armed Forces in close co-operation with the Swedish Aviation Safety Authority and other stakeholders concerned. The "Total Aviation System" is a model that is useful in clarification of the regulatory impact and interfaces to be considered when UAV Systems are introduced.	Noted Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation.

Justification

The term Total Aviation System (TAS) symbolizes a holistic view on the aviation system. TAS is a fairly stable model that may be adapted to the evolution of aviation at large. The Total Aviation System approach will provide a platform for elaboration of future complex system of systems like UAV Systems (UVS).

The key word safety is setting the borderline of TAS. The overall safety objective can be formulated as follows:

Safety aims at freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.
Safety within the Total Aviation System shall be promoted at a reasonable cost, subject to States meeting their minimum obligations under ICAO.
A cost is a reasonable cost where the value of the cost to the nation (Europe) is exceeded by the value of the resulting benefit to the nation (Europe).

The Total Aviation System concept also recognizes the importance to identify the systems organizational and technical architectures and to allocate responsibility to approved Organisations and provide for safety Authority supervision.

The military have traditionally been leading the development of advanced integrated systems and have also experienced the difficulties of integrating various elements to a systems entity that have the intended capabilities and functions. The fundamental and unifying systems structure defined in terms of system elements, interfaces, processes, constraints and behaviors, is the System Architecture. When the civil aviation community now will experience the difficulties of integrating advanced UAV Systems into the aviation system, it is time to adopt a systems architecture concept and the corresponding activities of defining, maintaining, improving and approving proper implementations of the systems architecture over the anticipated life cycle of the system.

An "advanced" UAV System including one or several unmanned aircraft, generic command & control element(s), communication links and networks, with their own system certificates, like today's engines and propellers, and with separate certificate holders, will be a system at a superior level in the architecture. There must be one certificate holder, the System integrator responsible for integrating the system of systems into a functioning entity and responsible for overseeing the system during its life cycle. The System integrator should be an approved design organisation (DOA) suitable for such system integration work and might be one of the TC-holders (if appropriate) or a stand-alone organisation.

In the future it might also be relevant to identify other kinds of system of systems including manned aircraft or ATM systems or a combination of those two, dedicated airports with UAS-adapted ground aids, etc, and requiring organizations with specific skills to be the system integrators and certificate holders. The present Essential requirements may have to be amended in order to cope with new system features.

Unmanned aircraft is the only UAV System Element subject to the essential requirements for airworthiness laid down in Annex I to Regulation No 1592/2002. Other UAV System Elements may be considered essential from a Flight safety as well as a security and environmental point of view.

As the term airworthiness only should be used for an aircraft, which actually is in the air, we are lacking a corresponding expression for

Comment	Response
such non-flying systems elements that may influence the airworthiness of the aircraft. UAV System Elements other than unmanned aircraft, necessary to enable flight, should comply with essential requirements, equivalent to those for airworthiness, laid down in Annex I of Regulation No 1592/2002 and any other requirement related to protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System concerned; to be considered system worthy. The definition of System worthiness, based upon the intention expressed in regulation (EC) No 1592/2002, Annex 1, Essential requirements for airworthiness, could be phrased: A system is considered as system worthy if: (1) Its system integrity conforms to its system design and is assured for all anticipated conditions of the operational life of the system, (2) The safety aspects of the operational use of the system have been addressed, and (3) Organisations undertaking design, system integration, production and maintenance of the system, are approved. A dominating purpose of the system worthy Air system is to make it possible for an aircraft, which has been integrated into the system, to be airworthy during flight. The evolution of aviation highlights the need for a more systematic approach when the parts of the Aviation Systems become more and more integrated. This situation requires that participating operators and providers can be identified during different phases of a systems life cycle, so that the distribution of responsibility can be established and maintained. For obvious reasons, introduction of new technology and its applications within aviation will be ahead of rulemaking. In the near future the introduction of advanced UAV systems will include UAVs with adaptive, autonomous programs for making near real time, machine-to-machine decisions on how to adapt to the environment. This will make it possible for a single UAV-pilot to oversee multiple UAVs. Distributed mission management will allow the transfer of unmanned aircraft control from one control station to another, which may be situated in different countries. The control stations may be designed as generic command & control elements, intended to exercise control of different types of UAVs and designed by stand-alone design organizations. This indicates the need for stand-alone type certificates for such command & control elements. Generic command & control elements may also be operated by stand-alone operators, maybe by advanced ATM providers/operators. Command & Control link elements may also be designed and operated by stand-alone organizations, maybe with no natural connections with the aviation system. All this indicates the need for new categories of stand-alone design approvals at different levels in the system architecture. The use of Certification Specifications and Safety Targets are complementary to each other. All overall safety objectives, set by society on the aviation system are expressed as safety targets. These safety targets must be interpreted by the design organisation and be transformed into certification specifications and/or special conditions inserted in the certification basis, acceptable to the competent Authority. The overall purpose with the certification basis is to establish means how to comply with the Essential requirements published in regulation (EC) No 1592/2002. In practice there are logical reasons why safety targets in some cases are “preferred”, especially in military development but certification specifications and industry standards are also used when suitable certification specifications and/or standards are available. Certification specification and standards will increase the success rate of the project, as these documents are partly based upon experience. A drawback might be that the latest technology might not be available if the certification specification or standard has not been upgraded to take the latest experiences into account. EASA should establish criteria and procedures on how to define the relationship between Certification specifications and safety targets. The natural proceeding would be the following steps: Establish the overall objectives (including safety targets), Analyze the overall safety targets and determine the requirements of a particular UAV System, by comparison of the intended operational use of the system with the overall safety targets. Establish the UAV System certification basis while conducting a system worthiness and system safety analysis with the purpose of identifying the requirements on each element of the UAV System and the interface requirements between these elements, to secure that the overall system worthiness requirements on the system (expressed as Essential requirements) are complied with. Use as far as practicable, established and applicable certification specifications and industry standards. When established and applicable certification specifications or industry standards do not exist, define customized requirements as special conditions. These customized requirements should be supported by a system safety analysis that must show that the requirement has been correctly identified and do not effect the overall safety target of the UAV System. If the future UAV market calls for modularization of UAV Systems, an applicant may apply for a type certificate for any substantial UAV System Element (inclusive of the unmanned vehicle) based upon a description of integrated functional systems, and the need for interface	

Comment	Response
control drawings and interface requirement specifications in relation to other UAV System Elements involved, including the proposed system characteristics and limitations. Otherwise, the same principles at present being in use for certification of aircraft engines and propellers may be used. The future Certification Specification, including a selection of airworthiness codes for UAVs, system worthiness specifications for other stand-alone UAV System elements, and an over-all system worthiness specification for complex UAV Systems should address the Air System with any combination of system elements necessary to enable flight. In addition the Certification Specification should include acceptable means of compliance. When applicable, the Certification Specification should be modularized with the possibility to tailor each certification module to create a complete, integrated and balanced design. There might be different design organizations responsible for each certification module. It should be possible to certify modules separately in the same manner as for engines and propellers and for the intended reuse in other applications. The Air System Certification Basis describes how the applicable Certification Specifications and any established Special Condition (based upon safety targets) set on the system are distributed on sub-system levels (certifiable stand-alone or not) for the showing of compliance with the Essential requirements. These requirements are considered when functional and physical requirements including the interface requirements between system elements are refined and distributed. All requirements must be distributed in a traceable top-down flow to the various lower level elements of the system architecture into certification modules acceptable to the competent Authority. The design organisation has to tailor each certification module to make it correspond to the distributed functional requirements and any applicable interface requirement specification. This tailoring process also implies the forming of quite new proposed requirements and special conditions covering functions not applicable for manned aircraft i.e. communication links, command & control elements, autonomy functions etc. It should be possible to collect these additional requirements from other established and accepted standards i.e. RTCA/EUROCAE, STANAG, AECMA or by creating a customized requirement, if these will contribute to an optimized design. Each certification module should comply with the following general requirements: There shall be an coherent, traceable requirement structure comprising the overall requirements and safety targets defined in the Certification Basis for the module, correlated and traceable to the functional and physical requirements corresponding to the system architecture with its interface requirement specifications, The functional and physical requirements must be satisfied taking all requirements of the Certification Basis into consideration and no requirements missing, Each requirement of the Certification Basis should be supported by acceptable means of compliance, preferably supported by established and approved standards or to a customized special condition, which is approved by the competent Authority, and Each requirement should be so formulated to be unambiguous, verifiable and realistic. The verification plan will include all detailed activities to show compliance with the Essential requirements.	

Comment	Response
Cmt. ***TRC AB, Sweden*** Ideally the UAV issue should be treated using a Total System Approach; A Total Aviation System approach has been the driving force in Sweden when the Swedish UAV Vision was developed by the Headquarters' of the Armed Forces in close co-operation with the Swedish Aviation Safety Authority and other stakeholders concerned. The "Total Aviation System" is a model that is useful in clarification of the regulatory impact and interfaces to be considered when UAV Systems are introduced.	Noted Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation.
Justification See attached copy of the Swedish UAV System Vision. The questionnaire addressed to the industry on 'The future of DOA' on January 20 2006 highlights the future need for "modular certification" Question 6 reads: Some aircraft systems are already treated as Products and hold a Type Certificate in their own right (e.g. Engines and Propellers). Would you like to see an extension of these principles to create a modular approach to certification? If yes, describe: a) what systems should be included, b) what you see as the pros and cons of such an extension, c) what interface issues may arise and how possible safety gaps are to be avoided, and d) how overall control and responsibilities are to be managed. The answer to these questions are implicitly given in the above referenced Swedish UAV System Vision. The term UAV is not yet introduced in the Regulation 1592/2002. The need for particular regulatory development in order to support the introduction of UAV Systems capable of flying in non-segregated airspace, should be recognized. Therefore, EASA should draft and submit an Opinion about amendment to Regulation EC) No 1592/2002 to the Commission including: The concept of the Total Aviation System (TAS) approach A global definition of "aeronautical product" The Term "System worthiness", complementary to Airworthiness A set of UAV System definitions Recognition of the UAV System integrator, being the applicant and future holder of the UAV materiel System Certificate (MSC) A set of essential requirements for UAV System Elements other than unmanned aircraft. Tasking of EASA for the purpose of co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	

Comment	Response

Paragraph IV 4 (d)

Cmt. *SAAB*

The next step will be the publication on the Agency's web-site of the Policy proposed in Part B of this A-NPA taking into account comments received. The ultimate objective should be to achieve in Europe a set of globally harmonized UAV System regulations allowing operation of unmanned aircraft (UAV) in non-segregated airspace across national borders. A multi-disciplinary task (MDM.030) has been included in the EASA advance rulemaking planning for 2007-2009. Its schedule and actual contents are not yet defined and will depend on the results of this consultation. Two other rulemaking tasks planned for 2006: Group BR.02 (Develop essential requirements and basic principles for the interoperability and safety regulation of airports) and Group BR.03 (Develop essential requirements and basic principles for the interoperability and safety regulation of air traffic management and air navigation services), could be tasked for initial studies of the interfaces between UAV Systems and Aerodrome system and the Airspace system respectively, suitable for consideration about. The Agency recalls however that it at present has no mandate to act as a co-ordinator of the various organisations potentially involved in the regulation of this type of activity. It also wants to insist that operational use of UAV is a political decision that goes well beyond the Agency's role and responsibilities. It suggests therefore that an appropriate co-ordinating body be put in place. In such context the Agency would be ready to go beyond its role if requested and if supported by the EU, Member States and Industry. Another alternative would be that the mandate of the Agency is extended in order to take on the co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

The responsibility of the regulations concerning the Europe Aviation is today divided on different Authoritiy bodies. It would be efficient if all regulations and rulemaking work could be handled and supervised by EASA.

Comment	Response
Cmt. ***TRC AB, Sweden*** The next step will be the publication on the Agency's web-site of the Policy proposed in Part B of this A-NPA taking into account comments received. The ultimate objective should be to achieve in Europe a set of globally harmonized UAV System regulations allowing operation of unmanned aircraft (UAV) in non-segregated airspace across national borders. A multi-disciplinary task (MDM.030) has been included in the EASA advance rulemaking planning for 2007-2009. Its schedule and actual contents are not yet defined and will depend on the results of this consultation. Two other rulemaking tasks planned for 2006: Group BR.02 (Develop essential requirements and basic principles for the interoperability and safety regulation of airports) and Group BR.03 (Develop essential requirements and basic principles for the interoperability and safety regulation of air traffic management and air navigation services), could be tasked for initial studies of the interfaces between UAV Systems and Aerodrome system and the Airspace system respectively, suitable for consideration about. The Agency recalls however that it at present has no mandate to act as a co-ordinator of the various organisations potentially involved in the regulation of this type of activity. It also wants to insist that operational use of UAV is a political decision that goes well beyond the Agency's role and responsibilities. It suggests therefore that an appropriate co-ordinating body be put in place. In such context the Agency would be ready to go beyond its role if requested and if supported by the EU, Member States and Industry. Another alternative would be that the mandate of the Agency is extended in order to take on the co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Justification The term UAV is not yet introduced in the Regulation 1592/2002. The need for particular regulatory development in order to support the introduction of UAV Systems capable of flying in non-segregated airspace, should be recognized. Therefore, EASA should draft and submit an Opinion about amendment to Regulation EC) No 1592/2002 to the Commission including: The concept of the Total Aviation System (TAS) approach A global definition of "aeronautical product" The Term "System worthiness", complementary to Airworthiness A set of UAV System definitions Recognition of the UAV System integrator, being the applicant and future holder of the UAV Materiel System Certificate (MSC) A set of essential requirements for UAV System Elements other than unmanned aircraft. Tasking of EASA for the purpose of co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	
Paragraph **IV 4 c iii** ***Cmt.*** ***ACG*** For Vehicles certified with the Safety Target Approach only a permit to fly shall be issued..	Not accepted The Agency will issue restricted certificates of airworthiness in this case: operational restrictions can also be put on restricted certificates of airworthiness
Justification Austrocontrol prefers the conventional approach. But in case that the agency will adopt the safety target approach, the vehicle can obtain only a permit to fly, to reflect operational limitations resulting from the certification approach.	

Comment	Response
Cmt. ***ACG*** Austro Control recommends the Conventional approach for UAV certification.	Accepted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.
Justification The mix of technical and operational requirements seems to be impractical. With this approach the need to know exactly which operation and which mission will be intended will exist at the time of certification. This is impractical and would lead to a multi-certification of the same aircraft because of changing operational environment. For multimission capable UAV´s the use of the safety target approach would sometimes lead to a certification before each flight because of the influence of the used airspace and overflown terrain. This results in a very high certification workload on the agency/NAA´s and would also increase the costs for a UAV operation beyond economic borders. Thus the Conventional approach is preferred by ACG.	
Paragraph **IV 4 c v Issue of certificate of airworthiness (pg 8 of 4)**	
Cmt. ***UVS Canada*** In the line, “The situation is different when only one control station controls two or more UAV.” , it is unclear whether the comment suggest multiple identical UAV or different types of UAV.	Noted Written as it is the sentence could be interpreted both ways. Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.
Justification It is possible for a single GCS to control multiple quantities and types of aircraft. Certification may be straightforward for controlling multiple identical UAV, but could be much more involved if the type of aircraft are different.	

Comment	Response
Paragraph **IV -4 c) v** ***Cmt.*** ***ACG*** Initially we would suggest the issuance of a CofA for an UAV system defined as compound of one Air Vehicle and one ground station. In the future it can be a CofA for the ground station and one for the air vehicle, if compatible data link standards have been established, and CS'es for ground stations are available. ***Justification*** At the time it would be too early, dealing with multiple Vehicles and / or Ground stations. Standards need to be established.	Agreed The policy will be modified to reflect the comment. Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework

Comment	Response
Paragraph **IV 4. b. 1st para**	

Comment	Response
Cmt. ***ECA*** It is questionable whether in an area in which design and operation is so intensively amalgamated as in the design/operation of an UAV, it makes any sense to develop policies on design without already considering operational issues. If EASA wants to develop design-criteria before the 'system' UAV is thoroughly discussed using the normal channels like ICAO, these criteria can cover only design for operation in segregated areas. Even there it is normally expected that the UAV behaves like any other aircraft, which implies similar certification and operation-criteria. Even while operating in segregated airspace, it must be assured, that contingency- and emergency-procedures flight to an emergency landing or emergency crash-site) upto and including hull-loss do not infringe upon non-segregated airspace and therefore endanger other aircraft.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems. The last sentence of the comment raises a valid point: the size of the segregated area should take into account the the emergency procedures. This information should be presented in the flight manual to allow the operator (e.g. the organisation that operate the UAV) to define the size. The will be clarified in the policy.

Justification

Comment	Response

Paragraph IV 4. c v.

Cmt. ECA

As outlined above, Legislation should allow to certify 'remote equipment' (e.g. Ground stations) independently, but in addition to that the combination of the ground control station with the UAV/UAV's they are intended to be used for has to be certified.	Not accepted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework. Certifying separately the control station would need modification to Regulation 1592.

Justification

Comment	Response
Paragraph IV 4. c vi. **Cmt.** ECA As is written in para 1 of this section, 'UAV pilots should have all information, capabilities and resources needed to be able to achieve the same level of avoidance of noise sensitive areas and objects.', we strictly object to the conclusion in para 2: As a UAV-pilot operates an aircraft, but in an environment which inherently cannot reproduce all the clues a real pilot gets, the criteria cannot be defined by authorities responsible for air navigation services, because they lack all the expertise of how a working environment of a pilot should look, not to mention the additional requirements necessary to substitute the clues described in our reply under Iv 4. c. ii 2nd para. As Regards intrinsic safety: the whole para implies that once the operating criteria have been defined, the 'avionics' necessary installed and certified and the 'sense and avoid-principle' is adhered to, the UAV would be ready to be cleared into non-segregated airspace: This could only be the case, If the certification-approach has been the conventional one. Every other certification-approach would imply a not-so-safe aircraft, or that the conventional approach is outdated and has to be superseded by a similar one for manned aircraft too. **Justification**	Partially agreed. EASA recognise 'sense and avoid' as a critical issue for safety and operations but the criteria should be defined by authorities responsible for the safety regulation of ATM complemented by specifications developed by standardisation bodies then EASA can 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; minimum crew considerations also take into account collision avoidance. It is therefore expected that during the tailoring of manned such paragraphs will be taken into account: aircraft lights should be installed and the UAV crew should be provide 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 this approach is limitations reflected by a statement in the flight manual. This will be clarified in the policy. In addition, the Agency will request the EUROCAE WG 73 to start developing a Special condition based on criteria of EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document indicates that its specifications UAV3, UAV7, UAV9, UAV10, UAV12, UAV13, UAV19, UAV20, UAV21, UAV31 and UAV32 would have an impact on 'airworthiness' Impact on airworthiness means that these specifications have an impact on the design of the UAV and its systems.

Comment	Response
Paragraph lv 4. c. ii 2nd para **Cmt.** ECA Rulemaking should allow to certify ground control stations as generic equipment, since they may be used to control more than one UAV/more than one type of UAV, or more ground control stations may be used to control one UAV. Regarding the control-station: As it presents the essential part of the UAV-pilots 'situational awareness', criteria similar to the ones used for cockpits of manned aeroplanes should be used, but in addition to that features to replace the senses of the pilot in the cockpit (noise/sounds, vibrations, temperatures, accelerations and artificial view) have to be incorporated, and therefore certified. **Justification**	Not accepted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework. Considering such substitute clues will be added into the special condition for the human machine interface.

Comment	Response
Paragraph IV para 4c iv Selection of the applicable manned certification specification. **Cmt.** *UVS Canada* Comment: The 'safety objectives' method is more holistic and flexible. It embeds the basic elements of the kinetic theory and therefore is a more realistic approach. As indicated at the end it will still come down to good common sense and much technical debate. Equivalencies to the safety objectives as they pertain to manned aircraft will be more acceptable to all regulatory bodies. **Justification**	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph IV. 4 c. (iii) UAV airworthiness and certification (Page 6) **Cmt.** *CAA, UK* a) Two possible approaches for UAV that are in the EASA remit: The Conventional approach: CAA supports the conventional approach and that the A-NPA appears to come out in favour of an approach based on the existing codes at least for use in non-remote areas. The Kinetic Energy criteria for choosing the base code are good, or it would be acceptable to retain with the same criteria as in the current codes, although it is accepted that the numbers of passengers discriminant is not very helpful! The Safety Target approach: CAA does not support a safety target only approach. It would be sufficient in remote areas for low utilisation, but this is not tenable in busy airspace over populated areas. Safety case is not used alone for manned aircraft. The safety case approach assumes that you know what can go wrong, however not enough is known about these novel systems yet.	Accepted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.
Justification	

Comment	Response

Paragraph **IV. 4 c. vi – Sense and Avoid (Page 8)**

Cmt. ***CAA, UK***

The statement in the ANPA that “The fact that the type-certification does not address ‘Sense and Avoid’ should be reflected by a statement in the aircraft flight manual” is interesting. It could be expected there would be a specification for sense and avoid agreed between the certification and other (air traffic, Airspace Policy, Ops etc) authorities and the airframe and equipment manufacturers that would define performance standards that the equipment had to meet. This is the same as for other required equipment on an aircraft. The Type Certification should address sense and avoid (via CS 2X.1301). The ANPA says that it is for the authorities responsible for air navigation services to define the criteria for sense and avoid. Ultimately this may be true, the mechanism in reality may be for them to agree such criteria, based on proposals from the UAV community. The Americans have now produced and published a "Standard Specification for Design and Performance of an Airborne Sense-and-Avoid System" as ASTM F2411 (formerly American Society for Testing and Materials). This appears to address all the aspects we would expect. However, the most interesting part of it is "Section 6 - Reliability and Maintenance". In this section ASTM presents statistics for manned aircraft mid-air collisions in "General Aviation" for the period 1991 to 2002, and derives an average collision rate of 0.51 per million flight hours. The Specification then makes the argument that if a Sense & Avoid system is to provide a level of safety equal to the current manned aircraft environment, the S&A avoid system will need to have a failure rate equal to or better than 0.51 per million hours. As the ability to avoid a collision (once the threat has been identified) will depend upon the UAV control system executing an appropriate manoeuvre, it follows that the complete UAV control system (including the sense and avoid function) will have to have the same level of reliability. For practical purposes therefore, to meet this standard, the design target for the reliability of a complete UAV guidance system should be in the region of 1 x 10-7 per flight hour. Collision avoidance becomes an issue as soon as a UAV operates beyond about 500 metres range from a human "look-out" who can monitor the airspace for conflicting traffic. The implication of the ASTM Specification is that any UAV (even a vehicle with a mass of only a few kg) that relies on a Sense & Avoid system to operate safely will need to have a control system reliability (xx.1309 compliance) of around 10-7 per flight hour. This is relevant to the discussions had during the JAA/Eurocontrol UAV initiative regarding the level of airworthiness requirements to apply to different classes of UAVs.	Partially agreed. Many comments regret that EASA certification does not address ‘sense and avoid’ EASA recognise ‘sense and avoid’ as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on ‘airworthiness’ and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Comment	Response
Paragraph IV. 4 c. vii – Environmental Protection (Page 8) **Cmt.** *CAA, UK* The ANPA says that the same environmental standards as for certified aircraft will apply (with a note to say that short take off jets need to be considered). CAA believes that for the time being this is a reasonable line to take. Operating experience may show a need for different standards for UAVs, if so they can be changed later. The proposal that noise certification requirements need to be developed for jet UAV with take-off distances below 610 meters, based upon the rationale used in the paragraph, is supported and that EASA should make a proposal as to the standards to be applied	Accepted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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 UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of "larger" UAVs 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.
Justification	
Paragraph IV. 4. c. v **Cmt.** *CAA, Sweden* There must be a standard developed for the certification of both the UAV vessel(s), and the control station(s), independent of each other. This certification standard must also make it possible to certify i.e. a certain control station towards different UAV vessels and vice versa. This could be compared to the certification of an engine, which in its turn can be certified together with one or several different aircraft. We also would like to point out that the devices for launch and recovery of the vehicle (where it is applicable) must be part of the system, and following that, the certification of these devices must be part of the certification standards for UAVs.	Not accepted Certifying separately the control station is not possible within the present framework of Regulation 1592
Justification We predict that there will be a need for one control station to control several UAV vessels, and also that one UAV vessel will be controlled by more than one control station. Therefore there must be a common system in which different components e.g. control stations as well as complete aircraft can be certified towards. Concerning launch and recovery devices, there has come to our knowledge that there have been suggestions that these should not be considered as part of the UAV system. We would like to point out that in our point of view, these things can not be separated in terms of a common certification standard.	

Comment	Response
Paragraph **IV. 4. c. vi. Sense and avoid**	

Comment	Response
Cmt. ***BMVBS, DE*** It is good airmanship but more significant is that is the law to avoid noise. Such criteria are defined by the regulator e.g Ministry for Environment and Ministry of Transport rather than the authorities responsible for air navigation services. It is agreed that the 'Sense and Avoid' basic approach is crucial issue for type certification and operational approval of UAVs. The acceptance of such an approach needs much further in depth investigation. From there numerous certification and operation requirements will yield. As such not to address 'Sense and Avoid', if found to acceptable at the end in the sense of the 'See and Avoid' as stated in the ICAO standards, in the type-certification and rather make a statement in the flight manual is unacceptable. Furthermore it is unusual to name other aircraft as "targets" in a paper about civil aircraft. It is recommended use the e.g. the term "intruder" as it is done in the TCAS/ACAS documents and standards.	Noted The sense and avoid concept presented in this paragraph covers two very different issue: sense and avoid other aircraft; sense and avoid noise sensitive areas. The first issue is a matter for authorities in charge of ATM safety regulation. The second one can be adressed by providing to the UAV pilot charts listing the sensitive noise areas. Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
	The Agency agrees to replace 'targets' by 'intruders'.

Justification

Self explanatory.

The application of 'Sense and Avoid' philosophy will yield amongst others also in technical solutions for which certification requirements will have to be defined, compliance to be shown and addressed in the type-certifcation.

Political more correct.

Paragraph **IV.1., ff. "EASA and National Authorities remits"**
IV.4.d. "Perspective"
V.c. "Final assessment"

Cmt. *UAV DACH*

IV.1., ff. "EASA and National Authorities remits" IV.4.d. "Perspective" V.c. "Final assessment" We understand that EASA does not feel responsible for the definition of operational requirements and procedures, such as regulations for the use of airspace. However, for the further development it is absolutely necessary to establish a body or committee that is responsible to co-ordinate all these interdisciplinary tasks. We also feel that EASA might be an adequate organisation that could do this kind of work. At least EASA should be committed to initiate such a process. Option 2 alone does not cover the needs for the primary goal of UAV-DACH, and the companies involved, which is to elaborate the premises for certification and operation of UAVs in order to make them a marketable product: - implementation of UAVs into civil airspace / air traffic on equal base to manned aircraft - Certification of involved technologies - Co-operation in the definition of UAV-specific standards and procedures It would be much easier if everything is co-ordinated by one hand. Sense and Avoid systems, for example, are essential for the introduction of UAVs into civil airspace. For the time being EASA does not feel responsible to define requirements for theses systems, but the certification of theses systems must be again in EASAs hands.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

Option 2 alone does not cover the needs for the primary goal of UAV-DACH, and the companies involved, which is to elaborate the premises for certification and operation of UAVs in order to make them a marketable product:
- implementation of UAVs into civil airspace / air traffic on equal base to manned aircraft
- Certification of involved technologies
- Co-operation in the definition of UAV-specific standards and procedures

It would be much easier if everything is co-ordinated by one hand. Sense and Avoid systems, for example, are essential for the introduction of UAVs into civil airspace. For the time being EASA does not feel responsible to define requirements for theses systems, but the certification of theses systems must be again in EASAs hands.

Comment	Response
Paragraph **IV.4.c.ii.** ***Cmt.*** ***BMVBS, DE*** Add “For the operation of UAVs in non-segregated airspace” certifying the UAV system is essential for safety. ***Justification*** For clarification.	Accepted The policy already proposes to certify in the case of operations in segregated airspace.

Comment	Response
Paragraph **IV.4.c.iii**	

Comment	Response
Cmt. ***DGAC, France*** For the time being the Policy should be limited to a "Policy for delivering permits to fly to UAV systems (Airworthiness and Environmental protection)" Delivering airworthiness certificates without taking care of the other aspects of the problem (certification, operating rules, frequencies, security, operator licensing, maintenance of ground station, …) does not seem appropriate.	Not accepted There may be a chicken and egg situation: there are no applications because there are no rules. It does not harm to anticipate. In addition UAV above 150 kg maximum take-off mass are included in the EASA remit., so EASA has to get ready to accept application. Providing for airworthiness certificates ensure an intrinsic safety of the UAV that is a starting basis for further authorisations. Because sense and avoid is not part of airworthiness there will be a statement in the flight manual to reflect this. The logic to issue permit to fly to get more knowledge of UAV and then when experience is gained move to certificates of airworthiness is debatable: there is already a lot of knowledge on UAV operation . The Agency considers that the option 2 is a reasonnable step forward and agrees that the ultimate objective should be the option 3. In addition with present EASA regulations, the issue of a permit to fly would necessitate the approval by the Agency of the flight conditons related to design. A policy would be needed to do so
Justification It seems a bit premature to try to define a policy for certifying UAVs (issuing TC and restricted TC) when so many technical areas are still open and where there is not a clear idea of the need. Beyond certification, each European National Authority remains responsible to ensure the overall safety of over flown population by those UAVs: it implies that the "certified UAV" must be evaluated and authorized to fly when its operation, the security aspects, protection of control frequencies, the airspace management, the pilot ability to control the UAV (license) are taken into account. This overall authorization leads the NAA to issue a permit to fly which clearly address those aspects and identify the limitations of use. As of today, it seems obvious that a major condition would be to limit the UAVs operations to occur within a restricted area, separated from other users. Also, it is not foreseen in a short term to have series of UAVs needing a type certificate and NAAs delivering individuals certificate. There is nevertheless a need to help NAAs to deliver flight permits for many unique UAV prototypes or for very limited series. As a first step, if the EASA and NAA were adopting guidelines to issue flight permits for UAVs on a consistent baseline, it would help to harmonize European national approaches while gaining experience for a further rulemaking activity to address all aspects of UAVs certification and operations. The EASA should realize that issuance of EASA type certificate and individual certificate by one of the NAA would still have an impact on NAA rules. Today, even if the airworthiness would be guarantied by such a certificate, the owner of such a certified UAV should be aware that he shall get from the DGAC an authorization to operate his UAV. He may be notified by DGAC additional requirements to cover operational aspects, to segregate it or not from other users, to demonstrate its license to operate, to limit the areas of operations… In order to make sure the UAV owner/operator will contact French authorities before flying the UAV, it is recommended that any flight permit issued by an NAA/EASA for such an UAV clearly states that "It is the responsibility of the owner/operator of UAV to contact local authorities before any operation of the UAV to make sure he/she has all necessary authorizations to operated his/hers UAV as intended. The flight permit without such an authorization does not allow operating the UAV over the NAA territory." As a side issue to be resolved, but major enough that it could prevent the whole concept if not resolved, frequencies used to control the UAV must be addressed. From recent meeting between manufacturers, military services, civil authorities, defense authorities, it seems difficult to allocate enough protected frequencies. It implies that UAVs without protected frequencies could only fly close to ground, in a dedicated area and with limited number of users as they might interfere among themselves. Dialogue with UIT must be completed before going further. Otherwise, we take the risk of uncontrolled situation where many applicants will start their business in order to sell on this raising market, even if they know the issue of frequencies. In a second step, once the "permit to fly" phase would have let the EASA/NAA achieve knowledge of the overall issues, the EASA could propose a "UAV" certification process, an UAV operator licensing process, a "control station" qualification, an overall "UAV system" certificate.	

Comment	Response

Paragraph **IV.4.c.iii.a) UAV airworthiness and certification and c) Conclusion**

Cmt. ***BMVBS, DE***

Text needs rewrite. There are no two approaches as written. It is rather a combination of both: - Since the implementation of UAV operation in non-segregated airspace is a change in the use of airspace which in any case requires as safety case study according ICAO Convetion. - The conventional approach is what is applied today to regular aircraft already. In addition to address uncertainties over the airworthiness of an UAV by restricting operations to defined volumes from which third parties are excluded (except polar region or unpopulated areas) is not a solution and as such not acceptable by the air traffic services due to the already existing constrains in the availability of airspace. The conclusions do not address effects on third parties as they not consider the possibilities of public and political acceptance the operation of UAVs in non-segregated airspace.	Agreed The commentator is right in saying that there is a combination of the two approaches. However the conventional approach should be used in normal cases and the safety target ones in a limited number of cases. There are no intentins to limit UAV operations to polar areas. Operators (e.g. the organisation operating UAV) will have to find compensating factors to the absence of sense and avoid criteria (e.g. operation in line of sight of the pilot, chase airplane, temporary segregated airspace) Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

Amongst others the ICAO Convention. Existing constrains in the availability of airspace. Lack of acceptance.

Comment	Response
Paragraph IV.4.c.iv. Selection of the applicable ... **Cmt.** *BMVBS, DE* The kinetic energy approach is not supported. **Justification** This approach assumes the loss of control of the UAV which results in a crash and consequently the risk of loss of property and life on the ground. Additionally it contradicts the “safe flight and landing” approach of other CS.	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. In additon there seems to be a misunderstanding: the purpose of the kinetic energy approach is not to accept loss of control but is to compare UAV to manned aircraft in a extreme scenario that safety regulations are trying to prevent.

Comment	Response
Paragraph IV.4.c.v. "Issue of certificate of airworthiness" **Cmt.** *NLR* Reply to your request for comments on the Policy and specific issues in § IV.4.a of the Explanatory Note.	Noted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.
Justification In our opinion, a problem arises if a UAV is handed over from one control station to another, hence from one system (with its own certificate) to another (with another certificate). This would only be possible if the UAV is certified as part of the certificate of both systems. For reasons of, e.g., liability and continued airworthiness such a handover may only be possible if the certificates of both systems are with the same certificate holder. The most simple solution could be to issue separate certificates for each separate component of the UAV system (control station, launcher, aircraft, ….) and specify in which system configurations these certificates are valid, for example: - The certificate of the launcher specifies which types of UAVs may be launched from it, - The certificate of the control station specifies which types of UAVs may be controlled from it, - The certificate of the UAV specifies from which types of launchers it may be launched and from which control stations it may be controlled.	
Paragraph IV.4.c.v. Issue of certificate of airworthiness **Cmt.** *BMVBS, DE* Whether the control station should be included in two certificate of airworthiness or whether a specific certificate of airworthiness should be created for the control station is a question which cannot be simply answered by a query in this A-NPA. Further research and studies, eventually flight trials might be necessary. This will be part of a (research) project launched by the BMVBS.	Noted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.
Justification Inappropriate question to be placed in an A-NPA	

Comment	Response
Paragraph IV.4.c.v:	
Cmt. *DGAC, France*	
It is proposed to defer the answer to this question of issuing a certificate of airworthiness to the control station to a later stage when experience is gained with UAVs that EASA/NAA would allow to operate under a flight permit process.	Not accepted There may be a chicken and egg situation: there are no applications because there are no rules. It does not harm to anticipate. In addition UAV above 150 kg maximaum take-off mass are included in the EASA remit., so EASA has to get ready to accept application. Providing for airworthiness certificates ensure an intrinsic safety of the UAV that is a starting basis for further authorisations. Because sense and avoid is not part of airworthiness there will be a statement in the flight manual to reflect this. The logic to issue permit to fly to get more knowledge of UAV and then when experience is gained move to certificates of airworthiness is debatable: there is already a lot of knowledge on UAV operation . The Agency considers that the option 2 is a reasonnable step forward and agrees that the ultimate objective should be the option 3. As the Agency intends to issue certificates of airworthiness, the question about the control station is relevant. In addition with present EASA regulations, the issue of a permit to fly would necessitate the approval by the Agency of the flight conditons related to design. A policy would be needed to do so
Justification	
The question to issue a certificate of airworthiness to the UAV system is a complicated question that raises many issues when we try to specifically state what would be applicable to the control station. One can note that even if the policy speaks to give a certificate of airworthiness to the UAV system, the detailed guidance in attachment I (page 28/42) does exclude some features of the control station from the airworthiness subject. If the approval of the overall UAV system is necessary, the issuance of an individual Certificate of Airworthiness may not be the most appropriate, as the UAV system approval may include : - one or more “UAV flight vehicle” (which may eventually be subject to individual airworthiness certification) - one or more “control station” (which may eventually be qualified, with some aspects linked to the airworthiness of the mobile and some aspects not) - operating conditions/limitations - UAV pilot qualification criteria. A UAV system may go from a single autonomous vehicle to a combination of UAV vehicles and stations. Apart from the fact that it may seem weird to give an airworthiness certificate to a station on the ground, there is a need for a in-depth assessment with legal advisers of all the implications of having or not a single certificate for the system or a separate certificate for the vehicle, notably concerning the question of registration (how do we mark a system including several vehicles and one or more control station) and liability. Then, there is the list of the following question to be resolved: - if the station is part of the airworthiness certificate, how is the certification requirement to apply to it? - What are the maintenance requirements to maintain its airworthiness capability: Part M requirements? - What are the maintenance engineer qualifications necessary to deal with the station? - (all of that assuming everybody is fine with the statement of airworthiness of a station that stays on the ground) If an airworthiness certificate is given to the UAV system, what does that mean concerning the weight limits (notably the 150 kg limit in Annex II of Regulation 1592/2002. Does that mean that EASA will be in charge of a UAV system with three 50 kg vehicles and a 150 kg station ? None of the solutions proposed by EASA (control station within or outside the airworthiness certificate) are obvious and legal implications have probably not been fully assessed. Both may have their advantages and difficulties to set up. This is why DGAC recommends going on with flight permits and to study through actual cases implication of all those issues in order to better define all regulatory tools that we would all need to address all aspects of safe UAV operations.	

Comment	Response
Paragraph IV.4.c.vi (Page 8) **Cmt.** *BMVBS, DE* We disagree strongly that the sense and avoid techniques can be assumed “preventing collision with other aircraft”. It cannot be excluded – especially looking at the current problems in that area of development – that the sense and avoid components fail and therefore a collision with other aircraft cannot be assumed impossible. Instead there will always be a risk left that has to be reduced to an acceptable level (and even an “acceptable level” does not mean that the likelihood of the risk is zero!). The definition of Sense and Avoid criteria, requirements and safety objectives will not change that. It can only reduce the likelihood of the occurrence of such a collision. ***Justification***	Accepted Zero risk does not exist. The paragraph will be re-written using the word minimise

Comment	Response

Paragraph **IV.4c.vi. "Sense and avoid"**

Cmt. *UAV DACH*

We understand (but do not appreciate) that EASA does not feel responsible for the definition of operational requirements and procedures, such as regulations for the use of airspace. However, "Sense and avoid" consists of both, operational and technical aspects. It cannot be treated as a sole operational problem. Either it is necessary to include S&A into the certification of a specific UAV system, or S&A-equipment must be certified separately (respectively approved like TSO equipment). Of course, the requirements for the S&A-equipments may be defined by the ATC, but the technical realisation must be approved by EASA. Therefore it will be necessary to establish a corresponding framework for the TC of S&A-equipment. A statement in the UAVs flight manual that its TC does not address "Sense and Avoid" will naturally limit UAV operations to segregated airspace and is not acceptable.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

A suitable Sense and Avoid equipment is probably the most essential part of an UAV-system that is intended to operate in non-segregated airspace, but S&A is not addressed within the EASA proposal. Even if EASA does not feel responsible for airspace regulations and ATC, S&A-equipment must be certified as any other kinds of equipment, either within the CS of he UAV-system (if inseparably connected to the system), or separately as many other types of equipment (if to be installed in any type of UAV system).

Comment	Response
Paragraph IV-1 **Cmt.** ACG Some Policy for the operational rules of UAV are urgently needed. Especially the minimum equipment or capabilities shall be specified. **Justification** The see/sense & avoid issue shall be specified, analog to the cockpit compartment view of a manned vehicle. What capabilities must such a system have?	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Comment	Response
Paragraph Page 10, paragraph A.V.2.a. **Cmt.** CEV The A-NPA introduces in page 10, paragraph A.V.2.a) three possible options : - The first option, "do nothing", is not reasonably imaginable; - The second option suggests to adapt civil type certification on a case by case basis. This adaptation would be based on general principles of current civil certification and on special conditions that would be written for all special features of the UAV; - The third solution, presented as the ultimate goal, consists in the elaboration of a complete airworthiness regulation that would be applicable to UAVs. This solution is presented as very ambitious, based on the fact that "mature drafts are not yet available". Amongst the 3 options suggested, the third solution i.e. the complete development of an airworthiness code applicable to UAVs, is the only way that can lead on a short term basis to integration of the UAVs in general airspace. Thus this third way is the one that should be followed. The USAR code is based on the CS-23, established by EASA, and is thus fully coherent with EASA regulation to which it could be integrated as a complete airworthiness code applicable to unmanned UAV systems. It could therefore be taken as a basis for future EASA certification.	Not accepted 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. This code has served as a basis for the development of a NATO standard. USAR is not the comprehensive framework for UAV regulation as envisaged by option 3. It does not address 'sense and avoid', operational regulations and flight crew licensing regulations. The Agency recognise however that USAR has been developed using a methodology closely related to the one described in the policy and accept to consider USAR version 3 as an acceptable means of compliance to the policy provided that: • Its applicability is limited to the scope of present CS-23 • The safety targets included in the safety analysis reflect the ones resulting from the application of the EASA UAV policy.
Justification Option 2 is, as it was stipulated in the A-NPA, a short term vision that will not allow to reach integration of UAVs in general airspace. To reach UAVs integration in general airspace, the third solution is the one that should be followed starting from an existing foundation : the UAV Systems Airworthiness Requirements (USAR) is a complete airworthiness code applicable to UAVs. It was elaborated by CEV with the support of French aeronautical industry (EADS, Dassault Aviation, Thalès and Sagem). The latest version of this document, 3.0, is recognised and applicable since it was published early 2005 for all new French MOD UAV systems falling within its applicability boundaries. The USAR code is a mature document and is currently being studied at NATO by the "USAR Specialist Team" working group that aims at giving to this document an international applicability. Even though it was written by military authorities and has now reached a high level of discussion in the international military world, the USAR code takes into account various points stated in the A-NPA, amongst which : - UAVs are treated as a complete system : ground control stations, communication links for UAV control and lauch and recovery elements, as mentioned in paragraphs A.IV.4.c.ii) page 6 and B.c) page 25, are dealt with in dedicated USAR paragraphs; - FAA AC23-1309 type safety objectives (attachment 2 of explanatory note and page 40 in appendix 1 to attachment 2 of the proposed policy) adapted to UAVs are included; - the principles of fairness, equivalence, responsibility/accountability and transparency (page 6, paragraph A.IV.4.c.i)) are respected exactly as per manned certification specifications. Therefore the USAR code, as an adaptation of CS-23, could fit perfectly in EASA airworthiness standards.	
Paragraph Page 13, iii Environmental **Cmt.** UAV DACH In the development of UAVs both effects will happen. But the main effect will be that UAVs will replace existing manned aircraft. With the experience it is no impossible, that niche roles will be created. It is even so that at present time requests are for UAVs, when it is dangerous to use manned aircraft. In this regard both options are of same influence.	Noted The comment will be taken into account into the revison of the regulatory impact assessment
Justification	

Comment	Response
Paragraph **Page 13, iv Social** ***Cmt.*** ***UAV DACH*** With option 3 are clearly regulated the requirements of UAVs as it is for manned aircraft. There is no special process in the certification of them. For the industry is even given the possibility to develop new aircraft for the use in the role of UAVs. ***Justification***	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) The relation of the comment with social issues is not obvious.

Comment	Response
Paragraph Page 25, Paragraph b. Objectives **Cmt.** *FAA, Certification* The airworthiness safety objective is the protection of the public in the air (i.e. on other aircraft) or on the ground. **Justification** As previously mentioned in an earlier comment the protection of flying public is an inherent safety objective in manned aircraft airworthiness standards. Ignoring this fact may prove detrimental to the UAS certification effort and its safety goals. While sense and avoid is an operational rule for manned aircraft complied with by the human pilot onboard, in UAS this is not the case. The remotely located UAS pilot will most probably depend on autonomous or semi-autonomous systems to assist in performing this critical function. It is recommended that for UAS the sense and avoid functions be considered under airworthiness due to the unique nature of the technology.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
Paragraph **Page 29, Attachm. 2, Para. 1, Section 3** **Cmt.** *UAV DACH* With respect to the definition of “Acceptable ground victim criterion”: - Is this criterion fully in line with the airworthiness aims for third party protection? - By which means will this criterion (reduced airworthiness of the vehicle) be visible for and supervised by air traffic controllers High implication on operational side. **Justification** The criterion and the corresponding attachment seems to be not feasible as such, unless further discussions and explanation on the subject has taken place. Topic should be further discussed in a technical forum (National Airworthiness Authorities, Government Representatives and Industry), which potentially might exceed the three months period for such comments.	Noted This criterion is relative to alternative II. In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph **page 3, I. General** ***Cmt.*** ***LBA*** Airspace regulators must be made aware of the new UAV trends. ***Justification*** The situation in the airspace is the more severe safety problem in context with UAV´s. The airspace structure and the requirements for all users of the airspace need to be carefully reviewed.	Accepted Airspace regulators participated into the joint initiative from JAA and EUROCONTROL on UAV. They are also regularly invited in UAV conferences.
Paragraph **page 31, Attachment 2 Item 4 Special Conditions and interpretative material** ***Cmt.*** ***LBA*** If credit will be given to comply with the safety objective by an Emergency Recover System/Procedure, additional requirements will be necessary for the crashworthiness of the fuel system. Note: Helicopter Fuel tank crashworthiness requirements may be use as guideline (see CS 29.952). ***Justification*** Post landing fire due to leakage in the fuel tank may create an additional hazard after a landing in a populated area. Current fixed wing airworthiness standards do not comprehensively address minimizing fuel leaks and potential fuel ignition sources. Fuel containment and hazard elimination provisions would reduce the probability of post landing fire or extend the time before a post landing fire could become critical.	Accepted The use of manned CS as a basis for the type certification already ensures that fuel tank crashworthiness is taken into account. The landing following emercency recovery is not necessarily an emergency landing.

Comment	Response
Paragraph **Page 6, paragraph A.IV.4.c.iii.a).** **Cmt.** *CEV* Two approaches are suggested in this paragraph : the conventional approach applying recognized and defined airworthiness codes and the Safety target approach focusing on safety critical issues with a combination of design and operational requirements. The conventional approach is the approach that should be preferred generally speaking. **Justification** A safety target approach would be associated with operational limitations as it is very rightly concluded in paragraph A.IV.4.c.iii.c). Therefore the conventional approach is the only one that will allow UAVs to be treated as general aviation aircraft with no operational limitations. This is the fastest and most efficient way for their integration in general airspace.	Noted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.

Comment	Response
Paragraph page 8 - sense and avoid **Cmt.** *CAA, Belgium* Sense and avoid will be an airworthiness matter in some way because: - it will have to be implemented by equipment; - equipments such as TCAS, EGPWS, ADS-B will have to be coupled someway to the autopilot to make an automatic evasive manoeuvre possible. (coupling with TCAS has already been experimented)	Accepted Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification	

Comment	Response
Paragraph page 8, Point IV.4.c.v. **Cmt.** LBA Do not priories when only one control station controls two or more UAV unless different controllers / operators are responsible for one UAV only each. **Justification** Even at most time autonomous operation it has to be expected in any case/at any time a necessity to switch over to manually flight operation but it is not foreseeable when and how long this will happen.	Noted No assumptions were made. Examples were presented to illustrate the problem.
Paragraph page 8, Point IV.4.c.vi. **Cmt.** LBA Sense and avoid instead of see and avoid could be of advantage for flight safety also for the manned aircraft as long as there are active systems available which are able to recognize any flight vehicle by itself (and not only via TCAS communication). **Justification** Self explanatory	Accepted Technologies developed for UAV may benefit also for manned aircraft.
Paragraph Page 8, v Issue of certificate of airworthiness **Cmt.** UAV DACH We prefer to issue a specific certificate of airworthiness for the control station. **Justification** The control station can possibly be used for different types of UAV. Then it is possible to define in this certificate that the control station can be used separate or a UAV can be controlled by several control stations. This is the same as the type certificate of engines. This is a unique element, that because of the requirements it is validly that a special certificate is issued.	Not accepted Issuing a certificate of airworthiness for the control station alone is not possible under the present framework of regulation 1592.

Comment	Response
Paragraph Page 8, vi Sense and avoid **Cmt.** *UAV DACH* This explains why the safety and environmental objectives of the Policy are limited to people on the ground and to the design of the UAV system. The requirements for sense and avoid equipment shall be defined in the regulations. **Justification** Does the above text explain that the sense and avoid are not for the security of people on ground? Also a collision is a danger for people on ground, because the collided aircraft will crash to ground. Sense and avoid is a very important equipment for a UAV because the pilot is not on board.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
Paragraph **Page 8, vii Environmental protection** ***Cmt.*** *UAV DACH* We prefer to keep the same requirements for all jet aircraft.	Noted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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. The exemption for take-off distances below 610 m was brought into Annex 16 in anticipation of development of dedicated standards for STOL (Short take-off and Landing) aircraft. As these never really developed, the action was abandoned. So the reason for extending the annex is because the UAV's are STOL not because they are unmanned. In addition, if it turns out that UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of “larger” UAVs are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements or operational restrictions may have to be taken into consideration (Again, not because they are unmanned, but because of their unusual operational use).
Justification There is no sense to define higher requirements for the new types of aircraft, the UAV. For all flying aircraft the same requirements, all have the same regulations and laws.	

Comment	Response
Paragraph Para 4.c.iii page 6 **Cmt.** *TC and Can Dept of Natl Defence Directorate* This is a consolidated Transport Canada and Canadian Department of National Defence Directorate of Technical Airworthiness response to EASA A-NPA No 16-2005. Although both organization's mandates are legally separate in terms of civilian and military regulation, in the area of UAVs there is close co-operation and a combined response is justified. Both TC and DND support the development of UAV standards but with the following caveat: In the Canadian context, both military and civil regulators have the option of specifying certification standards or of using risk-based, safety target approaches to achieve the acceptable level of safety. This option must be retained; therefore the standards should not become mandatory or force changes to the current national regulatory framework in which the standards would be employed. This requirement seems to be recognized in Article 5 Paragraph 3 and Part 21 subpart H as described at IV.4.c.iii.c) of the A-NPA (page 7). TC and DND agree that the standards should be based on the definition of safety objectives. FAR part 23/EASA CS-23 or equivalent standards appear to be appropriate staring points. (ref para 4.c.iii page 6). **Justification**	Noted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.
Paragraph Para 4.c.v page 8 **Cmt.** *TC and Can Dept of Natl Defence Directorate* This is a consolidated Transport Canada and Canadian Department of National Defence Directorate of Technical Airworthiness response to EASA A-NPA No 16-2005. Although both organization's mandates are legally separate in terms of civilian and military regulation, in the area of UAVs there is close co-operation and a combined response is justified. TC and DND consider that following the 'total system' approach, the type certificate is for the system and should specify the configuration and limitations for the system, i.e. the air vehicle and the ground stations. Air vehicles and ground stations should be then issued an individual certificate of 'airworthiness', as flight safety critical functions will be performed by the ground station as well as on the air vehicle. The system type certificate can then state the number of individual air vehicles that may be controlled with a single ground station - as long as they all have CofAs. Failure to certify the ground station in the context of the system, and to the same standards (particularly as the ground station will be carrying out flight safety critical functions and will almost certainly fall under the remit of a .1309-type paragraph) represents a serious airworthiness risk. TC and DND do not have visibility of the difficulty of this approach vis-à-vis the EASA Basic Regulation, but consider that it is the only valid approach given the philosophy outlined at para 4.b (page 5) and para 4.c.ii (page 6) of the A-NPA. **Justification**	Accepted The policy included in the A-NPA deals with UAV systems and therefore the Agency agrees with the comment. However relative to control stations and certificates of airworthiness, the Agency takes the following view: Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.

Comment	Response

Paragraph Para 4.c.vi. page 8

Cmt. *TC and Can Dept of Natl Defence Directorate*

This is a consolidated Transport Canada and Canadian Department of National Defence Directorate of Technical Airworthiness response to EASA A-NPA No 16-2005. Although both organization's mandates are legally separate in terms of civilian and military regulation, in the area of UAVs there is close co-operation and a combined response is justified. TC and DND agree that 'sense and avoid' should not be included in the certification standards (ref para 4.c.vi. page 8).	Accepted Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Comment	Response

Paragraph **para IV c iv and IV d of the explanatory note, para (d) and (f) of policy, para 1 of attachment 2**

Cmt. ***EADS***

Comment	Response
Instead of starting the development of each project with a “clean” CS for manned aircraft, it is recommended to start with an eventual avaialbale airworthiness requirement (even if not in a final version pbublished) which is already adopted to UAV. E. g. USAR, which is based on EASA CS 23 and is already tailored to UAV by French authority CEV could be used as a starting point. F) Type-Certification Basis: 1. The type-certification bais can be adapted from existing certification specifications developed for manned aircraft or from special UAV certification specifications. 3. (a) Existing certification specifications duly tailored to UAV Systems.	Partially accepted 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. This code has served as a basis for the development of a NATO standard. USAR is not the comprehensive framework for UAV regulation as envisaged by option 3. It does not address ‘sense and avoid’, operational regulations and flight crew licensing regulations. The Agency recognise however that USAR has been developed using a methodology closely related to the one described in the policy and accept to consider USAR version 3 as an acceptable means of compliance to the policy provided that: • Its applicability is limited to the scope of present CS-23 • The safety targets included in the safety analysis reflect the ones resulting from the application of the EASA UAV policy.

Justification

Justification
It will safe time and money to start with an already adapted set of requirements. As a first step e. g. USAR in its present version could be reviewed and changed to meet eventually EASA needs. Specific air vehicle issues can than be covered by special conditions. Due to the fact that the USAR is based on CS 23 (which is in addition similar to the US. FAR23) it should basically be suitable. At the moment USAR is under review for civil and military provision as well as be the US FAA.

Comment	Response

Paragraph **Paragraph 4 c iii: a,b&c**

Cmt. ***T. Wilbond***

Merlin Integrated Solutions supports the EASA view that the 'conventional' approach to airworthiness certification should be adopted for UAV systems. The Target Safety approach should present a compelling case for departing from the principle of equivalence (the conventional approach) and it fails to do this on many levels.	Accepted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.

Justification

The discussion in the document on the two possible approaches to airworthiness and certification is addressed extensively if not exhaustively in the paper and it is not intended to replicate the arguments in this response. It is highly likely that many UAV system operations will be conducted in operating environments where risk to people on the ground is minimal. The Safety Target Approach offers a flexible and adaptable way of approaching safety and particularly the issue of certification tuned to operating environments. An issue that the document does not cover is that EASA is responsible for the design, production, integration and function of avionics equipment as part of type certification. If an avionics system was developed for a UAV system, such as sense and avoid, and then flowed to manned systems mapping a Safety Target Approach to the conventional approach used in the manned system would introduce problems. Hence, the disadvantages of a Safety Target Approach far outweigh the advantages and the approach would seem to contravene the first basic principle of equivalence. The process outlined in Part 21 subpart H, which allows for restricted certificates of airworthiness to be issued, would provide the necessary flexibility. That said the use of restricted certificates of airworthiness for UAV systems should be reviewed with the intention of ensuring these could be issued as a matter of routine rather than an exception. In essence the case for a Safety Target Approach is insufficiently compelling to merit divergence from the principle of equivalence.

Comment	Response
Paragraph **Paragraph h)** ***Cmt.*** ***DGAC, France*** Noise certification requirements will have to be established specifically for UAVs taking into account their characteristics (rotorcraft, airplane, its weight, its kind of power generator) and their particular usage but shall not be less than the “equivalent manned aircraft” for each phase of flight. ***Justification*** For similar operations (take-off, cruise, landing), current noise certification specifications are probably applicable to UAV However due to specific operating conditions new certification specifications will have to be developed to ensure that nuisance to the general public is not increased by the use of UAV (We can imagine that a not so noisy UAV might have a noise unacceptable to inhabitants if it’s continuously flying very low, all day long to monitor an area close to private homes).	Accepted This is the approach proposed by the policy.

Comment	Response
Paragraph **Paragraph IV 4 a – EASA specific request for comment Comment 1, methodology. Affected paragraphs IV c iv Explanatory note, paragraph d and paragraph 1 of Attachment 2 of the Policy** ***Cmt.*** ***T. Wilbond*** With reference to the methodology for deciding which regulations and processes should apply to air vehicles we believe the approach using kinetic energy should be used. Once again there is no compelling overall case for change and logically there is no case to change the emphasis to defining safety against fatalities on the ground. The proposed change in mass thresholds could provide UAV systems with a competitive advantage but overall the use of target objectives would be divisive and breach the principles of equivalence and fairness.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification The established approach to defining which certification code is applicable to an aircraft is based on kinetic energy. The proposal for change is based upon the thesis that because there are no people on board a UAV the emphasis for safety should shift from preserving life on board to preserving life on the ground. This shift, called the safety objective approach, introduces other criteria directly related to population densities and probabilities of fatalities on the ground. In essence, the emphasis on preserving life in the air has provided the safety levels necessary to preserve life on the ground. Once again, applying the principle of equivalence there should be no need for change because following the proven approach adopted for manned aviation will deliver the required level of safety to people on the ground. Certainly, we believe that the proposal to move the mass thresholds for UAV systems is unacceptable for the time being. That is not to say that there may not be merit in changing when civil and commercial UAV operations might predominate but the case for change now is not sufficiently compelling to diverge from the underpinning principles and the indications are that it could in fact cause a situation that may undermine safety in the near term.	

Comment	Response

Paragraph **Paragraph IV 4 a – EASA specific request for comment**
Comment 2 Control Station. Affected paragraphs IV c v Explanatory note, paragraph d of the Policy

Cmt. ***T. Wilbond***

The issue of control station certification The regulatory environment and processes must not inhibit the evolution of civil and commercial UAV systems' markets. A detailed analysis of the market evolution in time and shape by Merlin Integrated Solutions has pointed to the development of management centres for the control of different long range, long endurance tasks and the need for a harmonised approach to managing different UAV systems at airfields, whether at dedicated UAV operating airfields or airfields where interleaved operations exist. This potential evolutionary route does not accord with the concept of tying control systems to UAV platform type certification. Further, the term control system does not encompass all the functionality necessary to manage chock to chock operations and not all functionality, required to manage each flight segment and operations within operating environments, is necessary in every 'control system.' Security is a safety issue and must be addressed as part of the certification process. Merlin Integrated Solutions would urge the following type certification should be split into two elements; Type certification for the air vehicle Type certification for the management system which in turn could be sub divided into three systems, generally defined by the management needs for the different operational phases : En route management system (Transit and task operations beyond line of sight) Airport management system (Take-off and recovery) Local management system (Line of Sight not covered above) Additionally, Merlin Integrated Solutions proposes that security should be addressed as part of the management station certification	Not accepted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework. Noted The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not mandate security requirements. However if security systems are mandated by the appropriate authority or installed voluntarily, they should not impact safety: EASA would have to address that. The group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Justification

Historically, UAV systems have evolved along the lines that for a specific air vehicle there is a specific control station (particularly in the context of the military systems predominant in the current market); these elements coupled with the link between the two and the launch and recovery system have defined a 'UAV system.' This has been important to drive thinking away from just the platform to a more system approach. A result is that the systems approach tends to reinforce the concept that a ground station is directly linked with the air vehicle and this thinking is flowed into the consultation document in the context that the ground station should form part of the type certification process. Merlin Integrated Solutions has conducted detailed output analysis of the needs of several potential civil and commercial customers and there are very strong indicators that management centres will evolve which will be capable of managing several different UAV systems potentially delivering different outputs. Similarly, an analysis of airport needs, driven initially by looking at spectrum needs at airports, indicated that a standard management station would evolve to manage all UAV systems over the approach, departure and taxiing phases of 'flight' rather than multiple ground stations for each certified airframe that may operate from the airfield.

The EASA initiative will be highly influential in driving accepted terminology and concepts either directly on certification matters or indirectly as a consequence of the approach it adopts such as the proposal to group the 'ground station' as part of a UAV airframe type certification. In this regards there is a danger of defining an approach that will inadvertently constrain the evolution of civil and commercial markets.

Comment	Response

Paragraph **Paragraph IV 4 a – EASA specific request for comment**
Comment 3 Noise certification. Affected paragraph h of the Policy

Cmt. ***T. Wilbond***

The issue of Noise certification The principle of equivalence should apply without variation	partially accepted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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 UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of “larger” UAVs 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.

Justification

The principle that must be applied to all environmental issues is equivalence and UAV systems must comply with all relevant regulations. More stringent constraints on UAV systems should only be considered when there is firm evidence that the way UAV systems are operated, including the impact of operating from different locations, requires change to ensure UAV systems stay within existing regulatory bounds. Equivalence must be applied to the possible additional requirements for jet aircraft with take off distances below 610 meters and only if UAV systems operate from an airfield where conditions are such that they cannot reach a height at which the noise pollution is within acceptable bounds should the additional requirement be enacted. This should be based upon a demonstrable problem not a hypothetical scenario.

Comment	Response
Paragraph **Paragraph IV 4 a EASA specific request for comment** **Comment 4 Regulatory impact assessment. Affected paragraphs 4 a iv and v of the regulatory impact assessment.** ***Cmt.*** ***T. Wilbond*** The regulatory impact assessment It is perhaps generally understood that the regulatory impact statement applies only to Europe but mixing world statistics with Europe is potentially confusing. Merlin Integrated Solutions also has core expertise in market projections and believes the data attributed to UVS International at paragraph V 1b on page 9 needs updating and putting into context. The Options outlined at paragraph for analysis are appropriate and fully agreed. However, having dismissed option 1 as not tenable it would have been more logical to take forward just options 2 and 3 for further consideration. In the economic assessment at paragraph 4 a ii, the approach to understanding market evolution is interesting but reflects older thinking. A more detailed and analytical methodology utilising event horizons and output needs has been developed and would provide a much better assessment of economic impact that currently contained at Reference A. Merlin Integrated Solutions believes the timelines presented need putting into greater context and refining. Specifically the European timelines are considered to be over optimistic. Environmental impact is considered at paragraph V 4a iii. It is not at all clear whether option 3 would provide a significantly better outcome for environmental impact. With regards to the last sentence Merlin Integrated Solutions' research points very strongly to the fact that UAV systems will increasingly displace manned aviation over time. Paragraph V 4 a iv considers social impact. This is a difficult issue but all technological change impacts the social environment especially the types of skills needed by people. It so happens that the air environment is heavily regulated and changes in regulation and processes that may be needed as a move to achieve UAV system routine operations may cause a reaction from sectors of the public and the aviation community. The greater concern is the possible luddite reaction of some elements of manned aviation to block regulatory change. ***Justification*** The regulatory impact assessments are generally agreed with the exception that there is not a direct cause and effect linkage in the social assessment between regulatory change and potential reactions to the technology. That said, proposed changes to allow UAV operations may heighten already existing negative reactions. The final assessment and recommendation as to the preferred option is fully supported because the EASA initiative could either founder or be significantly delayed if it tried to take on a wider remit. The initiative will provide an important stimulus for other agencies and national organizations.	Noted. The comment will be considered to improve the Regulatory Impact Assessment.

Comment	Response
Paragraph **Paragraph IV 4 a – EASA specific request for comment** **Comment 5 Next Steps. Affected paragraphs IV d of the explanatory note** ***Cmt.*** ***T. Wilbond*** Merlin Integrated Solutions does not think it appropriate for EASA to take on the overall coordinating role. EASA should drive forward the plan to move to a multi-disciplinary task as quickly as practicable. It should refine its consultation with national UAV systems bodies to help inform the process. ***Justification*** Quite simply, the task that EASA has in reaching the objective to achieve an agreed set of UAV regulations with regards to certification is daunting but is a key strand in achieving routine operations. Responsibility for other aspects of achieving routine operations lies with a multitude of other agencies both at the international and national levels. Trying to act as a coordinating focus would be very problematic, potentially diverting and would, in some areas, arguably fall outside the key competencies of EASA. It is considered that the earliest possible delivery of the objective to deliver comprehensive, equitable and fair regulations on certification would act as a key stimulus to other areas.	Accepted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Comment	Response
Paragraph **Paragraph IV 4 c v of the explanatory note.** **Cmt.** *ENAC* Replace last sentences from the one starting with "The situation is different …." with the following text: "The situation when only one control station controls two or more UAV, although considered technologically feasible, shall be seen as a future step in the implementation of the policy outlined by this NPA because it implies too many conceptual changes to the current system of regulations."	Accepted. The policy will be modified to reflect the comment. Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.
Justification In the case of the control station controlling more than one UAV, i.e. two, the same control station should be included in the two respective certificate of airworthiness, being part of the same control station necessary to establish that each individual UAV is airworthy. The control station, in terms of type certification procedures, can be compared at the engine of the aircraft, that is to say that the engine can be certified as a product, demonstrating that its type design comply with the engine certification specifications and, in the context of the aircraft type certification, the engine installation shall comply with the aircraft applicable certification specifications. For the engine, the type certificate can be granted like for the aircraft but the certificate of airworthiness can be released only to the complete aircraft. Similarly, the control station (part of it) shall be considered the remote part of the aircraft and then the certificate of airworthiness cannot be granted to a part but to the complete aircraft, differently from the type certificate that can be granted to a component like the engine, if it is possible to establish stand-alone certification specification or minimum safety requirements for that component like for the engine. The comparison with the engine is valid for the type design definition and procedures, but for the "as built" configuration it is different because in this case there is a physical resource that is shared between the two individual UAV . In such a case the two certificate of airworthiness would not be independent like for conventional aircraft, i.e. in case of modification of the control station, in principle, there could be impact on both certificate of airworthiness, and at minimum, for each change to the control station or to one of the two UAV, it should be demonstrated that there is no impact on the airworthy of the other UAV. Other questions come up from the current regulations (ICAO and Member States laws) in terms of aircraft identification and registration (registration marks) like for example if the control station controls more than aircraft, should it be part of two different aircrafts with different registration marks? And in terms of ownership? Moreover another difference with respect to the case of one control station controlling more that one UAV, is that for the ATC standpoint the conventional relationship individual aircraft 1 - registration marks 1 – pilot 1 is not anymore applicable because pilot 1 would the reference for more than one aircraft, does this difference impact the transparency for ATC, is it sure that for ATC standpoint procedures and communications would be unaffected?	
Paragraph **paragraph IV c v of the explanatory note and paragraph d of the Policy** **Cmt.** *Boeing Research & Technology* The suggested option is to have a certificate for the vehicle, another certificate for the control station and a set of certificates of interoperability between a vehicle and a control station (this last ones can be annexed to the appropriate vehicle and control station certificates).	Not accepted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.
Justification We can think about future standards for command and control interfaces, so an independent certificate for each component plus an interoperability certificate seems an appropriate solution. Launchers, Recovery, data link equipment are too not-attached elements which need to be certified. Launchers, for example, are clear examples of elements expected to be interchangeable between several types of UAVs.	

Comment	Response

Paragraph **paragraph IV d of the explanatory note**

Cmt. ***Boeing Research & Technology***

Next steps proposed: 1 - To initiate and promote activities "to develop a comprehensive regulatory framework for UAVs" (option 3) 2 - Open the MDM.030 content to industry and other parties allowing to participate in the definition. 3 - Create a body with all organizations involved in the regulation in order to centralize the development process.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

All actions needed to achieve " a comprehensive regulatory framework for UAVs" (option 3) should be started as soon as possible.

Comment	Response
Paragraph **Paragraph IV.4.d. "Perspective"** **Cmt.** ***NLR*** Reply to your request for comments on the Policy and specific issues in § IV.4.a of the Explanatory Note. **Justification** We support the proposal to put in place a co-ordinating body to achieve in a Europe a comprehensive set of UAV regulations allowing civil UAV operations in non-segregated airspace; to us it is obvious that EASA would then be the co-ordinator. It is very likely however, that also military UAVs will play an important role in the European airspace. For these, NATO should be the co-ordinator. In our opinion, in order to achieve the desired comprehensive set of UAV regulations allowing UAV operations in non-segregated airspace, both co-ordinators (EASA and NATO) should tune their policies. Note: neither of these covers other state UAVs, such as police / fire brigade etc. Because of their limited role in the airspace and the national responsibility for these we do not propose to represent these UAVs in the co-coordinating body.	Noted The Agency agrees that option 3 is the long term solution and propose the following: Create a group to identify building blocks and road map for a comprehensive framework for UAV regulation: The group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop regulatory impact assessment (in particular safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach) The Agency also agrees that close cooperation should be maintained with military.
Paragraph **Paragraph V.2.a** **Cmt.** ***DGAC, France*** There is an additional option, which apparently has not been examined by the Agency, which is to define a policy for issuing flight permits which will allow experience to be gained by all on the airworthiness matters and on the possible industrial applications until we are able top have a global approach of the question. **Justification** UAV overall usage issue presented in option 1, i.e. "Do nothing and let continue UAV to fly in a segregated airspace" is not really solved in option 2 especially when it does not address the sense and avoid question.. Until we are able to develop in parallel and in a coordinated way a policy to deal with all aspects of an UAV operation, and EASA is only able to take care of the airworthiness aspect, the best solution is to define a policy on airworthiness conditions to issue a flight permit to UAV while NAA would define rules to operate, fly in non-segregated airspace, maintain the UAV…	Noted The option of permit to fly is not fundamentally different from the one proposed by the policy. The recently adopted amendment to Part-21(Regulation EC 375/2007) on permit to fly requires that the issue of a permit to fly is dependant on the approval of flight conditions. This approval must be made by the Agency or an appropriately approved design organisation. The basis for approving the flight conditions would have to be defined and the policy attached in the A-NPA would be useful in such case. However the Agency considers that the issue of certificates of airworthiness would be more appropriate as there is a significant amount of knowledge on UAV. The option of permit to fly will be added into the regulatory impact assessment.

Comment	Response
Paragraph paragraph V.4.a.ii **Cmt.** *Boeing Research & Technology* The use of a different CS for similar mass shouldn't be considered as an un-equal treatment. The manned aircraft for sure won't have to comply with the sense & avoid requirements of the UAV, and this will not be seen as an un-equal treatment. **Justification** The absence of humans on board of the UAV has very important consequences and it makes sense to be consequent in regulations with this big difference between manned aircrafts and UAV's.	Not accepted. Although it is agreed that the absence of humans on board is an important difference with manned aircraft, it would be difficult to explain, from the perspective from third parties on the ground, that a manned aircraft and an un-manned aircraft of identical weight are certified to different criteria. For example, one may consider that from the perspective of third parties on the ground, the risk of rupture in flight or collision with obstacle, are important parameters because the former case is related to te risk of aircraft debris falling on the ground and the latter case is related to the risk of collision with buildings surrounding an airport. On these two points there are differences between CS-23 and CS-25: Relative to collision with obstacles, the former specifies only a gradient of 2% climb with one engine inoperative and landing gear retracted (commuter category) and the latter specifies a climb gradient in the same conditons of 2.4 %. Relative to rupture in flight, the former specifies a gust intensity of 66 Ft/s at VB and the latter a gust intensity of 90Ft/s.
Paragraph paragraph V.4.a.ii of Explanatory note Figure on Attachment 4 of the Explanatory note **Cmt.** *Boeing Research & Technology* In paragraph V.4.a.ii of Explanatory note it's said the MTOM for CS-23 could be increased to 35000 Kg. In figure on Attachment 4 of the Explanatory note it represents CS-UAV 23 limit of MTOM on 25000 Kg. **Justification**	Accepted Editorial mistake that will be corrected.
Paragraph paragraph V.5.b paragraph V.4.b **Cmt.** *Boeing Research & Technology* The Explanatory Notice insists in showing as only beneficiaries of the UAV development the manufacturers and designers. It's recommended to recognize some benefits will affect to other members of the community. In fact, there is a general benefit for all as this development is only another part of the general progress of aviation history. **Justification** UAV's are always associated to the Dirty, Dull & Dangerous missions. There is a general benefit on relieving humans from this tasks and is easy to think in new missions, not possible today without UAV's, which can deliver significant benefits to society. Even being the subject of the policy mainly airworthiness, some comments on this general benefits will be welcome.	Accepted The development of UAV will beneficiate to Aviation in general: for example the work conducted in relation with sense and avoid may be useable also n te framework of manned aviation. The regulatory Impact Assessment will be improved.

Comment	Response
Paragraph **Paragraph V-5** **Final assessment and recommendation of a preferred option:** **Cmt.** *UAV Systems Association* UAVS, representing the consensus position of the UK UAV industry, is fully supportive of the preferred option (Option 2) selected by EASA. It remains within the current remit of the organisation and is achievable in the short term. However UAVS would wish EASA to highlight the need for the necessary pan aviation framework, organizational structures and co-ordination identified as Option 3 to the European Commission for further action and implementation. UAVS does not see the need to expand the EASA remit at the expense of other agencies being properly engaged. **Justification** EASA has been established with a clear role and sphere of responsibility for Aviation Safety within an established worldwide aviation safety management and operational framework. UAV systems will be joining this established manned framework and these other parts of the framework will need to adapt accordingly to incorporate UAV operations on an equitable basis. EASA can support the development of the UAV industry and its operations by highlighting areas that need change to other organisations as appropriate.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Comment	Response
Paragraph **Policy b)**	

Comment	Response
Cmt. ***ECA*** ECA does not follow the rationale of the policy to restrict the Airworthiness Safety Objectives to people and property on the ground. As outlined above, UAV's are aircraft as any other, only under autonomous or remote control. The final aim would be to accommodate these aircraft into non-segregated airspace. Meeting other vehicles in the air with a midair-collision severity 1-condition has to be taken into account in the certification of UAV's.	Partially agreed. Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes

Comment	Response
	that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)

Justification

Paragraph **Policy d)**

Cmt. ***ECA***

As outlined above, ECA advocates the use of Alternative II as a method to assess UAV safety objectives, as Alternative I completely leaves out the possibility of midair-collisions and their contributing factors. With regard to the certification of Ground stations, rulemaking should allow the certification of ground control stations as generic equipment, as they may be used to control more than one UAV/more than one type of UAV, or more ground control stations may be used to control one UAV. The control-station presents the essential part of the UAV-pilots 'situational awareness', therefore criteria similar to the ones used for cockpits of manned aeroplanes should be used. In addition to that features to replace the senses of the pilot in the cockpit (noise/sounds, vibrations, temperatures, accelerations and artificial view) have to be incorporated, and therefore certified. It has to be emphasized, that the combination of the ground control station with the UAV has to be certified.	Noted Comment not understood as alternative II does not address the risk of mid-air collision. Considering such substitute clues will be added into the special condition for the human machine interface. The policy adress the UAV as a system incorporating in particular the control station.

Justification

Comment	Response
Paragraph **Questions raised by the A-NPA in paragraph 4 of the Explanatory Note.**	

Comment	Response
Cmt. ***CAA, CZ***	
Dear Sir/Madam, First of all, we would like to express our support to the joint effort of the EU Member States to develop a comprehensive set of UAV regulations. Notwithstanding the fact that experience of our authority (CAA CZ) with the operation of UAVs is very limited, the CAA CZ has made an assessment of the A-NPA in question and would like to contribute by providing our opinions to several issues which the A-NPA has raised. Method to select the relevant certification code applicable The method based on kinetic energy considerations allows from our point of view clear, unambiguous and transparent determination of the safety levels and applicable certification specifications and is in compliance with the basic principle of equivalence of regulatory airworthiness standards applicable to both manned and unmanned aircraft. We are of an opinion that the method based on safety objectives, particularly the proposed redefinition of the mass categories for the certification specifications, is not in line with this basic principle. Issue of certificates of airworthiness in relation with the control station Provided that the decision has already been made to certify a UAV system as a whole including ground control stations and any other remote equipment, we are of an opinion that it is appropriate to issue a single certificate of airworthiness to the system. The current development in the area of UAV operation however leads us to conclusion that the control stations tend to become universal stations controlling two or more UAVs of the same or even different types, able to transfer control from one ground station to another. Under these circumstances the principle of issuing a single certificate of airworthiness may not be applicable. To utilize the new possibilities of these universal control stations it seems more appropriate to separate the certification of the flying part of the system from the certification of the ground control station and other remote equipment and the issuance of the certificate of airworthiness for the flying part from issuance of a special approval for the control station (e.g. operational authorisation/approval), which would be practicable only in case the UAV communication and interface standards (interface protocols) are established. This approach requires a due consideration to be given to the mutual compatibility of the system components. Noise certification requirements For the time being no need has been identified to develop noise certification requirements for jet UAVs in the Czech Republic, however, we understand and agree that the problem may arise in the near future. The development of the relevant noise certification requirements applicable in EU should be coordinated with ICAO future activities in this field and should take into account, as much as possible, existing national requirements developed by States with long lasting experience with UAV operation. Environmental and social aspects The CAA CZ does not expect a large-scale introduction of UAVs and replacement of manned aircraft in the near future. This is at present, according to our experience, prevented by higher acquisition and operational costs of UAVs in comparison with manned applications, no or limited public experience with UAV operation and mistrust of the public in unmanned operation itself. Next steps for EASA We fully agree with the proposed objective to achieve in Europe a comprehensive set of UAV regulations allowing the operation of UAVs in non-segregated airspace and we are of an opinion that EASA should represent the EU Member States co-ordinating body. We are also of an opinion that close co-operation should be established between the EU co-ordinating body and ICAO in this matter as it may be shown that an update of ICAO standards is necessary. We would therefore like to express our support to EASA in this matter. We would also like to use this opportunity to point at the fact that a large percentage of current and potential future applications may be covered by UAVs which are currently in the responsibility of national authorities, in particular by UAVs with a maximum take-off mass below 150 kg. Non-harmonized development of requirements and whole regulatory systems on national level in this area may inhibit small UAVs development, prevent the future compatibility of the systems, may restrict the utilization of the systems to national level only and may thus represent a barrier to the international utilization of small UAVs and movement of these products, not only in EU.	Noted Method to select the relevant certification code applicable In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Issue of certificates of airworthiness in relation with the control station Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework. Noise certification requirements There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution to stick with the requirements of ICAO Annex 16, Volume I having in mind that possible additional requirements for jet aircraft with

Comment	Response
	take-off distances below 610 m have to be taken into account. The exemption for take-off distances below 610 m was brought into Annex 16 in anticipation of development of dedicated standards for STOL (Short take-off and Landing) aircraft. As these never really developed, the action was abandoned. So the reason for extending the annex is because the UAV's are STOL not because they are unmanned. In addition, if it turns out that UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of "larger" UAVs are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements or operational restrictions may have to be taken into consideration (Again, not because they are unmanned, but because of their unusual operational use). Environmental and social aspects The comment will be taken into account to update the Regulatory Impact Assessment Next steps for EASA Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) UAV of less than 150kg Several commentators requested that the Agency develops guidelines for the certification of small UAV. The comment is understood however the EASA is 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 regulation based on the work done by the UK-CAA. Because it sees merit in a harmonised approach between Member States, the Agency proposes that Member States agree that EUROCAE WG-73 develops guidelines for certification of such UAV. The guidelines drafted by the joint JAA-EUROCONTROL initiative only address the case of UAV that remain in direct line of sight of their pilot (e.g. crop spraying). However today application for UAV below 150kg envisages operations that would not remain in line of sight of the pilot (e.g. coastal surveillance) and therefore the guidelines need to be updated.

Comment	Response
Justification	
Paragraph **V -2 a , A V-5**	
Cmt. ***ACG***	
Austrocontrol recognizes the decision of the agency to choose option 2 , however option 3 is our preferred way to the future.	Noted The Agency highly appreciate the support given by the Commentator. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Justification	
We should start even with a rudimentary framework of regulations, but this could lead to equal opportunities and fairness for all developers. Also a common legal basis will enhance the development and guide the NAA´s in the directions where the implementation of UAV rules for operation in non segregated airspace should lead to.	

Comment	Response
Paragraph V 4 a vi. Security **Cmt.** *UAV Systems Association* UAVS, representing the consensus position of the UK UAV industry, considers that security is a fundamental part of UAV systems safety and should be fully incorporated in the overall safety assessment of the system from the outset. It has implications for all elements of the UAV system components, the air vehicle, management stations and any subsequent infrastructures that may arise from UAV operations. This will require the development of appropriate security specifications and interface specifications. UAVS would wish EASA to highlight the need for the necessary pan aviation framework, organizational structures and co-ordination identified as Option 3 to the European Commission for further action and implementation.	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.
Justification There is no one agency or body that can specify a ‘top down’ system approach to security for UAV system operations. Security typifies another area of UAV operations that requires the wider framework identified in Option 3 but for which EASA had no overall remit.	

Comment	Response
Paragraph **V 4. v. Last sentence** ***Cmt.*** ***ECA*** As stated above, criteria for sense and avoid cannot be validly developed without the participation of the pilots, since they are 'the others' occupying a common airspace with their manned aircraft. The burden for the 'see/sense and avoid' cannot be shifted to the pilots because of possible inherent problems for a UAV to cope with this fundamental principle. Another important fact is, that while coping with the principle 'see and avoid', or for the UAV 'sense and avoid', the reaction of the UAV must be in line with what would be expected from a normal, manned aircraft. This said, it is clear, that the qualification of the UAV-pilot must be certified by a comparable rule set similar to the qualification of a 'normal' pilot.	Accepted Participation of pilots is necessary. IFALPA is represented in the EUROCAE WG-73. Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification	

Comment	Response
Paragraph V 5 (c) **Cmt.** *TRC AB, Sweden* On balance option 2 has been chosen because it provides a realistic short term objective with limited resources and effort. It provides a basis to stimulate the development of UAV even if it does not allow for UAVs to fly directly into non-segregated airspace but provides a starting basis for them to do so. However, the outcome of this option might be that the Vision of the European UAV Industry Consultation Body, namely "Operators of qualified civil, commercial and military unmanned aerial vehicle (UAV) systems can fly their UAVs routinely, safely and reliably in non-segregated European airspace" might not come true in time.	Noted The Agency highly appreciate the support given by the Commentator to the use of option2 Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Justification The term UAV is not yet introduced in the Regulation 1592/2002. The need for particular regulatory development in order to support the introduction of UAV Systems capable of flying in non-segregated airspace, should be recognized. Therefore, EASA should draft and submit an Opinion about amendment to Regulation EC) No 1592/2002 to the Commission including: The concept of the Total Aviation System (TAS) approach A global definition of "aeronautical product" The Term "System worthiness", complementary to Airworthiness A set of UAV System definitions Recognition of the UAV System integrator, being the applicant and future holder of the UAV Materiel System Certificate (MSC) A set of essential requirements for UAV System Elements other than unmanned aircraft. Tasking of EASA for the purpose of co-ordination of all UAV System related rulemaking during the transformation period (until 2008).	

Comment	Response
Paragraph V 5. a. **Cmt.** ECA As stated above, it does not make a lot of sense to go for option 1, as this could lead to an impasse. The compatibility of the aviation-system in non-segregated airspace will most probably not be achieved. Similarly, option 2 leaves out the operational compatibility; without due consideration to operational compatibility in the construction and certification of UAVs, there is a risk that the issue will not progress. Although option 3 is the most complex one, it is the only feasible option, since it covers the whole area of incorporating new vehicles into the aviation system. Choosing option 3 means that all stakeholders have to participate in the rulemaking: As the use of some of the UAVs is not geographically limited, the natural agency for deciding this rulemaking should be ICAO.	Noted The Agency agrees that option 1 (do nothing) is not really an option as the UAV are included into EASA remit. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) The above mentionred group should have appropriate contacts with other Authorities (FAA) and ICAO.
Justification	

Comment	Response
Paragraph V 5. c. **Cmt.** *ECA* ECA does not share the recommendation of the Rapporteur: The explanatory note relies heavily on the JAA/Eurocontrol UAV Task-Force-report, without incorporating all its aspects: the midair-collision between a uav and a manned aircraft is not mentioned! This should be a severity 1 condition. Operational aspects of the design have been (intentionally) omitted: UAV-handovers between control stations: who is PIC?Going for option 2, a UAV could be certifiable without considering the see-and-avoid-principle and thus not being able to fly in non-segregated airspace.	Noted The Agency recognises the limitations of option 2 (propose a policy for the certifcation of UAV systems) but considers it to be a realistic short term objective that provides a basis to stimulate the development of UAV even if it does not allow them to fly directly into non-segregated airspace. This explain that not all the elements contained into the report of the jhoint initiative of JAA and EUROCONTROL on UAV are not incorporated in the policy. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Justification	

Comment	Response
Paragraph V RIA 4. a. iii and iv **Cmt.** *CAA, Sweden* All UAV activity must be environmentally restricted (noise and emission) regardless the certification code for “normal” aircraft certification it is based upon. **Justification** The UAV industry will in the long run have benefits of a relatively restricted code towards environmentally requirements, especially since this kind of activity (in the eye of the public society) is a new kind of activity, and may be regarded with uneasiness.	Not accepted Comment not fully understood: the commentator seems to request that UAV are subject to more restrictions than manned aircraft from an environmental pers pective. The policy specify compliance with ICAO Annex 16. Manned aircraft must also comply with Annex 16. There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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. The exemption for take-off distances below 610 m was brought into Annex 16 in anticipation of development of dedicated standards for STOL (Short take-off and Landing) aircraft. As these never really developed, the action was abandoned. So the reason for extending the annex is because the UAV's are STOL not because they are unmanned. In addition, if it turns out that UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of “larger” UAVs are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements or operational restrictions may have to be taken into consideration (Again, not because they are unmanned, but because of their unusual operational use).

Comment	Response
Paragraph V. 1. a. **Cmt.** ECA If operating UAV in non-segregated airspace, a common rule-set has to be applied, certification- and operation-wise. **Justification**	Accepted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002))
Paragraph V. 3. **Cmt.** ECA The sector concerned is too limited. Not having the operation in mind and therefore incorporating expertise in the operations-field (pilots) while certificating airworthiness of UAVs potentially hinders the development of common airworthiness criteria for UAVs capable (after clearing all other prerequisites) to fly in non-segregated airspace. Even while operating in segregated airspace, if there is the possibility of ground-damage to 3rd parties, the certification has to be done anyhow according established rules for manned aircraft. After all, a UAV is an aircraft like every other. You can't differentiate between 5,7 tons UAV or 5,7 tons manned aircraft coming through your roof. **Justification**	Accepted The paragraph sector concerned of the regulatory impact assessment will be expended.

Comment	Response
Paragraph **V. 4. vi. b. "Equity and fairness ..."** **5. b. "Summary describing** ***Cmt.*** *UAV DACH* The statement "UAV development will benefit their designers and manufacturers. The other sectors of the aviation system are affected by this development without direct benefit." underestimates the commercial impact of future operation of civil UAVs.	Accepted The development of UAV will benefit to aviation in general. For example the work performed on sense and avoid may also benefit to manned aircraft. The regulatory impact assessment will be improved.
Justification The most important benefit from the development of future UAV will hopefully be on the side of the customers, and not only on the side of the manufacturers. In case of a UAV for commercial telecommunication, for example, the benefit would also be on the side of the aircraft operators (i.e. the telecommunication provider) and of course their customers (i.e. the public). UAVs could provide services that are either new or currently reserved for satellites, creating a completely new segment of commercial air traffic. This new branch will probably create additional jobs for designers, technicians, mechanics, UAV-pilots, administration, etc. in the aviation business. However, the commercial success of a customer operating such UAV-system strongly depends on the environment that he has to deal with, and which has to be established by the appropriate authorities. If this environment is missing or inadequate, there will be no commercial benefit on the customers side, and consequently UAVs will be forced into a inconsiderable niche role. Even if it is feasible to design them with a reliability which is equal to manned aircraft, or even better, they would never be fully accepted by the public, the customers, or even the authorities.	
Paragraph **V. 5. c Final Assessment and recommendation of a preferred option (Page 15)** ***Cmt.*** *CAA, UK* Whilst the chosen Option 2 does not allow UAVs to fly directly into non-segregated airspace, it does provide a starting basis for them to do so. In addition the certification process will include noise requirements for STOLPORTS, which further implies the UAVs will be taking off from aerodromes that are not necessarily segregated for UAV use. If this is the intent, then this use of non-segregated airspace, where they will mix with other aircraft, needs to be addressed. The "sense and avoid" issue will not be addressed by type-certification. This has significant implications for ATM and aerodromes.	Accepted
Justification	
Paragraph **V.1.a Issue which the A-NPA is intended to address:** ***Cmt.*** *UAV Systems Association* In considering issues to be addressed by the A-NPA and the subsequent policy, UAVS, representing the consensus position of the UK UAV industry, sees it as important that the EASA is mindful that UAVs, as can be seen in manned aviation, will comprise systems including all methods of lift generation whether Lighter than Air, Fixed and Rotary Wing or even hybrid (tilt wing). UAV regulations therefore need to be equally appropriate and adaptive to air vehicle type.	Accepted The policy is generic enough to address all kind of air vehicles. When no CS are available (e.g. airships, tilt-rotor), the certification bases used for specific airship or tilt rotor projects may be used asa starting point. The policy will be clarified in this respect.
Justification Current manned aviation regulations allow for inherent differences and operations of the various type of air vehicle. In seeking equivalence in meeting manned standards it is important that that similar variations are allowable in the regulations and that an overall fixed wing brush is not applied throughout.	

Comment	Response
Paragraph V.1.b Scale of the Issue **Cmt.** *UAV Systems Association* In considering the scale of the issue, UAVS, representing the consensus position of the UK UAV industry, sees it as important that the EASA take a perspective of where the industry is likely to be in 10 to 20 years time and set the regulations such that, based only on current thinking and experience of predominantly first and second generation military system, they do not preclude the full development of the industry's capability rather than just remove and resolve current barriers and issues.	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) The possibility to organise studies allow to take into account technological developments.
Justification Much of the current thinking on the barriers and regulations required to opening up airspace for UAV operations concentrates on the problems of existing first and second generation systems adapted for civil applications from military systems. Most of these systems are one off designs and novel configurations unable to incorporate or adapt to the consequent requirements of the proposed regulations. If one were to project 10 to 20 years on then serious civil and commercial UAV operations are likely to conducted with properly capable systems, either of specific novel design, but also with significant adaptation of existing manned aircraft (for example in freight operations). The former may well comprise sub systems, for example TCAS or other mandated ATM systems, already certified in manned aviation and equally if UAV specific systems, like Sense and Avoid, are successful they may well have migrated into manned aviation. Given this perspective it can be seen that the determination of the regulations for UAVs and those of manned aviation are in fact more inextricable linked to permit the free flow of systems and their certification between sectors.	
Paragraph V.2.a (Page 10) And same issue also in V.4.a.i and V.5.a. **Cmt.** *BMVBS, DE* We disagree that the UAVs continuing to fly in segregated airspace means that no new safety risk is introduced. Without an appropriate safety assessment it cannot be judged how often (unintended) the UAVs leave the segregated airspace. It is a fact that they do leave the segregated airspaces without intention! However, the likelihood is still to be determined and it is to be assessed, if the resulting risks are acceptable or unacceptable and requiring mitigation.	Accepted One solution would be to require the designer of the UAV to define the containment zone necessary to take into account unintended deviation from the flight path due to system failure: such zone would be used by the airspace designer to define the segregated airspace.
Justification	

Comment	Response
Paragraph **V.2.a "The options identified for EASA action" and V.5.c. "Final assessment and recommendation of a preferred option"**	
Cmt. ***NLR***	
Reply to your request for comments on the Policy and specific issues in § IV.4.a of the Explanatory Note.	Noted. The Agency highly appreciate the support given by the Commentator. Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Justification	
We agree with EASA that choosing for balance option 2 (on page 15 of the A-NPA) would be a achievable short term objective. However, based on the experiences with other aviation regulations and standards, it would be better for industry, operators and national regulators to pursue option 3. We propose to add a long-term strategy and time-frame which pursues to implement balance option 3.	

Comment	Response
Paragraph V.2.a. Option 3 **Cmt.** *BMVBS, DE* Of course is Option 3 the preferred option. But it will only lead to a success in a joint effort of all stakeholders, besides EASA is to be mention the Member States, Eurocontrol, national air traffic services, EUROCAE and potential mil. and civil user / operator. Text is to be amended in this sense. **Justification** self explaining	Noted Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002)
Paragraph V.4.a.ii. Economic **Cmt.** *BMVBS, DE* 1) This paragraph can be shortened. 2) Delete GMES or rephrase sentence. 3) on Page 12 ..'It should be noted that there will be certification costs in these two options. In particular the need to obtain a design organisation approval must be pointed out, in particular relative to small organisations.' Operation Organisation should be added. 4) The discussion about contends of a potential future CS-UAV is irrelevant in this paragraph and should be put in a different place. However it is strongly recommended to keep a CS-UAV as simple and straight forward as possible. Efforts should be undertaken to cove all UAVs of a type (e.g. fixed wing, rotary, or air ship) one can think of today in one CS regardless of its size, weight and number of engines taking into account all relevant parts of existing CS. **Justification** 1) It does not add much to the basic considerations and the purpose of this A-NPA besides the fact that it includes a lot of uncertain speculation about future use of UAVs. 2) GMES may need scientists but it is intended to be a sustained operational monitoring system. 3) Operation Organization approval will be also needed and cause initial and incremental costs.	Noted The reasons to shorten the paragraph or to delete GMES are not fully understood; it is agred that this paragraph contains a certain amount of speculation but it was based ona study doen under the USICO EU research project. Cost related to the requirements applicable to the organisation that operates the UAV have not been mentioned because the policy only address UAV system certification. The Agency does not agree that only one CS will be able to address all categories of UAV. This has not been possible for manned aircraft.

Comment	Response
Paragraph V.4.a.ii. Economic **With respect to security the ground station is a sensitive part of the system and needs special attention.** ***Cmt.*** ***BMVBS, DE*** Replace UAVs by UAV Systems.	Accepted UAV in this paragraph means UAV systems. Text will be corrected accordingly. It is agreed that the control station is part of the UAV system. Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.
Justification With respect to security the ground station is a sensitive part of the system and needs special attention.	
Paragraph V.4.a.iv – Regulatory Impact Assessment - Impacts – All identified impacts - Social ***Cmt.*** ***Boeing Research & Technology*** The public acceptance has the potential to slow down this change and to limit, in time, UAV development. But the major social problem is from the people who feel the possibility to lose their work, as pilot community. However, we could imagine that part of the global air traffic increase will be dedicated to UAVs and then with minor people displacing. With option 2, the change will be smoother than option 3, even if the ideal objective is option 3.	Noted. The comment will be considered to improve the Regulatory Impact Assessment.
Justification Innovation and technological changes have been ever met a resistance phenomenon, even if our society of 21st century is characterized by the rapid rate of change. The development of UAVs is another unavoidable change; the question is with what rate the change will be done? But in any case, the change is in motion and it seems unstoppable. Another question is how to adapt the change to the social environment. As other technological changes, the UAV development will displace some people from their land to other fields. Nevertheless, the perspective for the pilot community at short/medium term is very good: all previsions indicate the increase of the global air traffic.	

Comment	Response
Paragraph V.4.a.vi - Security **Cmt.** *DGAC, France* After the last sentence namely “However, the other security issues would need to be addressed by the appropriate authority prior to UAV operations being permitted”, the following should be added : “The results of these works carried out by each authority should be harmonized in the European member states within an appropriate aviation security forum”. **Justification** Option 2 has been chosen for realistic short term reasons, but will not allow for UAVs to fly directly into non-segregated airspace. On the other hand, option 3, the ultimate goal, will allow for it and, with this aim, will comprehensively address security issues among others. Not to harmonize the security solutions relating to UAVs between concerned states would lead to obstacles and divergences in security solutions defined by each of this states hampering further development of the European UAVs applications waiting for effective implementation of option 3 in the long term. This is why it is proposed to work on security matters harmonization in concerned countries as from option 2 beginning.	Noted. The proposed Group to develop option 3 (comprehensive regulatory framework for UAV) could be used to ensure this harmonisation.
Paragraph V.4.a.vi (Page 14) **Cmt.** *BMVBS, DE* We think the following point should be added to the list of main security issues: - Protection of frequency spectrum The structure also does not seem totally clear to us yet. E.g. where are “Data” covered? Under “Data networks” or “Software”? And where would “Cyber Space” be covered? **Justification**	Accepted. However the data to be protected against malicious action is the command and control data: this is related to the communication link. Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Comment	Response
Paragraph V4. iv. **Cmt.** ECA Public Acceptance Obviously Option 1 will not need comment as it will not affect the Social aspects Option 2 and 3 would be the only selling point to the public to have acceptance under the appearance of equivalent safety levels as required for today's aviation aircraft. There still needs explanation how an UAV will be able to have equivalent levels of safety when the last line of defense, the 'onboard pilot' will not be there to avert fatal accident/s. **Justification**	Accepted The Regulatory Impact Assessment will take this comment into account.
Paragraph V4. vi **Cmt.** ECA It should be reiterated, that it is of utmost importance, that the datalink – especially the one used to steer the UAV – is securely protected against 'hijacking' of the UAV **Justification**	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Comment	Response
B. Policy for UAV system certification	

Comment	Response
Paragraph **Attachment 1 (Renamed to: Detailed guidance relative to the UAV System "System worthiness" definition)**	

Comment	Response
Cmt. ***SAAB*** - Items deemed to be part of a “System worthiness” and “Airworthiness” approval typically include: - Safety related aspects of unmanned aircraft performance & flight characteristics. - Design and production of unmanned aircraft structure (including launch and recovery loads). - Design and production of mechanical/hydraulic/pneumatic/ electrical systems. - Design and production of unmanned aircraft propulsion systems and APUs. - Design and production of avionic systems and equipment (including software) inclusive of considerations related to Level of Autonomy in so far as ensuring they perform their intended function to the expected safety level. - Design and production of any Emergency Recovery Capability. - Design and production of any Flight Termination functionality. - Safety and Security assessment of the UAV Command & Control Element function and for the Command & Control Element function required UAV Communication Link(s) including its/their susceptibility to environmental effects (HIRF, Lightning, Interference), inclusive of means for protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System. - Safety and security aspects of design for facilitation of UAV Pilot/ Command & Control Element hand-over. - Safety and security aspects of design for facilitation of Air operator hand-over/authentication. - The design and production of any other UAV System Element (other than the unmanned aircraft), necessary to enable flight the failure of which could prejudice safe control of the unmanned aircraft. - Human Machine interface of any UAV Command & Control Element inclusive of any Control Station where relevant to the safe Command & Control of the UAV. - Design and production of any Flight Termination system - Integration of payload - The instructions for continuing System worthiness and continuing airworthiness. - The UAV System “Flight Manual”, including emergency procedures and limitations inclusive of a statement about “minimum crew” (equiv.). Items not covered under “Airworthiness” of a stand-alone certification of an unmanned aircraft: Control station security. Security of the Flight Control link from wilful interference. Segregation of Aircraft. The competence/training of UAV pilots & operating personnel. The type of operation (other than to define flight envelope limitations and other aircraft limitations). Frequency spectrum allocation. Noise & Emission certification. Launch/recovery equipment that is not safety critical and which does not form part of the type-certification basis. Operation of the payload (other than its potential to hazard the aircraft) Note: Items not covered under “airworthiness” may be subject to other forms of approval.	Noted The concept described in the justification is the one of the total system approach. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Justification

The evolution of UAV Systems will soon include unmanned aircraft with adaptive, autonomous programs for making near real time, machine-to-machine decisions and real-time decisions on how to adapt to the environment. The UAV pilot of the Air operator will monitor decisions the unmanned aircraft is making with the ability to override them if necessary. Future development of system design will probably make it possible for a single UAV pilot to oversee multiple UAVs. Distributed mission management will allow the transfer of unmanned aircraft control from one Air operator to another, either based on ground, onboard a ship or perhaps onboard a manned aircraft.
A “simple” UAV system, consisting of one or more UAV vehicles and all dedicated elements, subsystems and functions necessary to enable flight being designed by a single designer, can be approved as today with a system approval equivalent to a type certificate. Such a system must nevertheless be System worthy to enable the unmanned aircraft being airworthy during flight.
An “advanced” UAV System including generic Command & Control Elements, Communication links and networks, with their own system approvals and with separate approval holders, will be a system at a superior level in the architecture. Such a “system of systems” must also be System worthy as an entity, enabling the different system elements of the system being System worthy and the unmanned aircraft being airworthy during flight.
The applicant for a UAV System Materiel System Certificate will present the functional baseline subject for certification. That document is the input to the certification process.
The development of future UAV Systems must be supported by regulatory procedural requirements that will stimulate development of UAV Systems that meet customers' stated and implied needs and the minimum safety and security requirements set by society. The traditional application for a Type Certificate should be replaced by an application for the Materiel System Certificate for a UAV System.

Comment	Response
The Certification basis for a UAV System is established between the applicant (UAV System integrator) and the Agency. The Certification basis will be based on the existing airworthiness standards derived for manned aircraft together with special conditions (or future UAV System standards) to address any novel system or design feature of the proposed UAV System. The definition of airworthiness needs to be supported by a definition of System worthiness because the entity of a system of systems must be system worthy to enable an unmanned aircraft belonging to the system, to be airworthy. A UAV System must comply with those functional system requirements that correspond to the intended flight in non-segregated airspace and surface operation on UAV-adapted airports. Threat Analysis and the resulting Vulnerability determine the Security measures applicable to a UAV System and/or its mission. There is a similar concern with respect to the severity and probability issues concerned with flight safety and design aspects of airworthiness. Safety and Security aspects, accrediting included must be treated together during the specification phase.	

Paragraph **) "Procedure for UAV system Certification"**

Cmt. ***UAV DACH***

It is understood that the tailoring shall be done by the applicant for his specific UAV product. This means that each applicant has to tailor his own requirements, add special requirements, discuss and agree the result this with the appropriate authority. First of all this is a lot of work for applicant and agency which has to be done for each considered UAV, Second, there is a danger that different applicants will have to deal with different agencies with different results. Third, the elaboration of may suffer from communication problems due to different languages. Therefore we would appreciate a standardised framework.	Accepted The policy envisage that the tayloring is done by the applicant. This has pros and cons: it give flexibility but it also generate more work. In the short term relative to USAR, 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. This code has served as a basis for the development of a NATO standard. USAR is not the comprehensive framework for UAV regulation as envisaged by option 3. It does not address 'sense and avoid', operational regulations and flight crew licensing regulations. The Agency recognise however that USAR has been developed using a methodology closely related to the one described in the policy and accept to consider USAR version 3 as an acceptable means of compliance to the policy provided that: • Its applicability is limited to the scope of present CS-23 • The safety targets included in the safety analysis reflect the ones resulting from the application of the EASA UAV policy.

Justification

The idea to tailor existing CS for manned aircraft is in general a good approach, but only if it results in a general Certification Standard for UAVs that is applicable to all new UAV designs. However, the A-NPA suggests that each applicant should tailor a Certification Program (Certification "Standard" seems not to be an appropriate expression in this context) for his own design. This would result in many different approaches, at least no "Standard", and probably with a lot of exemptions and restricted CofAs. By the way – isn't it already possible today to apply for a restricted TC based on a tailored CS? In addition it will be a big amount of repeated work to tailor the requirements for each single application for a TC, probably resulting in a lot of CRIs. Therefore we feel that this option does not provide the necessary commercial planning reliability for the companies involved, and a lot of risks that cannot be foreseen will remain during the certification process. This lack of a common certification basis may also result in a distortion of competition.

Comment	Response
Paragraph 4 Environmental Protection **Cmt.** *ACG* Add: "If aircraft or engines are not covered in Annex 16, Volume I or II, and therefore, additional requirements are needed, these new Standards have to fulfill today's environmental needs. Stringency levels have to be in consistency with the requirements already existing!' Delete: "(subject to possible additional requirements for jet aircraft with take of distances below 610 meters)" **Justification** Stringency levels have to be based on what is technically feasible and not necessarily on the first type investigated (compare JAAlEurocontrol UAV task-force final report from 11 May 2004 Section 7.12).	Noted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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. The exemption for take-off distances below 610 m was brought into Annex 16 in anticipation of development of dedicated standards for STOL (Short take-off and Landing) aircraft. As these never really developed, the action was abandoned. So the reason for extending the annex is because the UAV's are STOL not because they are unmanned. In addition, if it turns out that UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of "larger" UAVs are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements or operational restrictions may have to be taken into consideration (Again, not because they are unmanned, but because of their unusual operational use).
Paragraph 6.3.5 AERODROMES **Cmt.** *UVS Canada* The last paragraph suggests that the regulation of aerodromes may need to be changed. Q: Will this be general changes that will affect all aerodromes, or only those that cater to UAV operations? Will this encumber ATC personnel at aerodromes that cater to UAV more than those that only encounter traditional aircraft? **Justification**	Noted This comment seems however related to the report of the joint JAA-EUROCONTROL initiative on UAV. It is not related to the policy that address only UAV certification. The point mentioned in the comment is likely to be discussed into the group that has been proposed by the Agency to develop the Option 3
Paragraph a) **Cmt.** *SAAB* The proposed policy is applicable to certification of UAV systems inclusive of one or more unmanned aircraft with an operating mass of 150 kg or more with the intended use limited to flying with no persons onboard; unless the aircraft are excluded by Article 1(2) or Article 4(2) and Annex II of EC Regulation 1592/2002. **Justification** Text is inconsistent with present wording of Annex II (g) of Regulation No 1592/2002. The EASA Basic regulation should be amended to address UAV Systems. The scope of this Policy document is limited to UAV Systems including un-inhabited unmanned aircraft only.	Not accepted The scope decribed in the pragraph reflects the remit of the Agency.

Comment	Response
Paragraph a) Scope **Cmt.** *TRC AB, Sweden* The proposed policy is applicable to certification of UAV systems inclusive of one or more unmanned aircraft with an operating mass of 150 kg or more with the intended use limited to flying with no persons onboard; unless the aircraft are excluded by Article 1(2) or Article 4(2) and Annex II of EC Regulation 1592/2002. **Justification** Text is inconsistent with present wording of Annex II (g) of Regulation No 1592/2002. The EASA Basic regulation should be amended to address UAV Systems. The scope of this Policy document is limited to UAV Systems including un-inhabited unmanned aircraft only.	Not accepted The scope decribed in the paragraph reflects the remit of the Agency.
Paragraph **All within Attachment 2, see Page 29 to 32** **Cmt.** *UAV DACH* All these items which have not been covered in the A-NPA are more or less highly technically driven but vitally belonging to a UAV System Airworthiness Standard, similarly to CS 23 & 25. **Justification** The A-NPA policy for Unmanned Aerial Vehicle (UAV) certification is – as explained – a first step towards more comprehensive UAV regulations with a specific view from “Top Down”, not providing the comprehensive and technically driven detailed certification requirements for each specific UAV. Such technical certification procedures must also be established in a separate technical and comprehensive “Bottom Up” certification-process, as given for example with the DRAFT USAR, today being derived from the CS-23 (but – as Draft – momentarily with significantly gaps, characterizing any UAV-System with airbor-ne- and ground-based items, like specific CS-items, digital data-links, ATC-Comm, etc).	Accepted The technical details are included in the manned aircraft certification specifications taylored for UAV use. The policy envisage to use such CS as a starting basis. Relative to USAR, 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. This code has served as a basis for the development of a NATO standard. USAR is not the comprehensive framework for UAV regulation as envisaged by option 3. It does not address ‘sense and avoid’, operational regulations and flight crew licensing regulations. The Agency recognise however that USAR has been developed using a methodology closely related to the one described in the policy and accept to consider USAR version 3 as an acceptable means of compliance to the policy provided that: • Its applicability is limited to the scope of present CS-23 • The safety targets included in the safety analysis reflect the ones resulting from the application of the EASA UAV policy.

Comment	Response
Paragraph **Appendix 1 to attachment 2 of the proposed policy for UAV systems certification (page 33 and following pages).**	

Comment	Response
Cmt. ***CEV*** The A-NPA, favouring hypothesis n°2, offers a choice between two methods in order to select the appropriate civil airworthiness code for each type of UAV : the "Kinetic Energy" method is based on the calculation of kinetic energy in the cases of unpremeditated descent and loss of control. A direct comparison with manned aircraft kinetic energy gives the applicable code for the involved UAVs. The second method, called "method based on safety objectives", conducts a complete calculation of the risks encountered by the population on the ground. The lethal area is calculated from the kinetic energy of the aircraft and the dimensions of the UAV. A comparison with the corresponding lethal area for known manned aircraft allows to choose the appropriate code. Both methods are based on kinetic energy principles but the first one relies on direct comparison with current regulations, that only take into consideration people on board the aircraft, whereas the second one takes into account the UAVs' specificity and makes a more complete calculation based on the risks for on ground people. Therefore the second method named "based on safety objectives" is the one that should be chosen.	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Manned aircraft certification are based on ICAO Annex 8 that requires to protect also the people on the ground. The kinetic energy method address the impact on the ground.
Justification In comparing the choice given by these two methods, it is necessary to go back to the initial purposes of an airworthiness regulation : the goal of airworthiness is to guaranty a level of safety, i.e. a number of victims per flight hours that is deemed acceptable. Today, this probability calculation, that only applies to manned aviation, only takes into account people on board the aircraft. The current probability calculation is thus essentially irrelevant for unmanned UAVs that do not have any human being on board by definition. The "Kinetic Energy" method that is based on these manned aviation principles is thus hardly justifiable for unmanned UAVs. The probability of victims per flight hours has to be recalculated from the start based on real potential victims that are, by definition, people on the ground. In this context, the "method based on safety objectives" that takes into account on ground populations is the only one that is applicable to unmanned UAVs. This method leads to choosing CS-23 as the equivalent for all currently existing UAVs' airworthiness. Although the "Kinetic Energy" method leads to applying CS-25 for the heaviest UAVs, the application of CS-23 following the second method would not in the least constitute an "un-equal treatment" compared to civil aircraft on the contrary to what is suggested in page 13 paragraph A.V.4.a.ii) : it is the mere application of the most rational method. On the contrary, it is unrealistic as well as inequitable to demand from industry over-specified safety standards that are based on hypotheses not applicable to UAVs.	

Comment	Response

Paragraph **Appendix 1 to Attachment 2 to the policy, page 402**
Table under 5.1

Cmt. ***CAA, Belgium***

Comment : those figures are not realistic - See our comment N°09 As a consequence, the figures for the crash probability in the last column are not realistic Use for D a figure (at least 12500), which would be acceptable for the greatest part of the territory.	Accepted. In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

In order to achieve free circulation of goods, European certificated UAVs must be acceptable everywhere in Europe, which means that the proposed “crash probability objective” should be very much lower.

Comment	Response

Paragraph **Appendix 1 to Attachment 2 to the policy, page 402**
Table under 6.1 UAV safety objectives versus CS23 safety objectives

Cmt. ***CAA, Belgium***

Comment	Response
Comment : those figures are not realistic - See our comments N°09 & 10 The UAV crash objectives (4th column) are first to be calculated with realistic assumption before being compared with manned aircraft (see our comment 09 &10). This would give a very different picture: For the UCAV we would have a crash probability objective (acceptable for 99% of Belgian territory) of 8,E-06/125= 6,4E-08; which is much more demanding than the commuter statistic 1,E-06 or even the CS25 3,E-07 statistic. The equivalency with CS23 for UAVs up to 25000kg is not at all demonstrated. This invalidates the graph page 42 proposing to shift upward the weight boundaries between the codes.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

In order to achieve free circulation of goods, European certificated UAVs must be acceptable everywhere in Europe, which means that the proposed crash probability objective should be very much lower.

Comment	Response
Paragraph Appendix 1 to Attachment 2 to the policy, page39 **Cmt.** *CAA, Belgium* It might be suggested to used the following figures : Standard population density: D 100 habitants per km2 Density coef for civil aircraft: Fc 2 (high % of the flight over overpopulated area as terminal zones)" Comment : those figures are not realistic and therefore unacceptable. The used population density should be such that an EASA certified UAV could be used everywhere in Europe. Otherwise it should only receive a permit to fly. First of all the average population is - 339,2 h/km² in Belgium (1/1/2003) - around 400,- h/km² in Netherlands - 16.440,- h/km² in Monaco which is essentially a town.(year 2000) Secondly, the use of an average density is in itself questionable, one should use a density such that only a (very) small percentage of the territory would have a higher density and therefore a higher risk. Taking Belgium for example, Belgium is divided in 589 local entities (communes) with population densities varying between 20.200,- h/km² and 22,- h/km² (with 83% of them having a density higher than the proposed 100.) If we want the calculated risk to be valid for 99% of the Belgian territory, we find that 1% of the 589 Belgian communes have a population density above 12500h/km² or, in other words, that D=12500,- is acceptable for 99% of the communes. The figure of 99% is of course a political choice, if it is retained, this means that the proposed "crash probability objectives" have to be divided by a factor of at least 125. The calculation should be made for all the EU territories For information purpose, the density is - 18.392,- h/km² in London Kensington & Chelsea - 40.672, - h/km² in Paris XI	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

In order to achieve free circulation of goods, European certificated UAVs must be acceptable everywhere in Europe which means that the proposed "crash probability objective" should be lower than proposed by more than two orders of magnitude.

Comment	Response

Paragraph Att 2 - 3.

Cmt. *SAAB*

The following guidelines are proposed, with regard to the way certification specifications related to UAV System Safety should be handled:
The level of specification should be tailored according to and compatible with the agreed selected certification specification.
There should be a distinction between qualitative safety requirements and quantitative criteria to be set forth as acceptable means of compliance and advisory materials.
The worst UAV hazard event designated hereafter as “Catastrophic” or Severity I Event may be defined as the UAVs inability to continue controlled flight and reach any predefined landing site, i.e. an UAV uncontrolled flight followed by an uncontrolled loss of the UAV potentially leading to fatalities , severe damage or severe irreversible environmental damage in air or on the ground.
The overall (qualitative) Safety Objective for UAV System may subsequently be for example “to reduce the risk of UAV Catastrophic Event (as above defined) to a level comparable to the risk existing with manned aircraft of equivalent category.”
Quantitative safety objective for the individual UAV “Catastrophic” or “Severity I” conditions and/or for the sum of all failure conditions leading to a UAV Severity I Event should be set, per UAV category, based upon a rationale similar to the one used in AMC 25.1309 and FAA AC 23.1309-1C considering:
The probability for a catastrophic failure that is considered as acceptable by the airworthiness requirements applicable to manned aircraft of equivalent class or category.
The historical evidence and statistics related to manned aircraft “equivalent class or category”, including, where relevant, consideration of subsequent ground fatalities.
Severity categories lower than “I” may be defined as follows, as “parallel” the AMC.25.1309 categories of Hazardous, Major, Minor and No Safety Effect.
Severity “II” would correspond to failure conditions leading to the controlled loss of the UAV using Emergency Recovery procedures where required.
Severity “III” would correspond to failure conditions leading to significant reduction in safety margins (e.g., total loss of communication with autonomous flight and landing on a predefined emergency site)
Severity IV would correspond to failure conditions leading to slight reduction in safety margins (e.g. loss of redundancy)
Severity V would correspond to failure conditions leading to no Safety Effect.
As per advisory materials such as FAA AC 23.1309 1C or AMC.25. 1309, the quantitative probability ranges required for lower severities should be derived from the quantitative required objective for the worst severity
In addition, the following ground rules and system safety criteria is added because some of the mitigation measures for failures could be to rely on emergency sites:
Emergency landing sites (unpopulated areas) should be defined as follows:
These sites shall be unpopulated areas
Their location shall be such that:
the UAV will be able to reach them, considering e.g. UAV gliding capability and emergency electrical power capacity (e.g. in case of loss of thrust)
One of them will be selected to cope with failure conditions other than loss of thrust, e.g. total loss of Communication Link that would prevent the UAV from landing on normal site.
The method used to reach those emergency sites shall be determined and assessed, should any credit be requested in the system safety assessment.
When assessing the total probability of UAV Catastrophic Event, failure to reach those emergency sites should be taken into consideration.
The assumption made relative to the selection of the emergency sites should be made available to operators so that they can select their actual emergency sites. Appropriate limitations could be introduced in the flight manuals.

Justification

It might be bad psyhology to use the word “crash” The term “crash” is replaced by “ loss of the UAV ” wich is compatible wich expressions used in accidents accidents investigations i.g. “loss of hull”. Environmental damage on ground should be included in the definition.

Accepted

The words proposed by the commentator are more politically correct and the text will be modifed accordingly

Comment	Response
Paragraph **Attachment 1 (Renamed to: Detailed guidance relative to the UAV System "System worthiness" definition)**	

Comment	Response
Cmt. ***TRC AB, Sweden*** Items deemed to be part of a "System worthiness" approval typically include: - Safety related aspects of unmanned aircraft performance & flight characteristics. - Design and production of unmanned aircraft structure (including launch and recovery loads). - Design and production of mechanical/hydraulic/pneumatic/ electrical systems. - Design and production of unmanned aircraft propulsion systems and APUs. - Design and production of avionic systems and equipment (including software) inclusive of considerations related to Level of Autonomy in so far as ensuring they perform their intended function to the expected safety level. - Design and production of any Emergency Recovery Capability. - Design and production of any Flight Termination functionality. - Safety and Security assessment of the UAV Command & Control Element function and for the Command & Control Element function required UAV Communication Link(s) including its/their susceptibility to environmental effects (HIRF, Lightning, Interference), inclusive of means for protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System. - Safety and security aspects of design for facilitation of UAV Pilot/ Command & Control Element hand-over. - Safety and security aspects of design for facilitation of Air operator hand-over/authentication. - The design and production of any other UAV System Element (other than the unmanned aircraft), necessary to enable flight the failure of which could prejudice safe control of the unmanned aircraft. - Human Machine interface of any UAV Command & Control Element inclusive of any Control Station where relevant to the safe Command & Control of the UAV. - Design and production of any Flight Termination system - Integration of payload - The instructions for continuing System worthiness and continuing airworthiness. - The UAV System "Flight Manual", including emergency procedures and limitations inclusive of a statement about "minimum crew" (equiv.). Items not covered under "Airworthiness" of a stand-alone certification of an unmanned aircraft: Control station security. Security of the Flight Control link from wilful interference. Segregation of Aircraft. The competence/training of UAV pilots & operating personnel. The type of operation (other than to define flight envelope limitations and other aircraft limitations). Frequency spectrum allocation. Noise & Emission certification. Launch/recovery equipment that is not safety critical and which does not form part of the type-certification basis. Operation of the payload (other than its potential to hazard the aircraft) Note: Items not covered under "airworthiness" may be subject to other forms of approval.	Noted The concept described in the justification is the one of the total system approach. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Justification

The evolution of UAV Systems will soon include unmanned aircraft with adaptive, autonomous programs for making near real time, machine-to-machine decisions and real-time decisions on how to adapt to the environment. The UAV pilot of the Air operator will monitor decisions the unmanned aircraft is making with the ability to override them if necessary. Future development of system design will probably make it possible for a single UAV pilot to oversee multiple UAVs. Distributed mission management will allow the transfer of unmanned aircraft control from one Air operator to another, either based on ground, onboard a ship or perhaps onboard a manned aircraft.
A "simple" UAV system, consisting of one or more UAV vehicles and all dedicated elements, subsystems and functions necessary to enable flight being designed by a single designer, can be approved as today with a system approval equivalent to a type certificate. Such a system must nevertheless be System worthy to enable the unmanned aircraft being airworthy during flight.
An "advanced" UAV System including generic Command & Control Elements, Communication links and networks, with their own system approvals and with separate approval holders, will be a system at a superior level in the architecture. Such a "system of systems" must also be System worthy as an entity, enabling the different system elements of the system being System worthy and the unmanned aircraft being airworthy during flight.
The applicant for a UAV System Materiel System Certificate will present the functional baseline subject for certification. That document is the input to the certification process.
The development of future UAV Systems must be supported by regulatory procedural requirements that will stimulate development of UAV

Comment	Response
Systems that meet customers' stated and implied needs and the minimum safety and security requirements set by society. The traditional application for a Type Certificate should be replaced by an application for the Materiel System Certificate for a UAV System. The Certification basis for a UAV System is established between the applicant (UAV System integrator) and the Agency. The Certification basis will be based on the existing airworthiness standards derived for manned aircraft together with special conditions (or future UAV System standards) to address any novel system or design feature of the proposed UAV System. The definition of airworthiness needs to be supported by a definition of System worthiness because the entity of a system of systems must be system worthy to enable an unmanned aircraft belonging to the system, to be airworthy. A UAV System must comply with those functional system requirements that correspond to the intended flight in non-segregated airspace and surface operation on UAV-adapted airports. Threat Analysis and the resulting Vulnerability determine the Security measures applicable to a UAV System and/or its mission. There is a similar concern with respect to the severity and probability issues concerned with flight safety and design aspects of airworthiness. Safety and Security aspects, accrediting included must be treated together during the specification phase.	

Paragraph **Attachment 1 of policy for UAV systems certification (Airworthiness and Environmental protection), paragraph "Items not covered under Airworthiness).**

Cmt. ***BMNF / French Min of Defence***

The item "frequency spectrum allocation" must stay in the paragraph "items not covered under 'Airworthiness'.	Accepted. The item "frequency spectrum allocation" will remain in the paragraph "items not covered under 'Airworthiness'.

Justification

It is very important that to obtain an airworthiness certificate should not be dependent on the choice of a specific kind of frequency band for the command and control (C2) link.

Paragraph **Attachment 1 to policy**

Cmt. ***Schiebel Elektronische Geraete GesmbH***

Items deemed to be part of an "Airworthiness" approval typically include: - ….. - Integration of payload A payload itself should not be a part of an airworthiness approval of an UAV-system. Covered should be the payload interface with respect to electrical, mechanical and aerodynamic aspects.	Accepted The intention is that the payload is certified on a non-interference basis only. This means that the payload when operating normally or under failure conditions does not affect other systems required by airworthiness. Failure of the payloed to erform its intended function is not pat of airworthiness. The text will be modified acordingly.

Justification

UAV operators mainly will use a "certified UAV system platform" and flying their "payload application" like cargo goods within the limitations and rules set in force by the aircraft flight manual or operator manual.

Comment	Response

Paragraph **Attachment 1 to policy – detailed guidance'Items deemed to be part of airworthiness approval' - suggest add 'Sense & Avoid system performance & characteristics'**

(Page 28)

Cmt. *CAA, UK*

'Items deemed to be part of airworthiness approval' - suggest add 'Sense & Avoid system performance & characteristics'	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Comment	Response
Paragraph **Attachment 1: Detailed Guidance relative to the UAV airworthiness definition (Page 28)** **Cmt.** *CAA, UK* Items not covered under airworthiness include segregation of aircraft (contradictory given the extensive references to UAV operations in non-segregated airspace throughout the A-NPA) and the competence/training of UAV pilots & operating personnel. For the safety reasons described above, this should be covered under another form of approval at the same time as airworthiness.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification	

Comment	Response
Paragraph **Attachment 2 paragraph 4.3** **Cmt.** ***T. Wilbond*** Level of Autonomy At paragraph 4.3 on page 31 the implied relationship between autonomy and UAV regulation is incorrect. Autonomy will be responsive to regulations not vice versa. The level of autonomy must have no impact on compliance with ATC instructions or other airspace users (the principle of transparency). **Justification** Autonomy is an evolutionary 'technology' that when applied to UAV systems should facilitate compliance with regulations for example the avoidance of noise sensitive areas. This should not be confused with the need to set safety standards for certain elements of autonomy.	Accepted The introductory sentence of the outline of the special conditon will be modified to reflect that what follows is a list of issues to be taken into account. The purpose of the special conditon is to list issues that must be considered to certify levels of autonomy.
Paragraph **Attachment 2 to the policy , Page 32** **4.4 Human machine interface** **Cmt.** ***CAA, Belgium*** comment: adequate feedback must be provided. In a manned aircraft, the pilot may sense, vibrations,[bird] impact, explosions, odors, noises, and other « seat of the pants » cues. On the other side, the pilot at the control station should not suffer of spatial disorientation due to inadequate feedback from the aircraft. **Justification** Self explanatory	Partially accepted The special conditon relative to Human Machine Interface will be modified to request to take such issues into consideration.
Paragraph **Attachment 2 to the policy, Page 31** **4.2 Communications link** **Cmt.** ***CAA, Belgium*** Contingencies for lapse times, intermittent failures, alternate modes of Communication Links and total loss of Communication Link need to be evaluated as part of the airworthiness certification. Comment: lapse time or delay in transmission is not just a « contingency » problem. An excessive delay in the control loop aircraft-pilot-aircraft would result in instability/loss of control of the behavior of the aircraft when in « manual control mode ». As such it is not purely an operational requirement but an airworthiness requirement. Delays may be induced, for example by the use of a packed switched network. We suggest that not only range but also communication loop delay should be monitored at the control station. **Justification** Self explanatory	Agreed These considerations will be added to the special condition for communication link.

Comment	Response
Paragraph **Attachment 2, section 4 ("Special Conditions and interpretative material"), subsection 4.3 ("Level of autonomy") of Policy. Third bullet that says (literal):**	
Cmt. ***Boeing Research & Technology***	
- 'Specific autonomy based on Software tools that include different types from algorithms. It is necessary to pay attention to the safe behaviour (Deterministic versus non deterministic), quality of the final solution (optimal, sub-optimal, etc), capacity to find solutions.'	Accepted The text will be changed as proposed by the commentator.
Justification	
The word: "techniques" in the original text has been changed to "Software tools" and the word "algorithm" it has been removed from the parentheses and it has been put in the main body of the phrase. Is it very possible that the autonomy level will be used only in certain aspects of the quality and behavior of the on-board software. And this behavior probably resides only in the category (Deterministic versus non deterministic, optimal, sub-optima) of the algorithms and in the quality of the software.	
Paragraph **Attachment 2, section 4 ("Special Conditions and interpretative material"), subsection 4.4 (Human Machine Interface) of Policy for UAV. (32th page).**	
Cmt. ***Boeing Research & Technology***	
Add a bullet with the text: - Possibility of including commands on the human interface by means of the use of multimodality (e.g. haptic, speech, etc).	Accepted Text will be modified accordingly.
Justification	
With the objective to reach a greater reliability in the execution of commands from an operator of UAV, we suggested to add the possibility of execution of the commands by means of multimodal interfaces.	

Comment	Response
Paragraph b) **Cmt.** *SAAB* ii) Airworthiness Safety objectives Aircraft referred to in (i) above, shall comply with the essential requirements for airworthiness laid down in Annex I of Regulation No 1592/2002 with respect to the protection of people and property on the ground. (See also discussion on 'sense and avoid'). Iii) Environmental protection objectives Unmanned aircraft with its products, parts and appliances shall comply with the environmental protection requirements contained in Annex 16 to the Chicago Convention as issued in March 2002 for Volume I and November 1999 for Volume II, except for the Appendices to Annex 16; from the viewpoint of technical feasibility, economic reasonableness and environmental benefit. iv) System worthiness Flight safety and Security objectives for UAV System Elements other than unmanned aircraft UAV System Elements other than unmanned aircraft, necessary to enable flight, shall comply with essential requirements equivalent to those for airworthiness, laid down in Annex I of Regulation No 1592/2002 and any other requirement related to protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System concerned; to be considered system worthy.	Noted The approach chosen by the policy uses manned aircraft certification specifications (CS) as a starting basis. These CS are the standard means of compliance with the essential requirements included in Annex I of Regulation 1592. The terms systemworthiness is part of the concept of Total Aviation System. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Environmental protection objectives: Agreed
Justification Unmanned aircraft is the only UAV System Element subject to the essential requirements for airworthiness laid down in Annex I to Regulation No 1592/2002. Other UAV System Elements may be considered essential from a Flight safety and security point of view. For this purpose a new term, System worthiness should be introduced. The current version of (and the proposed amendment dated 16 November 2005, to) Regulation No 1592/2002 are not taking development of future, autonomous remotely monitored and ultimately commanded UAV Systems into consideration. An opinion should be drafted by EASA, including the required definitions and a set of essential requirements for UAV System Elements other than unmanned aircraft. Such requirements should be coordinated with the corresponding requirements being developed in conjunction with the SESAR Project for the Single European Sky. Initial studies of the interfaces between UAV Systems and Aerodrome system and the Airspace system respectively, should also be tasked to: Group BR.02 (Develop essential requirements and basic principles for the interoperability and safety regulation of airports) and Group BR.03 (Develop essential requirements and basic principles for the interoperability and safety regulation of air traffic management and air navigation services). Both groups will use the Total system's approach as proposed by the Commission in its communication on the future of EASA. Ref. EASA 2006 rulemaking program (Attachment to ED Decision No 2005/04/R).	

Comment	Response
Paragraph b) Objectives:	
Cmt. ***TRC AB, Sweden***	
i) System worthiness Safety objectives The insertion of UAV Systems into the subsystems of the Total Aviation system, namely the Operations system, the Aerodrome system and the Airspace system, shall not contravene the objectives set out in Article 2 of Regulation No 1592/2002. ii) Airworthiness Safety objectives Aircraft referred to in (i) above, shall comply with the essential requirements for airworthiness laid down in Annex I of Regulation No 1592/2002 with respect to the protection of people and property on the ground. (See also discussion on 'sense and avoid'). iii) Environmental protection objectives Unmanned aircraft with its products, parts and appliances shall comply with the environmental protection requirements contained in Annex 16 to the Chicago Convention as issued in March 2002 for Volume I and November 1999 for Volume II, except for the Appendices to Annex 16; from the viewpoint of technical feasibility, economic reasonableness and environmental benefit. iv) System worthiness Flight safety and Security objectives for UAV System Elements other than unmanned aircraft UAV System Elements other than unmanned aircraft, necessary to enable flight, shall comply with essential requirements equivalent to those for airworthiness, laid down in Annex I of Regulation No 1592/2002 and any other requirement related to protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System concerned; to be considered system worthy.	Noted The approach chosen by the policy uses manned aircraft certification specifications (CS) asa starting basis. These CS are the standard means of compliance with the essential requirements included in Annex I of Regulation 1592. The terms systemworthiness is part of the concept of Total Aviation System. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Environemental protection: Agreed
Justification	
Unmanned aircraft is the only UAV System Element subject to the essential requirements for airworthiness laid down in Annex I to Regulation No 1592/2002. Other UAV System Elements may be considered essential from a Flight safety and security point of view. For this purpose a new term, System worthiness should be introduced. The current version of (and the proposed amendment dated 16 November 2005, to) Regulation No 1592/2002 are not taking development of future, autonomous remotely monitored and ultimately commanded UAV Systems into consideration. An opinion should be drafted by EASA, including the required definitions and a set of essential requirements for UAV System Elements other than unmanned aircraft. Such requirements should be coordinated with the corresponding requirements being developed in conjunction with the SESAR Project for the Single European Sky. Initial studies of the interfaces between UAV Systems and Aerodrome system and the Airspace system respectively, should also be tasked to: Group BR.02 (Develop essential requirements and basic principles for the interoperability and safety regulation of airports) and Group BR.03 (Develop essential requirements and basic principles for the interoperability and safety regulation of air traffic management and air navigation services). Both groups will use the Total system's approach as proposed by the Commission in its communication on the future of EASA. Ref. EASA 2006 rulemaking program (Attachment to ED Decision No 2005/04/R).	

Comment	Response
Paragraph **B. Policy for UAV system certification** **Attachment 2** **paragraph 3 UAV system safety objectives and criteria** **Cmt.** ***Dassault*** Dassault Aviation recommends to use for definition of catastrophic event : “Failure condition that would prevent the UAV from continued safe flight and landing, resulting in uncontrolled flight and uncontrolled crash in the open country which could lead to a risk of causing fatalities”. **Justification** Dassault Aviation recommends this definition because it is the definition used by the DGA for the UAV regulation USAR. This definition is the result of discussions between industry and authorities. It might be too severe to consider any crash outside landing site as catastrophic. In case of problem, the today technology may allow to proceed to a control crash in a specific and designed area. Such event might not have to be considered as a catastrophic event. As there is no people on board, a loss of control of a UAV in an uninhabited area might not be considered as catastrophic.	Not accepted The defintion is not fundamentally different from te one proposed by the policy (See top of page 30 of the A-NPA)

Comment	Response
Paragraph b: Airworthiness safety Objectives **Cmt.** ACG The Text should include the protection of people and properties in the air .	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

When dealing with UAV´s the most obvious safety concern is always the protection of people and properties on the ground. There are however other user in the airspace used by UAV´s which are also concerned by the operation of an air vehicle and also needs protection. In oder to formulate this as open as possible, the same wording as for the protection of people and properties on ground would be recommended.

Comment	Response
Paragraph **b; Policy for UAV system certification** **Attachment 2 Chapter 3 UAV System Safety Objectives and Criteria**	

Comment	Response
Cmt. ***EADS, France*** The Policy specifies a "Catastrophic " or Severity I event as “the UAVs inability to continue controlled flight and reach any predetermined landing site, i.e. an UAV uncontrolled flight followed by an uncontrolled crash, potentially leading to fatalities or severe damage on the ground”. A. It is proposed to replace the above-mentioned statement by the definition used in USAR Version 3.0 as “Failure conditions that would prevent the UAV from continued safe flight and landing, resulting in uncontrolled flight and uncontrolled crash in the open country, potentially leading to fatalities.” B. Based on Alternative II (see EADS MAS-F Comment Form 1), the following safety objectives will have to be defined from tailoring of manned AMC 1309 requirement : - global safety objective at UAV System level, - probability level reference system at individual failure conditions level, - risk reference system (relationship between probability and severity of failure condition effects), - software development assurance levels and applicable standards. The definition of these safety objectives shall be carefully established according to the UAV categories defined as part of the implementation of Alternative II (ideally as the consensual result of a working group involving the UAV industry representatives under EASA responsibility).	Not accepted The definition proposdby the commentator is not fundamentally different from the one already included in the policy (See top of page 30 of the A-NPA) Use of alternative II In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Risk to other airspace users: Partially agreed. Many comments regret that EASA certification does not address ‘sense and avoid’ EASA recognise ‘sense and avoid’ as a critical issue for safety and operations but considers that 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. When such specifications are available, EASA will be able to certify the

Comment	Response
	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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

A. As discussed in EADS MAS-F Comment Form 2, it is considered that safety objectives and criteria for UAV Systems shall be defined by considering the protection of the people on ground as opposed to the protection of people on board (Alternative II for selection of manned aircraft certification specification). Accordingly, an uncontrolled crash of an UAV in a predefined and unpopulated area should not be considered as "Catastrophic".

Furthermore, the inclusion of "severe damage on the ground" as part of the Policy definition for "Catastrophic" failure conditions is not understood. This should be limited to "fatalities".

It is recommended to use the definitions for Severity Categories I to V which have been significantly discussed and agreed between representatives of the European UAV industry as part of the USAR Version 3.0 document (AMC 1309, page 159).
For this purpose, the following definitions should be considered :
(a) Uncontrolled crash :
An uncontrolled crash is defined as a condition resulting from one or a combination of failure conditions that prevents the flight control system from maintaining the UAV controllable and maneuverable until the impact on the ground.
(ii) Forced landing or recovery in the open country :
A forced landing or recovery is defined as a condition resulting from one or a combination of failure conditions that prevents the UAV from landing on its planned main landing site although the flight control system is still able to maintain the UAV controllable and maneuverable.
The open country is defined as a ground area likely to present a risk of human being occupancy as opposed to a predefined and unpopulated area.

B. The risk to other airspace users shall also be addressed (an actual airborne collision between an UAV and a manned air vehicle would

Comment	Response
have to be considered as a Catastrophic Event). However, the safety assessment of the risk of airborne collision is currently outside the EASA remit and is not covered by the current scope of the proposed Policy (Option 2 of RIA, limited to airworthiness and environmental protection requirements). The risk to other airspace users should then be addressed through Sense & Avoid / Collision Avoidance requirements (as part of a future comprehensive regulatory framework – Option 3 of RIA). In conclusion, as UAVs will not be allowed to fly in non-segregated airspace under the current Policy regime, “Catastrophic” failure conditions should only address the protection of people on ground.	

Comment	Response
Paragraph **c)**	

Comment	Response
Cmt. ***SAAB*** The following definitions shall be used for interpretation of this document. Where used in this document, the words defined below will be identified by initial capital letters. All definitions applicable to manned flight are considered to be applicable except where modified here: UAV System: A UAV System comprises individual UAV System Elements consisting of the flying vehicle (UAV), and any other UAV System Elements necessary to enable flight. Note. There may be multiple UAVs, Command & Control Elements, Communication Link Elements or Launch and Recovery Elements within a UAV System. A UAV System Element, typically a Control Station, may be certified in its own right as a product. A UAV System Element may as well be a specified function that can be verified, e.g. an information or data transmission function. A UAV System element is from a maintenance point of view classified by the UAV System Integrator as “normal” or “advanced”, which is inserted in the Type Certification Data Sheet. - UAV (Unmanned Air Vehicle, Unmanned Aerial Vehicle): An aircraft which is designed to operate with no human pilot onboard. Aeronautical product means any technical system, sub-system, manned or unmanned aircraft, system element, other product, parts and appliances, software product, basic data, mission data, ground materiel or consumable and expendable product that may have an influence on the level of flight safety. Airworthiness. A product (aircraft, engine or propeller) is considered as airworthy if: (1) Its product integrity conforms to its type design and is assured for all anticipated flight conditions for the operational life of the product, (2) The airworthiness aspects of the product operation have been addressed, and (3) The organisations undertaking design, manufacture or maintenance of the product, are approved. Autonomy: The ability to execute processes or missions using on-board decision capabilities. Certification (of an aeronautical product, service, organisation or person) means the legal recognition that such aeronautical product, service; organisation or person complies with the applicable requirements. Control Station (CS): A stand-alone variant of “Command & Control Element” from which a UAV is subject to command and control for all phases of flight. There may be more than one control station as part of a UAV System. A Command & Control Element may deal with two or more UAV. Emergency Recovery Procedures: Emergency Recovery Procedures are those that are implemented through UAV pilot command or through autonomous design means in order to mitigate the effects of certain failures with the intent of minimizing the risk to third parties. This may include automatic pre-programmed course of action to reach safe landing or crash area. Emergency Recovery is not a catastrophic event. Flight Termination: Flight Termination is a system, procedure or function that aims to immediately end the flight. “Flight” is defined as also including taxiing, takeoff and recovery/landing. Flight Termination is not a catastrophic event. Materiel System Certificate (MSC) means a document issued for a UAV System, equivalent to a Type Certificate issued for Products in accordance with Part 21.21. Remotely Piloted Vehicle (RPV): An RPV is an UAV that is continuously under control of a pilot. Security means characteristic or condition that implies protection against unauthorized (accidental or intentional) access, loss or manipulation; usually in connection with intentional attempts of utilizing possible weaknesses of a UAV System. System integrity means a condition of a technical system where it's specified functional, physical and operational qualities are within established limits. System worthiness. A system is considered as system worthy if: (1) Its system integrity conforms to its system design and is assured for all anticipated conditions of the operational life of the system, (2) The safety aspects of the operational use of the system have been addressed and information for safe operation has been established, and (3) Organisations undertaking design, systems integration, production and maintenance of the system, are approved. UAV Communication Link: The means to transfer command and control information between the elements of a UAV System, or between the UAV System and any external system or location. Note: That includes transfer of command and control data between Command & Control Elements and vehicles and between the UAV System and Air Traffic Control. UAV Commander: A suitably qualified person responsible for the safe, secure and environmentally compatible operation of a UAV System during a particular flight or series of flights and who has the authority to direct a flight or multiple flights under her/his command. UAV Launch and Recovery Element: A facility or device(s) from which a UAV is controlled during launch and/or recovery. There may be more than one launch and recovery element as part of a UAV System. UAV Operator: The legal entity being certified Air operator, operating one or more unmanned aircraft within its UAV System. Note: Distributed mission management will allow the transfer of unmanned aircraft command & control from one Air operator to another within a cluster of compatible UAV Systems. UAV Pilot: The person in direct control of the UAV. Note: The pilot will monitor decisions the vehicle is making with the ability to override them if necessary. A single UAV Pilot may oversee multiple UAV if the certified UAV System design so permit. UAV System Integrator means a corporate organisation being in control of the design aspects of System worthiness, production (partially	Not accepted Some of the definitions proposed by the commentator are related to the Total Aviation System advocated by the commentator: Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. . Some of the defintions would need a change to regulation 1592 (e.g. product) Finally some of the definitions are related to security: Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link. Some of the definitions (e.g airworthiness) are already implicit into Part-21 (see GM nr 3 to 21A.165 c)

Comment	Response
or totally) and commercialisation of UAV Systems. Note: The organisation is responsible for configuration control in a life cycle perspective of the UAV System design, which has shown compliance with the applicable flight safety, security and airworthiness requirements incorporated in the certification basis.	
Justification	
The new definitions inserted are essential for the understanding of the Policy. Suggested changes in existing definitions intended to clarify the objects.	
Cmt. ***SAAB***	
The term “Unpopulated area” is used in the Policy document. If it is to be used it must be given a definition. However the suggestion is to exclude the term.	Noted The word is to be understood in its dictionary meaning
Justification	
If the term is not strictly defined there will be huge differencies in the interpretations.	
Paragraph **c) Definitions and acronyms (Page 25)**	
Cmt. ***CAA, UK***	
Emergency Recovery Procedures: The concept of having pre-designated landing sites to be used in the event of loss of datalink is a more complex issue for UAVs than for manned aircraft. The big difference is that when a manned aircraft prepares for an off-airfield landing the pilot will make an up-to-the-moment assessment of the suitability of the landing site; an autonomous UAV cannot do this. This implies that all diversion sites will need to be secure from trespass. An alternative would be to only use airfields but this could lead to problems of conflict with other local air traffic, particularly because following the loss of data link the serviceability of any sense & avoid system will be unknown.	Accepted The point will be added in paragraph 3 of the atachment 2 to the policy.
Justification	

Comment	Response
Paragraph **c) Definitions and acronyms:**	

Comment	Response
Cmt. ***TRC AB, Sweden*** The following definitions shall be used for interpretation of this document. Where used in this document, the words defined below will be identified by initial capital letters. All definitions applicable to manned flight are considered to be applicable except where modified here: UAV System: A UAV System comprises individual UAV System Elements consisting of the flying unmanned aircraft (UAV), and any other UAV System Elements necessary to enable flight. Note. There may be multiple UAVs, Command & Control Elements, Communication Link Elements or Launch and Recovery Elements within a UAV System. A UAV System Element, typically a Control Station, may be certified in its own right as a product. A UAV System Element may as well be a specified function that can be verified, e.g. an information or data transmission function. A UAV System element is from a maintenance point of view classified by the UAV System Integrator as “normal” or “advanced”, which is inserted in the Type Certification Data Sheet. UAV (Unmanned Air Vehicle, Unmanned Aerial Vehicle): An aircraft which is designed to operate with no human pilot onboard. Aeronautical product means any technical system, sub-system, manned or unmanned aircraft, system element, other product, parts and appliances, software product, basic data, mission data, ground materiel or consumable and expendable product that may have an influence on the level of flight safety. Airworthiness. A product (aircraft, engine or propeller) is considered as airworthy if: (1) Its product integrity conforms to its type design and is assured for all anticipated flight conditions for the operational life of the product, (2) The airworthiness aspects of the product operation have been addressed, and (3) The organisations undertaking design, manufacture or maintenance of the product, are approved. Autonomy: The ability to execute processes or missions using on-board decision capabilities. Certification (of an aeronautical product, service, organisation or person) means the legal recognition that such aeronautical product, service; organisation or person complies with the applicable requirements. Control Station (CS): A stand-alone variant of “Command & Control Element” from which a UAV is subject to command and control for all phases of flight. There may be more than one control station as part of a UAV System. A Command & Control Element may deal with two or more UAV. Emergency Recovery Procedures: Emergency Recovery Procedures are those that are implemented through UAV pilot command or through autonomous design means in order to mitigate the effects of certain failures with the intent of minimizing the risk to third parties. This may include automatic pre-programmed course of action to reach safe landing or crash area. Emergency Recovery is not a catastrophic event. Flight Termination: Flight Termination is a system, procedure or function that aims to immediately end the flight. “Flight” is defined as also including taxiing, takeoff and recovery/landing. Flight Termination is not a catastrophic event. Flight Safety aims at freedom from those conditions within the Total aviation system that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment. Materiel System Certificate (MSC) means a document issued for a UAV System, equivalent to a Type Certificate issued for Products in accordance with Part 21.21. Remotely Piloted Vehicle (RPV): An RPV is an UAV that is continuously under control of a pilot. Security means characteristic or condition that implies protection against unauthorized (accidental or intentional) access, loss or manipulation; usually in connection with intentional attempts of utilizing possible weaknesses of a UAV System. System integrity means a condition of a technical system where it's specified functional, physical and operational qualities are within established limits. System worthiness. A system is considered as system worthy if: (1) Its system integrity conforms to its system design and is assured for all anticipated conditions of the operational life of the system, (2) The safety aspects of the operational use of the system have been addressed and information for safe operation has been established, and (3) Organisations undertaking design, systems integration, production and maintenance of the system, are approved. The Total Aviation System consists of: o Aviation related goals and objectives; o laws and regulations and one or more rulemaking function(s); o Distribution of duties, responsibility and corresponding authority within the system; o Supervising agency/ies (Safety authority); o Providers of State functions (Either State provided functions or through suitable Agencies); o Certified Air operators of civil aircraft or State aircraft, inclusive of military aircraft; o Other certified operators or providers of aviation related services including training of people, making of aeronautical products, ground, constructions, and premises for the aviation system; o Certified personnel (issued by the State); and o Certified or approved aeronautical products.	Not accepted Some of the definitions proposed by the commentator are related to the Total Aviation System advocated by the commentator: Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Finally some of the defintions are related to security: Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link. Some of the definitions (e.g airworthiness) are already implicit into Part-21 (see GM nr 3 to 21A.165 c)

Comment	Response
Note: The Total Aviation System comprises of three subsystems: o Aircraft operations system o Aerodrome system o Airspace system UAV Communication Link: The means to transfer command and control information between the elements of a UAV System, or between the UAV System and any external system or location. Note: That includes transfer of command and control data between Command & Control Elements and vehicles and between the UAV System and Air Traffic Control. UAV Commander: A suitably qualified person responsible for the safe, secure and environmentally compatible operation of a UAV System during a particular flight or series of flights and who has the authority to direct a flight or multiple flights under her/his command. UAV Launch and Recovery Element: A facility or device(s) from which a UAV is controlled during launch and/or recovery. There may be more than one launch and recovery element as part of a UAV System. UAV Operator: The legal entity being certified Air operator, operating one or more unmanned aircraft within its UAV System. Note: Distributed mission management will allow the transfer of unmanned aircraft command & control from one Air operator to another within a cluster of compatible UAV Systems. UAV Pilot: The person in direct control of the UAV. Note: The pilot will monitor decisions the vehicle is making with the ability to override them if necessary. A single UAV Pilot may oversee multiple UAV if the certified UAV System design so permit. UAV System Integrator means a corporate organisation being in control of the design aspects of System worthiness, production (partially or totally) and commercialisation of UAV Systems. Note: The organisation is responsible for configuration control in a life cycle perspective of the UAV System design, which has shown compliance with the applicable flight safety, security and airworthiness requirements incorporated in the certification basis.	

Justification

In order to make the policy for certification of UAV Systems more adapted to the Total system's approach as proposed by the Commission in its communication on the future of EASA, a number of additional definitions and changes to the existing ones, have been proposed.

Paragraph **Chap. 4.2, p. 31**

Cmt. ***BMVBS, DE***

Add to "Uplink/downlinks are sensitive to electromagnetic interference (EMI) and shall be adequately protected from this hazard." the sentence "Uplink/downlinks shall not cause harmful electromagnetic interference to other users of the airspace."	Accepted This sentence will be added as proposed.

Justification

Two years ago, we found out that a „global hawk" which came to Germany for a demonstration, made use of a DGPS-datalink (for transmission of adjustment data to the on-board receiver) which wasn't compliant to ICAO standards.
Therefore it could have led to interference with other VORs using the same frequency range, if no action had been taken (selection of an adequate frequency, such that a sufficient frequency separation could be achieved in relation to other relevant VORs).
Such a preventative action can only be taken as an exception, because there is only a limited number of clear channels in the range of VOR-frequencies available, in order to guarantee a "guard band" above and below the UAV-used channel.

Comment	Response
Paragraph **d)**	

Comment	Response
Cmt. ***SAAB*** A basic requirement for flying without restrictions in non-segregated airspace is an unmanned aircraft (UAV) that would qualify for a Standard Certificate of Airworthiness in compliance with the intentions of the Essential requirements for airworthiness referred to in Article 5 of "the basic Regulation" (EC) No 1592/2002. The Essential requirements include three areas of concern: o Design aspects of airworthiness and Continuing airworthiness; o Airworthiness aspects of product operation; and o Organisations for design, manufacture and maintenance that have to be approved when specified conditions have been met. A UAV System is comprised of one or more aircraft (UAV) plus all dedicated elements, subsystems and functions (further referred as "UAV System Elements") necessary to enable flight. "Flight" also includes taxiing, takeoff and recovery and/or landing. A UAV System element, e.g., typically, a Control Station may be certified in its own right as a product. A UAV System element may as well be a specified function that can be verified, e.g. an information or data transmission function. Functional requirements related to the need for conflict avoidance with cooperative & non-cooperative aircraft related to a particular airspace class, is not a basic Airworthiness issue, but related to operating rules. (A cooperative system relies on transmissions from the other aircraft to develop situational awareness). Needed design changes to the UAV System for implementation of the functional requirements must be certified such that the incorporation is based upon approved design data. The Essential requirements for airworthiness referred to in Article 5 of "the basic Regulation" (EC) No 1592/2002 are indirectly applicable to UAV Systems. These must comply with the design aspects of the appropriate System worthiness requirements to get a Materiel System Certificate (MSC). This is done based upon the current configuration baseline of the approved Materiel system design, shown to comply with the applicable Certification basis. The Certification process is an essential element in the development of UAV Systems. The definition of airworthiness needs to be supported by a definition of System worthiness because the entity of a system of systems must be system worthy to enable an unmanned aircraft belonging to the system, to become airworthy. The general principle is that Part-21 is applicable to the UAV System and need not to be changed in order to issue different types of certificate (TC and MSC). The definition of the applicable requirements is done using paragraph 21A.17, in particular the provisions 21.17(a)1 ("unless otherwise agreed by the Agency") and 21.17(a)2 (special conditions). The Certification basis is established according to paragraph 21A.17. It will consist of requirements based on the reference certification specifications developed for manned aircraft (if relevant), which are selected and tailored in accordance with the method detailed in appendix 1 to attachment 2 of this policy. Where the existing requirements do not contain adequate or appropriate safety standards, Special Conditions will be added in accordance with 21A.16B. Materiel System Certificates and/or Type-certificates are issued in accordance with paragraph 21A.21 (to be modified). The UAV System integrator is the applicant for a Materiel System Certificate (MSC) for the UAV System and the organisation developing the Materiel system design. UAV System's integrity must be assured for all anticipated conditions for the operational life of the system. UAV System must be covered by the mandatory occurrence reporting system of the State. A certified design organisation at materiel system level, the UAV System integrator, shall when needed, take initiative for corrective actions and when applicable impose temporary limitations to the operation of the UAV System, and as soon as practicable notify the competent authority about these limitations. In order to obtain a MSC and/or TC, a Design Organisation Approval issued as required by 21A.14 and Sub-part J must be obtained. UAV System categories and types covered by the EASA regulations are considered to be complex systems and do not qualify for the use of alternative procedures under 21A.14 (b). The issuance of a Standard Certificate of Airworthiness for an unmanned aircraft (UAV) is made on condition that the aircraft type is covered by a Type Certificate (MTC) and the aircraft type is integrated into one or more UAV System(s) covered by (a) valid Materiel System Certificate(s) (MSC). A UAV System must comply with those functional system requirements that correspond to the intended flight in non-segregated airspace and surface operation on UAV-adapted airports. This includes adaptation to: o The need for conflict avoidance with cooperative & non-cooperative aircraft during flight within different classes of airspace; o Updated ATM-systems for increased capacity, efficiency and flexibility; o Updated communication systems; o Updated navigation systems, and o Enhanced air and ground surveillance systems and applicable airport functions. Certificate of Airworthiness are issued to the individual unmanned aircraft in accordance with Part 21 subpart H and renewed in accordance to part M subpart I.5 Noise certificates are issued to the individual unmanned aircraft in accordance with part 21 Subpart I. Issuance of a Restricted C of A will be considered for remote operations. Where application is made for a restricted certificate of	Noted The comment is broadly agreed. Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework Also present terminology (e.g. TC, TC holder) of part-21 will be kept.

Comment	Response
airworthiness under the provisions of Article 5 paragraph 3 of EASA regulation 1592/2002 and detailed in Part-21 subpart H, the Agency will set the system worthiness and airworthiness specifications commensurate with safety objectives and the level of imposed operational restrictions. Production organisation approvals are issued to the manufacturer in accordance with Part 21 Subpart G.	

Justification

Control Station (CS) means a stand alone variant of “Command & Control Element” from which a UAV is subject to command and control for all phases of flight. There may be more than one control station as part of a UAV system.
Future UAV Systems may be based upon UAV Control Station(s) that are capable of handling different types of UAVs of different classes simultaneously. Any design organisation may be able to design and apply for certification of UAV Control Stations capable of handling different types of common UAVs. Other design organisations may be able to design and apply for approval of highly autonomous UAVs capable of being controlled by different UAV Control Station(s).
Whatever the combination would be, from a regulatory point of view, someone has to be in control of the design aspects of System worthiness of the superior UAV System.
That is the UAV system integrator, who should be the applicant for Materiel system certification of the UAV System. That organisation could be the same legal person as the applicant for UAV (aircraft) Type certificate or the UAV Control station Type certificate - or a stand-alone organisation.
The “UAV system integrator” is the holder of the UAV Materiel system Certificate (MSC). That organisation provides system design data during the life of the UAV System. This information is needed to maintain the flow of required design data supporting continued System worthiness including airworthiness.
The development of future UAV Systems must be supported by regulatory procedural requirements that will stimulate development of UAV Systems that meet customers' stated and implied needs and the minimum safety and security requirements set by society. The traditional application for a Type Certificate should be replaced by an application for the Materiel System Certificate for a UAV System.
The difference is not a matter of shifting nomenclature only. It is a matter of mind setting connected to the introduction of a new kind of applicant: the UAV System Integrator. This person should present an application based upon a systems description, preliminary basic data and proposed operating characteristics and limitations. The UAV System proposed may be a new design all through or based upon a combination of new design and off-the-shelf UAV Elements previously approved upon their own merits or within other UAV System.
The Certification basis for a UAV System is established between the applicant (UAV System integrator) and the Agency. The Certification basis will be based on the existing airworthiness standards derived for manned aircraft together with special conditions (or future UAV System standards) to address any novel system or design feature of the proposed UAV System.
The general principles of Part-21 with corresponding administrative procedures are with minor changes applicable to the certification of UAV Systems.

Paragraph **d) Procedure for UAV system Certification:**

Cmt. ***Schiebel Elektronische Geraete GesmbH***

UAV categories and types covered by the EASA regulations are considered to be complex systems and do not qualify for the use of alternative procedures under 21A.14(b).” The certification base for an UAV, based on CS-VLR (developed for manned aircraft), with a MTOM of 150 kg or more (Basic Regulation 1592/2002, ANNEX II) must not necessarily be of complex design. Therefore, the possibility to make use of an alternative procedures under 21A.14(b) should not be categorically excluded.	Partially accepted The policy envisaged by the A-NPA requires systematically a DOA (design organisation approval) for the designer. Several comments have questioned this requirement. The use of CS-VLA can be accepted as a starting basis: designers of CS-VLA aircraft do not need to obtain a DOA and can demonstrate their capability to design by using alternative procedures to DOA. However even if the air vehicle is of simple design, the UAV system (air vehicle, data-link, control station) is not so simple: this would justify requiring a DOA. However the Agency is ready to accept alternative procedures based on an appropriate substantiation by the designer. The policy will be modified accordingly for UAV that would use CS-VLA or CS-VLR as a starting basis following application of alternative I.

Justification

- Basic Regulation 1592/2002, ANNEX II
- AMC VLR. 1 (Applicability and definition of “simple design”)

Comment	Response
Paragraph **d) Procedure for UAV systems Certification (Page 26)** ***Cmt.*** ***CAA, UK*** The idea that a Restricted Type Certificate and or C of A can be issued for an aircraft that will only be used in very remote areas is supported, however it is not clear what environmental standards would apply. It appears from 21A18 that there are no applicable environmental requirements for a Restricted Type Certificate, although Article 6 of EC Reg. 1592/2002 appears to say that all products parts and appliances shall comply with ICAO Annex 16. ***Justification***	Accepted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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 UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of “larger” UAVs 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.

Comment	Response
Paragraph **d) Procedure for UAV Systems Certification:**	

Comment	Response
Cmt. ***TRC AB, Sweden*** A basic requirement for flying without restrictions in non-segregated airspace is an unmanned aircraft (UAV) that would qualify for a Standard Certificate of Airworthiness in compliance with the intentions of the Essential requirements for airworthiness referred to in Article 5 of "the basic Regulation" (EC) No 1592/2002. The Essential requirements include three areas of concern: o Design aspects of airworthiness and Continuing airworthiness; o Arworthiness aspects of product operation; and o Organisations for design, manufacture and maintenance that have to be approved when specified conditions have been met. A UAV System is comprised of one or more aircraft (UAV) plus all dedicated elements, subsystems and functions (further referred as "UAV System Elements") necessary to enable flight. "Flight" also includes taxiing, takeoff and recovery and/or landing. A UAV System element, e.g., typically, a Control Station may be certified in its own right as a product. A UAV System element may as well be a specified function that can be verified, e.g. an information or data transmission function. Functional requirements related to the need for conflict avoidance with cooperative & non-cooperative aircraft related to a particular airspace class, is not a basic Airworthiness issue, but related to operating rules. (A cooperative system relies on transmissions from the other aircraft to develop situational awareness). Needed design changes to the UAV System for implementation of the functional requirements must be certified such that the incorporation is based upon approved design data. The Essential requirements for airworthiness referred to in Article 5 of "the basic Regulation" (EC) No 1592/2002 are indirectly applicable to UAV Systems. These must comply with the design aspects of the appropriate System worthiness requirements to get a Materiel System Certificate (MSC). This is done based upon the current configuration baseline of the approved Materiel system design, shown to comply with the applicable Certification basis. The Certification process is an essential element in the development of UAV Systems. The definition of airworthiness needs to be supported by a definition of System worthiness because the entity of a system of systems must be system worthy to enable an unmanned aircraft belonging to the system, to become airworthy. The general principle is that Part-21 is applicable to the UAV System and need not to be changed in order to issue different types of certificate (TC and MSC). The definition of the applicable requirements is done using paragraph 21A.17, in particular the provisions 21.17(a)1 ("unless otherwise agreed by the Agency") and 21.17(a)2 (special conditions). The Certification basis is established according to paragraph 21A.17. It will consist of requirements based on the reference certification specifications developed for manned aircraft (if relevant), which are selected and tailored in accordance with the method detailed in appendix 1 to attachment 2 of this policy. Where the existing requirements do not contain adequate or appropriate safety standards, Special Conditions will be added in accordance with 21A.16B. Materiel System Certificates and/or Type-certificates are issued in accordance with paragraph 21A.21 (to be modified). The UAV System integrator is the applicant for a Materiel System Certificate (MSC) for the UAV System and the organisation developing the Materiel system design. UAV System's integrity must be assured for all anticipated conditions for the operational life of the system. UAV System must be covered by the mandatory occurrence reporting system of the State. A certified design organisation at materiel system level, the UAV System integrator, shall when needed, take initiative for corrective actions and when applicable impose temporary limitations to the operation of the UAV System, and as soon as practicable notify the competent authority about these limitations. In order to obtain a MSC and/or TC, a Design Organisation Approval issued as required by 21A.14 and Sub-part J must be obtained. UAV System categories and types covered by the EASA regulations are considered to be complex systems and do not qualify for the use of alternative procedures under 21A.14 (b). The issuance of a Standard Certificate of Airworthiness for an unmanned aircraft (UAV) is made on condition that the aircraft type is covered by a Type Certificate (MTC) and the aircraft type is integrated into one or more UAV System(s) covered by (a) valid Materiel System Certificate(s) (MSC). A UAV System must comply with those functional system requirements that correspond to the intended flight in non-segregated airspace and surface operation on UAV-adapted airports. This includes adaptation to: o The need for conflict avoidance with cooperative & non-cooperative aircraft during flight within different classes of airspace; o Updated ATM-systems for increased capacity, efficiency and flexibility; o Updated communication systems; o Updated navigation systems, and o Enhanced air and ground surveillance systems and applicable airport functions. Certificate of Airworthiness are issued to the individual unmanned aircraft in accordance with Part 21 subpart H and renewed in accordance to part M subpart I.5 Noise certificates are issued to the individual unmanned aircraft in accordance with part 21 Subpart I. Issuance of a Restricted C of A will be considered for remote operations. Where application is made for a restricted certificate of	Noted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework. Also present terminology (e.g. TC, TC holder) of part-21 will be kept.

Comment	Response
airworthiness under the provisions of Article 5 paragraph 3 of EASA regulation 1592/2002 and detailed in Part-21 subpart H, the Agency will set the system worthiness and airworthiness specifications commensurate with safety objectives and the level of imposed operational restrictions. Production organisation approvals are issued to the manufacturer in accordance with Part 21 Subpart G.	

Justification

Control Station (CS) means a stand alone variant of “Command & Control Element” from which a UAV is subject to command and control for all phases of flight. There may be more than one control station as part of a UAV system.
Future UAV Systems may be based upon UAV Control Station(s) that are capable of handling different types of UAVs of different classes simultaneously. Any design organisation may be able to design and apply for certification of UAV Control Stations capable of handling different types of common UAVs. Other design organisations may be able to design and apply for approval of highly autonomous UAVs capable of being controlled by different UAV Control Station(s).
Whatever the combination would be, from a regulatory point of view, someone has to be in control of the design aspects of System worthiness of the superior UAV System.
That is the UAV system integrator, who should be the applicant for Materiel system certification of the UAV System. That organisation could be the same legal person as the applicant for UAV (aircraft) Type certificate or the UAV Control station Type certificate - or a stand-alone organisation.
The “UAV system integrator” is the holder of the UAV Materiel system Certificate (MSC). That organisation provides system design data during the life of the UAV System. This information is needed to maintain the flow of required design data supporting continued System worthiness including airworthiness.
The development of future UAV Systems must be supported by regulatory procedural requirements that will stimulate development of UAV Systems that meet customers' stated and implied needs and the minimum safety and security requirements set by society. The traditional application for a Type Certificate should be replaced by an application for the Materiel System Certificate for a UAV System.
The difference is not a matter of shifting nomenclature only. It is a matter of mind setting connected to the introduction of a new kind of applicant: the UAV System Integrator. This person should present an application based upon a systems description, preliminary basic data and proposed operating characteristics and limitations. The UAV System proposed may be a new design all through or based upon a combination of new design and off-the-shelf UAV Elements previously approved upon their own merits or within other UAV System.
The Certification basis for a UAV System is established between the applicant (UAV System integrator) and the Agency. The Certification basis will be based on the existing airworthiness standards derived for manned aircraft together with special conditions (or future UAV System standards) to address any novel system or design feature of the proposed UAV System.
The general principles of Part-21 with corresponding administrative procedures are with minor changes applicable to the certification of UAV Systems.

Comment	Response
Paragraph **d, B-f 2** ***Cmt.*** ***ACG*** Austrocontrol strongly recommends the use of method 1, the Impact energy method for the determination of the applicable airworthiness code. ***Justification*** The standard approach with a airworthiness rule selected on the basis of the weight is commonly used in manned aviation. This includes a safety objective determination in Paragraph 1309. As this is recommended to be included in the UAV certification anyway, the selection of a certification code according to this classification seems to be inappropriate. The impact energy method is comparable to the weight induced selection used in manned aviation and should therefore be the selection criteria for the applicable airworthiness code for UAV´s .	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph e)	
Cmt. *SAAB*	
i. UAV System Elements to be included in the Certification basis For certification, any function of the UAV System that can prejudice safe take-off, continued safe flight, safe landing, security implications or environmental compatibility of the UAV, and the aeronautical products equipment performing that function, (including aeronautical products equipment remote from the UAV unmanned aircraft being installed in other UAV System Elements), shall be considered as part of the UAV System for the purposes of the validity of the Materiel System Certificate and as such will have to comply with the applicable airworthiness, security and environmental requirements as stated in the Certification basis. This does not exclude the possibility of using communication links available on the commercial market and provided by commercial operators as long as their reliability and failure frequency comply with the stated safety requirement. Identification of UAV System Elements included as part of the UAV System shall normally be supported by a system safety assessment performed by the applicant. (See attachment 1 for further guidance) ii UAV System elements to be included in the type-certification basis for stand-alone UAV System Elements If the future UAV market calls for modularization of future UAV Systems, an applicant may apply for a type certificate for any substantial UAV System Element (inclusive of the unmanned vehicle) based upon a description of integrated functional systems, and the need for interface control drawings and interface requirement specifications in relation to other UAV System Elements involved, including the proposed system characteristics and limitations. Otherwise, the same principles at present being in use for certification of aircraft engines and propellers may be used.	Noted The policy for certification of UAV may be considered as an interpretation on how to apply Part-21 for UAV. The wording used by the commentator is related to the total aviation system concept promoted by the commentator. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Concerning the control station or other sub-elements (except for engine and propellers), they have today to be certificated as part of the UAV systems.
Justification	
Current, UAV Systems may well be certified using the current Part-21 principles looking upon the non-flying UAV System Elements as subordinated but fully integrated sub-systems. However, this approach will hamper the development of future more advanced modularized UAV Systems. Therefore the approach should be made more flexible from the beginning. Introduction of an additional certificate (the Materiel System Certificate) represents no undue administrative burden. Introduction of System worthiness makes it possible to introduce Security requirements as one part of the certification requirements without making changes to the existing view upon airworthiness. The term aeronautical product is introduced in order to distinguish between UAV System Elements having an influence upon flight safety from those that do not fall under this category (e.g logistic support equipment). All Aeronautical products to a UAV System must be established in a configurations list.	

Comment	Response

Paragraph **e) General considerations**

Cmt. ***TRC AB, Sweden***

i. UAV System Elements to be included in the Certification basis For certification, any function of the UAV System that can prejudice safe take-off, continued safe flight, safe landing, security implications or environmental compatibility of the UAV, and the aeronautical products performing that function, (including aeronautical products remote from the unmanned aircraft being installed in other UAV System Elements), shall be considered as part of the UAV System for the purposes of the validity of the Materiel System Certificate and as such will have to comply with the applicable airworthiness, security and environmental requirements as stated in the Certification basis. This does not exclude the possibility of using communication links available on the commercial market and provided by commercial operators as long as their reliability and failure frequency comply with the stated safety requirement. Identification of UAV System Elements included as part of the UAV System shall normally be supported by a system safety assessment performed by the applicant. (See attachment 1 for further guidance) ii UAV System elements to be included in the type-certification basis for stand-alone UAV System Elements If the future UAV market calls for modularization of future UAV Systems, an applicant may apply for a type certificate for any substantial UAV System Element (inclusive of the unmanned vehicle) based upon a description of integrated functional systems, and the need for interface control drawings and interface requirement specifications in relation to other UAV System Elements involved, including the proposed system characteristics and limitations. Otherwise, the same principles at present being in use for certification of aircraft engines and propellers may be used.	Noted The policy for certification of UAV may be considered as an interpretaion on how to apply Part-21 for UAV. The wording used by the commentator is related to the total aviation system concept promoted by the commentator. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation. Concerning the control station or other sub-elements (except for engine and propellers), they have today to be certificated as part of the UAV systems.

Justification

Current, UAV Systems may well be certified using the current Part-21 principles looking upon the non-flying UAV System Elements as subordinated but fully integrated sub-systems. However, this approach will hamper the development of future more advanced modularized UAV Systems. Therefore the approach should be made more flexible from the beginning. Introduction of an additional certificate (the Materiel System Certificate) represents no undue administrative burden. Introduction of System worthiness makes it possible to introduce Security requirements as one part of the certification requirements without making changes to the existing view upon airworthiness. The term aeronautical product is introduced in order to distinguish between UAV System Elements having an influence upon flight safety from those that do not fall under this category (e.g. logistic support equipment).

Comment	Response
Paragraph f) 3 b, Attachment 2 to Policy **Cmt.** ACG The "1309" Approach ...should be tailored for the unmanned matters and the probability values should be reduced (decreased) using the results of an analysis similar to the one in Appendix 1 to Attachment 2. **Justification** The safety objective approach, commonly known as 1309, is a well known tool in manned aviation. For the purpose of certification to that idea guidance material has been developed to allow standardized application of the 1309 rule. The development or adoption of such guidance material to UAV´s would be necessary to guaranty the same level of standardization as for manned aircraft. As for the Part 23 Aircraft (in AC 23.1309-1c) there should be a tailoring of the probability values according to the weight of the UAV´s. However the weight classes and the values of probability to be used will have to be determined carefully according to the risks introduced by a UAV to other airspace users and to persons and properties on the ground. Due to the fact, that no persons are on board of the aerial vehicle, the risk for a total loss of the UAV does not automatically include risks to persons. In the development of 1309, the risks to persons where however a major concern. Therefore Austrocontrol believes that the probability values as calculated in Appendix 1 to Attachment 2 should be used, while the process should be similar to the one in AC23.1309-1c.	Noted Several comments addressed the UAV system safety analysis and its detailed objectives. The guidance relative to the safety analysis contained in attachment 2 of the policy envisaged by the A-NPA is expressed in qualitative terms. Such terms are applicable for all categories of UAV. Quantitative values to be used should be those used for the 1309 analysis contained into the manned CS that has been selected as a starting basis for the certification of a given UAV. As a result, numerical values will depend of the selected CS. However the Agency accepts that the guidance provided with the policy need improvements. It will be kept as it is for the first issue of the policy but EASA plans to ask EUROCAE WG-73 to further develop the guidance based on the comments received on the A-NPA.

Comment	Response
Paragraph **f)**	

Comment	Response
Cmt. ***SAAB*** A UAV System must comply with those functional system requirements that correspond to the intended flight in non-segregated airspace and surface operation on UAV-adapted airports. UAV System's integrity must be assured for all anticipated conditions for the operational life of the system. Security issues represent a significant level of concern in connection with the possibility of unlawful interference. Safety and Security aspects, accrediting included must for this reason be treated together during the specification phase. 1. The Certification basis for the UAV Element of a UAV System will be adapted from relevant parts of the existing certification specifications developed for manned aircraft. Some parts of existing certification specifications may be relevant for other UAV System Elements remote from the unmanned aircraft. 2. The methodology for selecting the appropriate certification specification is detailed in Appendix 1 to attachment 2. 3. A typical Certification basis is likely to include: a. Existing manned aircraft certification specification duly tailored to UAV Systems, b. System Safety Objectives and Criteria, applying the "1309" approach to UAV System elements that could effect Flight safety and/or Security, including a description of the System Safety work to be performed, c. Special Conditions & interpretative materials related to UAV System specifics, such as: o Emergency Recovery Capability o Flight Termination functionality o Communication Link o Protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System o Level of Autonomy o Human Machine Interface o UAV Pilot/ Command & Control Element hand-over o Air operator hand-over/authentication o Other Special Conditions as appropriate considering the envisaged kinds of operations (e.g. IFR operations certification in case of JAR/CS-VLA code application.) Attachment 2 provides more guidance on how to establish the Certification basis	Parially accepted The comment reflects in part what has been proposed by the policy but add three elements: o Protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System o UAV Pilot/ Command & Control Element hand-over o Air operator hand-over/authentication Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link. The two other elements are related to operations and the Agency has not yet the remit to regulate aircraft operations.

Justification

The Certification process is an essential element in the development of UAV Systems. The Process owner is the Agency. The UAV system integrator is the applicant for a Materiel system Certificate for the UAV System. The applicant will present a UAV System specification made up in order to satisfy customers' stated and implied needs. This specification will identify the desired functionality of the system to be certified.
Unmanned aircraft is the only UAV System Element subject to the essential requirements for airworthiness laid down in Annex I to Regulation No 1592/2002. Other UAV System Elements may be considered essential from a Flight safety and Security point of view. For this purpose a new term, System worthiness should be introduced. The current version of (and the proposed amendment dated 16 November 2005, to) Regulation No 1592/2002 are not taking development of future, autonomous remotely monitored and ultimately commanded UAV Systems into consideration. An opinion should be drafted by EASA, including the required definitions and a set of essential requirements for UAV System Elements other than unmanned aircraft. Such requirements should be coordinated with the corresponding requirements being developed in conjunction with the SESAR Project for the Single European Sky.
Security aspects have been claimed not to be intermixed with airworthiness. Threat Analysis and the resulting Vulnerability determine the Security measures applicable to a UAV System and/or its mission. There is a similar concern with respect to the severity and probability issues concerned with flight safety and design aspects of airworthiness. Protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System is particularly critical when authority of the UAV System is handed over. The boundary between Security and Safety becomes blurred as the security measures are designed to maintain the safety of the UAV System as well. This is in particular valid for information security. Safety and Security aspects, accrediting included, must for this reason be treated together during the specification phase.
Initial studies of the interfaces between UAV Systems and Aerodrome system and the Airspace system respectively, should also be tasked to: Group BR.02 (Develop essential requirements and basic principles for the interoperability and safety regulation of airports) and Group BR.03 (Develop essential requirements and basic principles for the interoperability and safety regulation of air traffic management and air navigation services). Both groups will use the Total system's approach as proposed by the Commission in its communication on the future

Comment	Response
of EASA. Ref. EASA 2006 rulemaking program (Attachment to ED Decision No 2005/04/R).	
Cmt. ***SAAB***	
Alternative I (IMPACT ENERGY METHOD FOR ESTABLISHING THE DESIGN STANDARDS FOR UAV SYSTEMS8) is recommended.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification	
Method I is easy to understand and easy to use. The logic and discussion behind is quite clear. The method will also as far as possible apply equal safety levels on manned and unmanned aviation, which is essential when introducing unmanned aircraft in the unsegregated airspace. The society will certainly has difficult to accept a high frequency of unmanned vehicle falling down from the sky even if they do not cause fatalities, and it will be difficult to justify such accidents with the benefit of UAV operations. Method II is essentially based on an assumed population density at overflown ground. This would put a very severe operational resctriction on the UAV System. The UAV could not be flown over ground with population density higher than the assumption used in the formulas. For example this would raise great complications for ATC to performe separation between an UAVs and manned aircraft.	

Comment	Response
Paragraph **f) Type certification basis: (renamed to: Certification basis)**	

Comment	Response
Cmt. ***TRC AB, Sweden*** A UAV System must comply with those functional system requirements that correspond to the intended flight in non-segregated airspace and surface operation on UAV-adapted airports. UAV System's integrity must be assured for all anticipated conditions for the operational life of the system. Security issues represent a significant level of concern in connection with the possibility of unlawful interference. Safety and Security aspects, accrediting included must for this reason be treated together during the specification phase. 1. The Certification basis for the UAV Element of a UAV System will be adapted from relevant parts of the existing certification specifications developed for manned aircraft. Some parts of existing certification specifications may be relevant for other UAV System Elements remote from the unmanned aircraft. 2. The methodology for selecting the appropriate certification specification is detailed in Appendix 1 to attachment 2. 3. A typical Certification basis is likely to include: a. Existing manned aircraft certification specification duly tailored to UAV Systems, b. System Safety Objectives and Criteria, applying the "1309" approach to UAV System elements that could effect Flight safety and/or Security, including a description of the System Safety work to be performed, c.Special Conditions & interpretative materials related to UAV System specifics, such as: o Emergency Recovery Capability o Flight Termination functionality o Communication Link o Protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System o Level of Autonomy o Human Machine Interface o UAV Pilot/ Command & Control Element hand-over o Air operator hand-over/authentication o Other Special Conditions as appropriate considering the envisaged kinds of operations (e.g. IFR operations certification in case of JAR/CS-VLA code application.) Attachment 2 provides more guidance on how to establish the Certification basis	Partially accepted The comment reflects in part what has been proposed by the policy but add three elements: o Protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System o UAV Pilot/ Command & Control Element hand-over o Air operator hand-over/authentication The first element is related to security. Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link. The two other elements are related to operations and the Agency has not yet the remit to regulate aircraft operations.

Justification

The Certification process is an essential element in the development of UAV Systems. The Process owner is the Agency. The UAV system integrator is the applicant for a Materiel system Certificate for the UAV System. The applicant will present a UAV System specification made up in order to satisfy customers' stated and implied needs. This specification will identify the desired functionality of the system to be certified.
Unmanned aircraft is the only UAV System Element subject to the essential requirements for airworthiness laid down in Annex I to Regulation No 1592/2002. Other UAV System Elements may be considered essential from a Flight safety and Security point of view. For this purpose a new term, System worthiness should be introduced. The current version of (and the proposed amendment dated 16 November 2005, to) Regulation No 1592/2002 are not taking development of future, autonomous remotely monitored and ultimately commanded UAV Systems into consideration. An opinion should be drafted by EASA, including the required definitions and a set of essential requirements for UAV System Elements other than unmanned aircraft. Such requirements should be coordinated with the corresponding requirements being developed in conjunction with the SESAR Project for the Single European Sky.
Security aspects have been claimed not to be intermixed with airworthiness. Threat Analysis and the resulting Vulnerability determine the Security measures applicable to a UAV System and/or its mission. There is a similar concern with respect to the severity and probability issues concerned with flight safety and design aspects of airworthiness. Protection against unauthorized (accidental or intentional) access, loss or manipulation of the UAV System is particularly critical when authority of the UAV System is handed over. The boundary between Security and Safety becomes blurred as the security measures are designed to maintain the safety of the UAV System as well. This is in particular valid for information security. Safety and Security aspects, accrediting included must for this reason be treated together during the specification phase.
Initial studies of the interfaces between UAV Systems and Aerodrome system and the Airspace system respectively, should also be tasked to: Group BR.02 (Develop essential requirements and basic principles for the interoperability and safety regulation of airports) and Group

Comment	Response
BR.03 (Develop essential requirements and basic principles for the interoperability and safety regulation of air traffic management and air navigation services). Both groups will use the Total system's approach as proposed by the Commission in its communication on the future of EASA. Ref. EASA 2006 rulemaking program (Attachment to ED Decision No 2005/04/R).	

Paragraph **f) Type-certification basis (Page 27)**

Cmt. ***CAA, UK***

A qualifying caveat that should be added to this NPA is that the 1309 approach alone is not enough for adequate airworthiness of the system. There are other design requirements dealing with failure cases that assume that the probability of occurrence is 1. For example, it must be possible to maintain control of the aircraft to carry out a controlled landing following the loss of all engines, the loss of all generated power etc regardless of the probability of those failures occurring. It is in these requirements where the risk of single failures leading to catastrophic events will be addressed. It should be kept in mind that engine failure on a piston-powered single-engined aircraft is generally classified as Major, (not Hazardous or Catastrophic), as it is assumed that the aircraft will always be within gliding distance of a suitable landing ground. Similar classifications may be acceptable for equivalent UAVs provided that equivalent operational constraints are applied. In summary, if the UAV operators are willing to accept the same operational constraints as equivalent manned aircraft then they can use precisely the same 1309 probability criteria. It is not believed that more frequent failures should be allowed for UAVs because they are unoccupied. A higher frequency of crashes, no matter how rural, compared with manned aircraft is likely to arouse concern in the media and therefore represents a business risk to the UAV industry and the regulators. The bottom line is that when we have our first fatality caused by a UAV, (it will happen one day), the regulators and the industry will be in a better position to defend against criticism if we can simply state that the standards applied to UAVs are the same as for equivalent manned aircraft. Our position will be much more difficult if we have to explain why we allowed less demanding standards for UAVs.	Accepted The policy consider the 1309 analysis as coming in addition to the technical conditions included into the taylored manned certificition specification. This point will be clarified by introducing the word 'and' between the 3 elements contained in paragraph f(3) of the policy.

Justification

Comment	Response
Paragraph **g)** ***Cmt.*** ***SAAB*** Annex I (Part M) of Regulation 2042/2003 is applicable to the unmanned aircraft UAV Element of a UAV System. The following scope of Part M is applicable to maintain continuing system worthiness of a UAV System: Part M Section M.A Subpart F establishes the measures to be taken to ensure that system worthiness is maintained for normal UAV Systems, not classified as “advanced”. The following Subparts of Section A, are applicable to all UAV Systems: o Section M.A Subpart C Continuing airworthiness o Section M.A Subpart D Maintenance standards o Section M.A Subpart E Components o Section M.A Subpart H Certificate of release to service; and o Section M.A Subpart I Airworthiness Review Certificate However, when airworthiness is mentioned, the term “system worthiness”, as defined in c) Definitions and acronyms, above, shall be incorporated into the text and applied to complete UAV Systems and to other UAV System elements than aircraft (UAV) as well. The owner or the organisation legally representing the owner is responsible for the continuing airworthiness of an unmanned aircraft and the overall system worthiness of a UAV System and shall o ensure that no flight takes place unless the Certificate of System worthiness (C of S) remains valid, and evidence has been acquired that all remote UAV System element necessary to enable flight are System worthy and released to service by a certified maintenance organisation, and o it is clarified as part of the owner’s overall responsibility, which certified maintenance organisation can survey the situation and take on responsibility for the maintenance of the UAV System being performed in accordance with the approved maintenance program and being responsible for the UAV System’s integrity i.e. its System worthiness before flight, and o the unmanned aircraft continuing airworthiness and the overall system worthiness of the UAV System and the serviceability of both operational and emergency equipment are ensured by fulfillment of the Section M.A Subpart C Continuing airworthiness requirements. Maintenance of complete UAV System that includes one or more large unmanned aircraft (UAV) maintained according to Annex II (Part 145) of Regulation 2042/2003 and/or remote UAV System elements necessary to enable flight that according to approved maintenance data are classified as “advanced” and maintenance of such remote UAV System Element and components and software products thereof shall be carried out by a Annex (X) of Regulation 2042/2003 (TBD) certified maintenance organisation. ***Justification*** Airworthiness of the unmanned aircraft (UAV) is dependent of the integrity of the UAV system. Airworthiness certificates for aircraft are issued by State of Registry or, by agreement with that State, by the State of Operator. Usually, a certified maintenance organisation ensures continued airworthiness and provides Certificates of Release to Service for the aircraft. In case of an unmanned aircraft (UAV), a prerequisite would be the acquire of evidence that any remote UAV System Element necessary to enable flight are System worthy and released to service by a certified maintenance organisation. It has to be clarified which maintenance organisation can survey the situation and take on responsibility of the UAV System’s integrity i.e. its System worthiness before flight. This matter must be regulated as part of the Air operator’s overall responsibility. Compare the requirement in the Commission Regulation (EC) No 2042/2003 Part M Subpart I about Airworthiness Review Certificates for aircraft. For the UAV System application, it is more appropriate to issue such document after periodical System worthiness review of the UAV System with appurtenant unmanned aircraft. If future development leads to one individual aircraft (UAV) being admitted into several independent UAV-systems with the same interface requirement specification, then another situation will arise that has to be controlled by involved Air operators. There are Swedish military rules (published in RML-V-6B) for certification of organisations for maintenance of flight safety related ground materiel, including remote UAV System Elements, and rules governing the issue a Certificate of release to service or System worthiness approval tags (similar to EASA Form 1). These rules are based upon civil requirements for maintenance organisations according to Commission Regulation (EC) No 2042/2003 Part 145. This RML-V-6 Subpart B also prescribes rules and requirements applicable to those organisations within the military aviation system undertaking maintenance and operational safety related tasks according to ESSAR 5 on Flight safety related ground materiel being part of the mixed civil-military ATM system. Equivalent internationally recognized civil or military aeronautical rules are not available. It is recommended that EASA initiates an additional Group into the EASA 2006 Rulemaking program. This Group should be tasked with development of a new Appendix to Regulation No 2042/2003 covering certified organisations for maintenance of aeronautical products other than aircraft and aircraft components, inclusive of UAV System elements that from a maintenance point of view are classified by the UAV System Integrator as “advanced”, according to information inserted in the Type Certification Data Sheet. The Swedish RML-V-6B could be used as a model.	Noted Part-M is considered applicable to UAV and contains the points mentioned by the commentator: a large UAV that uses CS-25 as the basis for its certification will have to be maintained by a Part-145 organisation. Part-M may be directly applicable to UAV when instead of aircraft one reads UAV system. This means that all UAV components that contributes to airworthiness will have to be issued with a Form 1. The Agency will consider the need of creating a rulemaking task to include UAV in Part-M

Comment	Response

Paragraph **g) Continuing Airworthiness (renamed to: Continuing System worthiness and Airworthiness)**

Cmt. ***TRC AB, Sweden***

Annex I (Part M) of Regulation 2042/2003 is applicable to the unmanned aircraft UAV Element of a UAV System. The following scope of Part M is applicable to maintain continuing system worthiness of a UAV System: Part M Section M.A Subpart F establishes the measures to be taken to ensure that system worthiness is maintained for normal UAV Systems, not classified as “advanced”. The following Subparts of Section A are applicable to all UAV Systems: o Section M.A Subpart C Continuing airworthiness o Section M.A Subpart D Maintenance standards o Section M.A Subpart E Components o Section M.A Subpart H Certificate of release to service; and o Section M.A Subpart I Airworthiness Review Certificate However, when airworthiness is mentioned, the term “system worthiness”, as defined in c) Definitions and acronyms, above, shall be incorporated into the text and applied to complete UAV Systems and to other UAV System elements than aircraft (UAV) as well. The owner or the organisation legally representing the owner is responsible for the continuing airworthiness of an unmanned aircraft and the overall system worthiness of a UAV System and shall o ensure that no flight takes place unless the Certificate of System worthiness (C of S) remains valid, and evidence has been acquired that all remote UAV System element necessary to enable flight are System worthy and released to service by a certified maintenance organisation, and o it is clarified as part of the owner’s overall responsibility, which certified maintenance organisation can survey the situation and take on responsibility for the maintenance of the UAV System being performed in accordance with the approved maintenance program and being responsible for the UAV System’s integrity i.e. its System worthiness before flight, and o the unmanned aircraft continuing airworthiness and the overall system worthiness of the UAV System and the serviceability of both operational and emergency equipment are ensured by fulfillment of the Section M.A Subpart C Continuing airworthiness requirements. Maintenance of complete UAV System that includes one or more large unmanned aircraft (UAV) maintained according to Annex II (Part 145) of Regulation 2042/2003 and/or remote UAV System elements necessary to enable flight that according to approved maintenance data are classified as “advanced” and maintenance of such remote UAV System Element and components and software products thereof shall be carried out by a Annex (X) of Regulation 2042/2003 (TBD) certified maintenance organisation.	Noted Part-M is considered applicable to UAV and contains the points mentioned by the commentator: a large UAV that uses CS-25 as the basis for its certification will have to be maintained by a Part-145 organisation. Part-M may be directly applicable to UAV when instead of aircraft one reads UAV system. This means that all UAV components that contributes to airworthiness will have to be issued with a Form 1. The Agency will consider the need of creating a rulemaking task to include UAV in Part-M

Justification

Airworthiness of the unmanned aircraft (UAV) is dependent of the integrity of the UAV system. Airworthiness certificates for aircraft are issued by State of Registry or, by agreement with that State, by the State of Operator. Usually, a certified maintenance organisation ensures continued airworthiness and provides Certificates of Release to Service for the aircraft. In case of an unmanned aircraft (UAV), a prerequisite would be the acquire of evidence that any remote UAV System Element necessary to enable flight are System worthy and released to service by a certified maintenance organisation.
It has to be clarified which maintenance organisation can survey the situation and take on responsibility of the UAV System’s integrity i.e. its System worthiness before flight. This matter must be regulated as part of the Air operator’s overall responsibility.
Compare the requirement in the Commission Regulation (EC) No 2042/2003 Part M Subpart I about Airworthiness Review Certificates for aircraft. For the UAV System application, it is more appropriate to issue such document after periodical System worthiness review of the UAV System with appurtenant unmanned aircraft. If future development leads to one individual aircraft (UAV) being admitted into several independent UAV-systems with the same interface requirement specification, then another situation will arise that has to be controlled by involved Air operators.
There are Swedish military rules (published in RML-V-6B) for certification of organisations for maintenance of flight safety related ground materiel, including remote UAV System Elements, and rules governing the issue a Certificate of release to service or System worthiness approval tags (similar to EASA Form 1). These rules are based upon civil requirements for maintenance organisations according to Commission Regulation (EC) No 2042/2003 Part 145. This RML-V-6 Subpart B also prescribes rules and requirements applicable to those organisations within the military aviation system undertaking maintenance and operational safety related tasks according to ESSAR 5 on Flight safety related ground materiel being part of the mixed civil-military ATM system. Equivalent internationally recognized civil or military aeronautical rules are not available.
It is recommended that EASA initiates an additional Group into the EASA 2006 Rulemaking program. This Group should be tasked with development of a new Appendix to Regulation No 2042/2003 covering certified organisations for maintenance of aeronautical products other than aircraft and aircraft components, inclusive of UAV System elements that from a maintenance point of view are classified by the UAV System Integrator as “advanced”, according to information inserted in the Type Certification Data Sheet. The Swedish RML-V-6B could be used as a model.

Comment	Response
Paragraph h)	
Cmt. ***SAAB***	
Noise For propeller driven aeroplanes up to 8618 kg there are the requirements of Annex 16, Vol I, Chapter 10, which are applicable to equivalent unmanned aircraft (UAV). For heavier aeroplanes, the requirements of Chapter 3 or 4 are applicable to equivalent unmanned aircraft (UAV) (subject to possible additional requirements for jet aircraft with take of distances below 610 meters). For Helicopters the normal requirements of Chapter 8 and/or 11 are applicable to equivalent unmanned aircraft (UAV). Gaseous Emissions and fuel venting For Turbojet and turbofan engines the normal requirements of Annex 16, Volume II are applicable. Currently no requirements for engines with other propulsion principles (such as piston driven) exist.	Noted The clarification requested by the comentator will be made in the text.
Justification	
Clarification only	
Paragraph **h) Environmental protection**	
Cmt. ***TRC AB, Sweden***	
Noise For propeller driven aeroplanes up to 8618 kg there are the requirements of Annex 16, Vol I, Chapter 10, which are applicable to equivalent unmanned aircraft (UAV). For heavier aeroplanes, the requirements of Chapter 3 or 4 are applicable to equivalent unmanned aircraft (UAV) (subject to possible additional requirements for jet aircraft with take of distances below 610 meters). For Helicopters the normal requirements of Chapter 8 and/or 11 are applicable to equivalent unmanned aircraft (UAV). Gaseous Emissions and fuel venting For Turbojet and turbofan engines the normal requirements of Annex 16, Volume II are applicable. Currently no requirements for engines with other propulsion principles (such as piston driven) exist.	Noted The clarification requested by the commentator will be made in the text.
Justification	
Clarification only	
Paragraph **Item c 'Definitions and acronyms'.**	
Cmt. ***NLR***	
Communication link the definition in the A-NPA may be confused with the link for R/T communications; in line with the Eurocontrol UAV OAT Task Force we propose to use the term 'Control data link' instead. UAV Commander the definition in the A-NPA is unclear and may be confused with the 'Commander' in the CS-OPS; 'qualified' could imply that (s)he does not need to be qualified as a 'pilot' (which is not consistent with the commander in CS-OPS) but would be equivalent to the mission commander in military operations. Is this term needed anyway? Is it possible to delete it?	Accepted Control data link will be used. The definition of Commander and actually the definition of pilot are not used in the policy and may be removed. The policy uses as starting basis manned certification specifications that contains specifications for minimum crew (Paragraph 1523). For certification purposes only this concept of minimum crew is important: commander/pilot/ pilot in command are defintions that are needed for operational rules only.
Justification	

Comment	Response
Cmt. ***NLR*** Delete the definition of autonomy and replace by: "Autonomous - Actions performed by automation without operator supervision".	Accepted The definition will be modified as proposed.
Justification The definition given in the A-NPA is not very specific and leaves a grey area between automatic and autonomous. Approach 1: based on the nature (deterministic or non-deterministic) of the decision making. i.e. - automatic implies pre-programmed and repeatable (deterministic) execution of functions and processes. - autonomous implies non-deterministic decision making, leading to non-repeatable execution of functions and processes. Approach 2: based on the division of responsibility between human and machine in decision making and executing tasks - automatic: "Actions performed by automation with operator supervision" - autonomous: Actions performed by automation without operator supervision" Here, supervision also implies the possibility to override the machine. From the view of certification, the predictability of the system behavior is a key issue. On the other hand, the possibility for human override in case something goes wrong is also very relevant for certification. Assessing these definitions in view of system safety leads to the matrix of table 1. **** SEE PAPER COPY FOR: Table 1: Impact of definitions on certification process ***** When reading the A-NPA document, it is clear that autonomous / autonomy is used most of the time in accordance with Approach 2, i.e. the absence of human intervention. Therefore, it is proposed to use the definition of Approach 2.	
Paragraph **Item h. "Environmental Protection"** ***Cmt.*** ***NLR*** Reply to your request for comments on the Policy and specific issues in § IV.4.a of the Explanatory Note.	Noted The proposals from the commentator will be taken into account in the drafting of the noise requirements for jet UAV with take-off distance of less than 610m. Point nr 3 proposed by the commentator may be more an assumption to define the criteria than a criteria itself.
Justification The to develop noise certification requirements for jet UAV with shorter take-off distances shall at least take into account 1. The noise emission of the UAV 2. The climb performance of the UAV 3. Town and country planning in the vicinity of the launch site / airfield. The latter is not part of the ICAO Annex 16. Maybe EASA could propose a general statement that for the neighbouring inhabitants the perceived noise of jet UAV with shorter take-off distances should not exceed those from jet UAVs with take-off distances exceeding 610 m.	

Comment	Response
Paragraph IV. 4.c. iv and Attachment 2 **Cmt.** *CAA, Sweden* The Swedish CAA suggest the Alternative I method according to Appendix 1 (Impact energy method for establishing the design standards for UAV systems). **Justification** Alternative I ('Kinetic Energy' method) is a simple method of comparing UAV systems with existing manned aircraft. A significant feature of this method is that it relies on a comparison with existing conventional aircraft design requirements which contribute to a currently accepted level of safety. This method provides a useful tool in anticipating the general level of airworthiness requirements to be set. Alternative II ('Safety Objectives' method) is based on statistics from US Navy. One disadvantage with this method is that it is based on the fact that the safety objectives must be consistent with the safety objectives of all today flying machines, not only the objectives of transport civil aircraft but also with the objectives of military aircraft and helicopters. This indicates that the method is comparing data of separate distinction. This method also proposes to use CS as a guide to define UAV type certification basis but will redefine the mass categories for the CS. There is no justification provided for this redefinition of mass categories.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph page 16 Attachment 1 **Cmt.** LBA Add Cargo Safety to the considerations.	Noted Cargo safety and handling of dangerous goods is usually covered by operational rules. The general principles 'equivalent risk' covers the point raised byt he commentator.
Justification Cargo safety and the handling of dangerous goods need to be considered. That will be an important market segment for the future.	

Comment	Response
Paragraph **page 23 Attachment 4** ***Cmt.*** ***LBA*** Do not priories Alternative II. Priority of protection should be enhanced to people on board. ***Justification*** Protection of persons on the ground should not be the only objective safety considerations. It is of the same importance to protect persons on board of other Aircraft (flying or taxiing) from the risk of collision.	Noted Alternative II does not ensure protection of peple in other aircraft. Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
Cmt. ***LBA*** Stay with the kinetic energy approach (Alternative I). That would be the fastest and experienced way to get an UAV certified. .	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification In the past the kinetic energy approach delivered many good experiences in context with aircraft certification. We should stay with that approach in general also with the existing borderlines between the certification specifications. However we need to take into account that CS-25 was designed for multiengine aircraft. Special considerations for single engine aircraft and the communication link between the UAV and its “pilot” need to be defined	

Comment	Response
Paragraph Page 25, paragraph B.c) **Cmt.** *CEV* UAV definition is given at page 25, paragraph B.c) : "an aircraft that is designed to operate with no human pilot on board". This definition should be more specific and be writen : " A UAV is an aircraft which is designed to operate with no human pilot on board, and more generally with no human being on board.". **Justification** The definition given in the A-NPA includes two categories of UAVs : those who bring no human being on board and those who may (passengers for example). No known UAV currently belongs to the second category. Social and psychological factors from the professional aircrew community as well as from the public are such that this type of UAV does not constitute today any urgent technical or commercial pressure. Such is not the case for totally unmanned UAVs. These UAVs represent a growing activity that demands urgently the creation of regulations to reach integration in general airspace. The fully unmanned UAVs must therefore be dealt with urgently by airworthiness requirements.	Not accepted The definition proposed by the commentator would be more restrictive than the definition included into the policy. The Agency agrees however that the first civil applications of UAV will not to carry passengers on board. The policy has been drafted with that assumption in mind. Nevertheless the definition will be kept as it is to avoid to change it when pasenger carrying UAV will appear.
Paragraph Page 25, Paragraph c. Definitions and Acronyms **Cmt.** *FAA, Certification* The UAV Commander and Pilot definitions are ideally the same. While the Commander is “responsible for the safe and environmentally compatible operation of a UAV System during a particular flight” so is the Pilot. The pilot is the ultimate in command of the UAS during flight operations. This philosophy is similar to manned aircraft operations. It is recommended that that the two definitions be combined into UAV Pilot. **Justification** Creating new layer(s) of command and control for a new/novel technology that is remotely controlled may further confuse the operation and the crew involved and create new or increase existing operational risks.	Partially accepted The distinction between Commander and Pilot may be necesssary in the long term when one can imagine a Commander responsible for the operation of sefveral AV each of them being piloted by a different pilot. However the definition of Commander may be deleted at this stage as it is not used in the policy. The policy will be updated accordingly.

Comment	Response
Paragraph **Page 25, Paragraph f. 3. c. Type Certification Basis** **"Special Conditions & interpretative materials related to UAV specifics, such as:"**	

Comment	Response
Cmt. ***FAA, Certification*** As previously mentioned it is recommended that the 'sense and avoid' function be included as an airworthiness item and added as a part of the "Special Conditions & interpretative materials related to UAV specifics, such as:"	Not accepted. The category 'other special conditions' is meant as described in the Policy: it should cover cases where the Certification Specification (CS) selected as a starting basis does not cover a kind of operation. The policy give the example of CS-VLA that does not cover IFR operations. Concerning 'sense and avoid', the following can be replied: Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification A human pilot on board the aircraft no longer performs the operational function of 'sense and avoid' in the case of a UAS. This function will be either performed autonomously or semi-autonomously by on-board systems. The semi-autonomous system design may include a	

Comment	Response
human pilot in the loop who will be ground based. This significantly changes the original intent of 14 CFR Part 91.113, which was meant as an operational function performed by an onboard human pilot. Therefore, it is recommended that airworthiness standards address this issue.	

Paragraph **page 27 subpara f) 'Type-certification basis'**

Cmt. ***UAV DACH***

Level of Autonomy shall be replaced by: 'Criteria based on functions onboard / offboard'	Accepted. The defintion will be replaced by the one proposed by NLR (See their comment) and will read as follows: "Autonomous - Actions performed by automation without operator supervision".

Justification

The definition of 'Level of Autonomy' is ambiguous and may be misleading. There are different approaches/proposals for the number of levels and the determination/criteria of a certain level. A general accepted definition of the different levels of autonomy of an UAV System (in Europe as well as worldwide) may not be envisaged in the near future. So the usage of the term 'Level of Autonomy' is not beneficial for the time being and should be avoided.
It would be preferable from our point of view to use the term: 'Criteria based on functions onboard / offboard (the airborne element)'.
This definition has the advantage of a clear relation to a certain function and the execution of the function at the airborne element of the UAV System, the (remote) control station or a combination of both.

Paragraph **page 27 subpara h) 'Environmental protection'**

Cmt. ***UAV DACH***

Takeoff Distance for Jet Aircraft below 610 m : Currently the application of launching sites does not apply to German law. This item seems to be a very complex subject and should be discussed outside this document as such.	Noted There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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. The exemption for take-off distances below 610 m was brought into Annex 16 in anticipation of development of dedicated standards for STOL (Short take-off and Landing) aircraft. As these never really developed, the action was abandoned. So the reason for extending the annex is because the UAV's are STOL not because they are unmanned. In addition, if it turns out that UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of "larger" UAVs are intended to operate at low altitudes and/or stay for some time at a certain location, then more stringent source requirements or operational restrictions may have to be taken into consideration (Again, not because they are unmanned, but because of their unusual operational use).

Justification

There should be no more stringent requirements for UAV Systems as for manned airplanes. A shorter takeoff distance does not necessarily request additional requirements compared to the noise requirements for manned aircraft. This subject has to be treated with the upmost care and should be excluded from this policy paper.

Comment	Response
Paragraph **page 28 Attachment 1** ***Cmt.*** ***UAV DACH*** Comment concerning 'Items not covered under "Airworthiness" ': Accuracy of frequency or channel separation should be covered by this document. ***Justification*** Different to manned aircraft, the data link from control station to the UAV airborne element is vital for the safe and unrestricted operation of a UAV System in general airspace, especially in emergency or failure cases. Therefore it is necessary to define key requirements for a safe and effective data link as accuracy of frequency and channel separation. In our point of view the A-NPA policy paper would be the right document to address and put these requirements in place. Please consider: This recommendation is not linked with the allocation of a frequency spectrum for UAV System data link, which is national task of the respective regulatory authorities and can therefore be handled independently.	Noted This point should be covered by the paragraph xx-1301 of the Certification Specifications that reads as follows: Be of a kind and design appropriate to its intended function.

Comment	Response
Cmt. ***UAV DACH*** Comment concerning 'Items not covered under "Airworthiness"': 'Type of operation should' be defined under acronyms and definitions. ***Justification*** Missing definition may lead to misinterpretation.	Partially accepted. Type of operations means here aerial work or commercial air transportation. As such it does not belong to airworthiness: certification specifications do not assume a type of operations. However kind of operations is addressed in paragraph CS 25, VLA, VLR-1525 of the Certification Specification that reads as follows: The kinds of operation to which the aeroplane is limited are established by the category in which it is eligible for certification and by the installed equipment. The acceptable means of compliance for the flight manual for CS-25 (AMC 25.1581) provides further information for large aeroplanes. The information is provided below to help understanding what is meant by kind of operations Kinds of Operations. This subsection should contain a statement similar to the following: This aeroplane is certificated as a Large Turbine-powered Aeroplane and is eligible for the following kinds of operations when the appropriate instruments and equipment required by the airworthiness and operating requirements are installed and approved and are in operable condition. The approval status of the following should be stated: (i) Operation in atmospheric icing conditions. (ii) Extended over-water operation. (iii) Extended range operations with two-engine aeroplanes (ETOPS). (iv) Day and night operations under visual flight rules (VFR). (v) Operations under instrument flight rules (IFR). (vi) Backing the aeroplane with reverse thrust. (vii) Category I, II or III operations. CS-29 and CS-27 are however more specific and reads as follows (CS-23 has a comparable wording): The kinds of operations (such as VFR, IFR, day, night, or icing) for which the rotorcraft is approved are established by demonstrated compliance with the applicable certification requirements and by the installed equipment. The Flight test Guide for CS-23 (pages 2-FTG-6-9 and 10) introduces a concept of kind of operation equipment list (KOEL). The Agency believes that all this information alleviates the ned to create a definition in the policy.

Comment	Response
Cmt. ***UAV DACH*** Comment concerning 'Items not covered under "Airworthiness"': The A-NPA should keep the following issue included and addressed by the A-NPA: Segregation of Aircraft	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification Segregation of aircraft is dependant of the capability of the airborne platform to follow the instructions of the airspace controller and maintain the instructed flight conditions. This function is generally considered as safety critical and is therefore part of airworthiness. To be able to fulfil the segregation instructions of the airspace controller, the UAV system design is highly dependant from its sub systems functional performances of the airborne part. For segregation from other aircraft especially the capabilities and functional performance of the air data system and the flight control system are decisive. Also the functional capabilities of the 'Sense & Avoid System' are important for segregation in controlled airspace to support and enable the PoC in avoidance of mid air collision (in emergency cases).	

Comment	Response
The general segregation requirement(s) have to be defined in co-operation the airspace controlling agency(ies), however they have to be addressed in the policy of UAV system certification as an essential set of requirements for the functional capabilities of an UAV System.	

Cmt. ***UAV DACH***

Comment concerning 'Items not covered under "Airworthiness"': The A-NPA should keep the following issue included and addressed by the A-NPA: Security of the control station and of the flight control data link .	Noted. Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Justification

Security of the control station as well as security of the flight control data link is a vital issue for the airworthiness of the UAV System. The technical realisation of both might highly affect airworthiness aspects. Not addressing these issues here highly degrades the applicability of the A-NPA. Security of the Flight Control data link as a key issue for flying UAV Systems in non-segregated airspace has to be addressed by the A-NPA. The data link as an essential part has to be type certificated (pending to the functionality implemented onboard / off-board the UAV System airborne part), therefore the requirements cannot be excluded from the A-NPA. It will not help UAV System designers/ integrators to have a type certificate according to the A-NPA, if exclusion of the control station and data link security from this type certificate will not enable them to fly their systems routinely and without major restrictions in non-segregated airspace.

Paragraph **page 29 Attachment 2 Item 2.**

Cmt. ***LBA***

For tailoring of existing CS the area of operation should be taken into account.	Not accepted The policy intends to issue normally a Type Certificate using manned Certification Specifications as a starting basis, in such csae no assumption is made on the area of operation. The comment is understood as taking into account the density of population. The policy allows to issue restricted certificates of airworthiness for operations in remote areas.

Justification

The safety level should be determined in the same manner as known from traditional aircraft. The area of operation should be taken into account in addition to the kind of the mission.

Comment	Response
Paragraph **page 31 subpara 4.3) 'Level of autonomy'**	
Cmt. ***EADS***	
The following areas will also have considerable impact on the realized 'level of autonomy' and shall be consequently added to the list: - Diagnostic and Health Monitoring system - Data displayed and functions provided at the Control Station	Accepted The outline of the Special Condition will be improved accordingly.
Justification	
Legal aspects (concerning responsibility for operation/piloting of an UAV System) will require a defined level of situational awareness of the PiC / Commander of an UAV System and have considerable influence on: - the kind / quality quantity of data displayed and functions provided at the Control Station - functional capabilities of the diagnostic and health monitoring system - selected method for recovery execution in failure/ emergency case.	

Comment	Response
Paragraph para b Airworthiness Safety Objectives (Page 25 **Cmt.** CAA, UK This paragraph should include the protection of other airspace users and not, as currently expressed, just the protection of people & property on the ground. **Justification**	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response
Paragraph **Paragraph 1 of Attachment 2 to the policy**	

Comment	Response
Cmt. ***ENAC*** At the end of the paragraph to be added: "Alternative 1 is the method to be applied to determine the certification specifications from which the UAV System type certification basis shall be identified."	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification Alternative 1 "kinetic energy method" guarantees to implement the equivalence principle ensuring the equal treatment with other aircraft. We confirm all the justification principles provided by the NPA to nominate alternative 1 as the possible preferred method, and to enforce the choice we just want to provide some more considerations. The alternative on the safety objectives (alternative 2) is concentrated on the numerical feature of the safety concept, but in a complete certification specifications set, all the airworthiness requirements outlining a class of aircraft correspond to a determined global level of safety, then numerical figures are normally used only for systems installation, but other specific design requirements shall be provided for other aspects like for powerplant installation, materials, structures and so on. Then if we make the same example of par. V.4.a.ii about the possibility, with the safety objectives method, to apply the CS-23 to certify a 35000 Kg UAV System, in such a case we would apply design principles and requirements much less demanding than those that we would apply for a 35000 Kg. conventional aircraft, certified against CS-25, i.e. structures requirements or flight control, and so on. On the other side, the main objection to apply in such a case the CS-25 is that the majority of the CS-25 requirements are related to the commercial transport operations, but we think that the selection of the certification specification is only a starting point and each requirement can be conveniently justified and/or tailored to be introduced in the certification basis, then such an analysis allows to take into account the design complexity, the specificities of UAV Systems (no passengers on board, no commercial transport operations, etc…), and all the possible applicable operating restrictions (low population density areas, etc…).	

Comment	Response
Paragraph **Paragraph d) of the policy.** **Cmt.** ***ENAC*** To replace the current last paragraph with the following text: "In order to obtain a TC, a Design Organization Approval issued as required by 21A.14 and Sub-part J must be obtained unless the applicant can demonstrate that the UAV System for which they are applying qualify for the use of the alternative procedures under 21A.14(b) and the Authority involvement in the compliance determination activity can be kept in limits compatible with the Authority policy on this matter".	Partially accepted The policy envisaged by the A-NPA requires systematically a DOA (design organisation approval) for the designer. Several comments have questioned this requirement. The use of CS-VLA can be accepted as a starting basis: designers of CS-VLA aircraft do not need to obtain a DOA and can demonstrate their capability to design by using alternative procedures to DOA. However even if the air vehicle is of simple design, the UAV system (air vehicle, data-link, control station) is not so simple: this would justify requiring a DOA. However the Agency is ready to accept alternative procedures based on an appropriate substantiation by the designer. The policy will be modified accordingly for UAV that would use CS-VLA or CS-VLR as a starting basis following application of alternative I.
Justification Requesting the DOA for whatever class of UAV would represent a non equal treatment between aircraft and unmanned aircraft with low kinetic energy, i.e. those UAVs with a weight between 150 Kg and 750 Kg that, depending on their kinetic energy could be superimposed to the VLA aircraft class, and that in principle could have a conventional design as far as the aeronautical part of the design is concerned. The alternative procedures recognition does not reduce responsibilities and charges of the applicant in the compliance determination activity, but mainly influence the Authority involvement in such an activity, therefore if the Authority can support the activity it could be evaluated if the alternative procedures could be used to qualify the applicant not only taking into consideration the design characteristics as an absolute parameter but as correlated to the Authority involvement and then to the possibility for the Authority to provide the necessary resources in the compliance determination activity.	
Paragraph **paragraph h of the Policy** **Cmt.** ***Boeing Research & Technology*** Additional requirements for some UAV's could be seen against Equivalence/Fairness principles. Noise issue must be treated following a balanced approach not only imposing restrictions to the vehicle design but using other methods to obtain the final noise protection pursued.	Not accepted. Such requirements do not exist. The purpose of drafting them is to facilitate acceptance of such UAV.
Justification In Annex 16 Volume I, there are different aircraft classification from the basis of noise certification. For each classification of aircraft type, a noise evaluation measure has been standarized. Various measurement points, maximun noise levels at lateral, approach and flyover noise measurement points, along with flight test procedures, have been designated for every type of aircraft. Depending on the size of the aircraft and the propulsion system, the UAV's can follow the requirements of Chapter 10, 3 or 4. However, the operational procedures of UAV's can differ from existing aircrafts: different glideslope angle, different take off distances, etc... The measurement procedures (measurement points, flight paths and aircraft performance) contained in Annex 16 for noise certification should be adapted to take into account the operational conditions of UAV's. But final noise impact is due to vehicle design, operations, airport infrastructures... only option 3 (see V. 2.a Options in Explanatory Note) would allow to a realistic approach to solve Noise issue.	

Comment	Response
Paragraph Policy Attachment 2 para 3 **Cmt.** *Israel Aircraft Industries Ltd* - UAV System Safety Objective should be first and foremost defined as "the probability of an UAV Catastrophic Event as resulting from all system causes" (In line with Euro UAV ICB Item 1, the exact value should eventually be set and tailored as per UAV category on a consensual basis that may be the subject of a dedicated post A-NPA Working Group). - The policy should also refer to the way Software will be handled from a Safety Point of View. It is suggested to add the following statement : "The definition of Software Levels as to be defined per DO178B methodology (or any other equivalent) method should be made in a manner consistent with the severity definitions and probability requirements as tailored for UAV applications" **Justification** - Even in recent Airbus Type Certification, prime consideration of all system causes leading to a Catastrophic Event has been given, in case individual probability objectives cannot be met. - Quantitative System Safety Objective (i.e. the probability of a "catastrophic Event" resulting from all system causes) that will be found to provide an equivalent safety level between UAV Systems and manned aircraft of similar category are likely not to be the same order of magnitude and could be established in the region of 5.10-5/h (like in recent French DGA USAR). - DO178B Levels for manned aircraft are currently defined based upon "1309" manned severity definition and probability levels. Thus, once tailoring of severity definition (as per A-NPA Policy d, Attachment 2, 3) and probability levels is established for UAVs, the DO178B Levels (or any equivalent method) should be established in a consistent manner.	Noted Several comments addressed the UAV system safety analysis and its detailed objectives. The guidance relative to the safety analysis contained in attachment 2 of the policy envisaged by the A-NPA is expressed in qualitative terms. Such terms are applicable for all categories of UAV. Quantitative values to be used should be those used for the 1309 analysis contained into the manned CS that has been selected as a starting basis for the certification of a given UAV. As a result, numerical values will depend of the selected CS. However the Agency accepts that the guidance provided with the policy need improvements. It will be kept as it is for the first issue of the policy but EASA plans to ask EUROCAE WG-73 to further develop the guidance based on the comments received on the A-NPA.
Paragraph Policy for UAV certification c) definition and acronyms **Cmt.** *Dassault* Dassault Aviation recommends that the U of UAV be interpreted as Uninhabited and not as Unmanned **Justification** First justification is coming from ICAO which is using this definition in the EANPG/47- WP10 (3/11/2005) There might be in the future UAV (Unmanned Air Vehicle) with passengers, nevertheless the today priority is to certify and allow operations of UAV (Uninhabited Aerial vehicle). As explain in the explanatory note, safety objectives of UAV (Uninhabited Aerial vehicle) will no longer be oriented to the protection of on board people but will have be oriented to the protection of on ground populations. This means that regulations for UAV (Unmanned Air Vehicle) with passengers will be similar to existing aircraft regulations and will be very different to the regulations of UAV (Uninhabited Aerial vehicle).	Noted It is agreed that passsenger carrying UAV are not envisaged for a near future and that the priority should be to certify for the civil applications envisaged today (e.g.aerial work). However the fact that the definition is broader than anticipated short term civil applications does not harm.

Comment	Response
Paragraph **Policy for UAV system certification Attachment 2 Paragraph 3 "Catastrophic " or severity one event may be defined as the UAVs inability to continue controlled flight and reach any predetermined landing site** **Cmt.** ***Euro UAV ICB*** "Catastrophic " or severity one event may be defined as the inability to continue flight and to induce on ground victims. EuroUAV ICB recommends for definition of a catastrophic event or severity one : "Failure condition that would prevent the UAV from continued safe flight and landing, resulting in uncontrolled flight and uncontrolled crash in the open country which could lead to a risk of causing fatalities". **Justification** As there is no people on board, a loss of control of a UAV in an uninhabited area might not be considered as catastrophic.	Not accepted. The proposed text is not significantly different than the one proposed in the policy.
Paragraph **Policy For UAV system certification c) definition and acronyms** **Cmt.** ***Euro UAV ICB*** EuroUAV ICB recommends to limit certification activities to UAV with no people onboard **Justification** There might be in the future UAV (Unmanned Air Vehicle) with passengers, nevertheless the today priority is to certify and allow operations of Uninhabited UAV. As explained in the explanatory note safety objectives of UAV (Uninhabited Aerial vehicle) will no longer be oriented to the protection of on board people but will have be oriented to the protection of on ground populations. This means that regulations for UAV (Unmanned Air Vehicle) with passengers will be similar to existing aircraft regulations and will be very different to the regulations of UAV with no people onboard note : for information recently ICAO has published a UAV document (EANPG/47- WP10 (3/11/2005)) where UAV was interpreted as Uninhabited Air Vehicle. 4. PERSON/ORGANISATION PROVIDING THE	Noted It is agreed that passsenger carrying UAV are not envisaged for a near future and that the priority should be to certify for the civil applications envisaged today (e.g.aerial work). However the fact that the definition is broader than anticipated short term civil applications does not harm.
Paragraph **Policy For UAV system certification d) Procedure for UAV systems Certification** **Cmt.** ***Euro UAV ICB*** Current Policy requires that "In order to obtain a TC, a DOA issued as required by 21A.14 and Sub-part J must be obtained. UAV categories and types covered by the EASA regulations are considered to be complex systems and do not qualify for the use of alternative procedures under 21A.14 (b)". This requirement could be potentially detrimental to the development of civil UAV Systems. Justification for this requirement will have to be further elaborated, particularly in the context of Part 21 application to the UAV Systems regulation. It is then recommended that this matter be carefully addressed before being endorsed by EASA as part of the Policy, particularly with regard to future business related to the certification of civil UAVs being manufactured by small-medium organisations. It is subsequently proposed to remove this paragraph from the proposed Policy and, at this stage, to deal with this issue on a case by case basis. **Justification** There seems to be no obvious reason why Part 21 should apply differently to UAV Systems than manned aircraft for design organisation approval requirements, which may lead to over specifying the Policy for UAV system certification. Costs for obtaining a design organisation approval from the Agency may create an un-equal treatment with manned aircraft of comparable mass, although the general principles underlying the Policy (e.g. fairness / equity, responsibility and economics) aim not to impose regulations that may be inappropriate or found not to be easily adaptable to UAVs.	Partially accepted The policy envisaged by the A-NPA requires systematically a DOA (design organisation approval) for the designer. Several comments have questioned this requirement. The use of CS-VLA can be accepted as a starting basis: designers of CS-VLA aircraft do not need to obtain a DOA and can demonstrate their capability to design by using alternative procedures to DOA. However even if the air vehicle is of simple design, the UAV system (air vehicle, data-link, control station) is not so simple: this would justify requiring a DOA. However the Agency is ready to accept alternative procedures based on an appropriate substantiation by the designer. The policy will be modified accordingly for UAV that would use CS-VLA or CS-VLR as a starting basis following application of alternative I.

Comment	Response
Paragraph **Policy For UAV system certification** **d) Procedure for UAV systems Certification, page 26**	

Comment	Response
Cmt. ***EADS, France*** It is proposed to remove the sentence "In order to obtain a TC, a Design Organisation Approval issued as required by 21A.14 and Sub-part J must be obtained. UAV categories and types covered by the EASA regulations are considered to be complex systems and do not qualify for the use of alternative procedures under 21A.14 (b)". It is recommended that any regulatory restrictions related to this issue shall be handled carefully, taking advantage of return of experience to be gathered from future UAV Systems certifications. ***Justification*** A. There is no obvious reason why Part 21 should apply differently to UAV Systems than manned aircraft for design organisation approval regulation (light UAVs with a maximum take-off mass above 150 kg may not be considered more complex than a small aeroplane). B. Part 21 indicates that any TC applicant shall : - either obtain a Design Organisation Approval from the Agency as defined by 21A.14 (a) and Sub-part J, - or by way of derogation from paragraph (a), seek Agency agreement for the use of alternative procedures under 21A.14 (b) setting out the specific design practices, resources and sequence of activities necessary to comply with this Part, for specific product categories. * When applying for a design organisation approval, an organization will seek from the Agency privileges as indicated under 21A.263, e.g. : - compliance documents submitted by the applicant for the purpose of obtaining a type-certificate shall be accepted by the Agency without further verification, - the holder of a design organisation approval shall be entitled, within its terms of approval and under the relevant procedures of the design assurance system, to classify changes to type design as 'major' or 'minor', and to approve minor changes to type design, to approve documentary changes to the aircraft flight manual. * Considering the potential incurred costs for obtaining a design organisation approval from the Agency, appliance of the Policy to all UAV Systems may create an un-equal treatment with manned aircraft of comparable mass. Small organisations of UAV Systems should be allowed to favor the alternative procedures as defined in a) above to the privileges as defined in b) above when applying for a type certificate. C. The Policy requirement related to DOA seems not consistent with the objective and general principles underlying the Policy : * Section IV. The A-NPA: background, purpose and specific issues 4 in section b), states that the A-NPA objective is to present ideas for debate but not to impose regulations that may be inappropriate or found not to be easily adaptable to UAVs. * Section V. Regulatory Impact Assessment 4 a) ii - Economics states that : - It should be noted that there will be certification costs in these two options. In particular the need to obtain a design organisation approval must be pointed out, in particular relative to small organisations." * Attachment 1 to the explanatory note defines the Fairness adopted principle when comparing manned and unmanned systems ("Any regulatory system must provide fair, consistent and equitable treatment of all those it seeks to regulate.") and states that "a concept of regulation for UAV Systems should start from the basis that existing regulations and procedures developed for and applicable to manned aircraft should be applied wherever practicable and not simply discarded in favour of a regulatory framework tailored specifically for UAV Systems". D. In conclusion, it is recommended that a) in absence of any sound return of experience from certifying UAV Systems, b) in consistency with the equity and fairness principles defined by the JAA/ Eurocontrol Task Force and adopted by the Policy, and c) in order not to prevent small organisations from being drive out of the UAV industry business, the need to obtain a design approval organisation for all type certificate applicants should not be specifically imposed to UAV Systems manufacturers as part of the current version of the Policy – Part 21 (article 21A.14) should apply as per manned aircraft.	Partially accepted The policy envisaged by the A-NPA requires systematically a DOA (design organisation approval) for the designer. Several comments have questioned this requirement. The use of CS-VLA can be accepted as a starting basis: designers of CS-VLA aircraft do not need to obtain a DOA and can demonstrate their capability to design by using alternative procedures to DOA. However even if the air vehicle is of simple design, the UAV system (air vehicle, data-link, control station) is not so simple: this would justify requiring a DOA. However the Agency is ready to accept alternative procedures based on an appropriate substantiation by the designer. The policy will be modified accordingly for UAV that would use CS-VLA or CS-VLR as a starting basis following application of alternative I.

Comment	Response
Paragraph **Policy for UAV systems certification - Page 26 definitions** **UAV Pilot: The person in direct control of the UAV.** **Cmt.** *CAA, Belgium* Comment : This definition seems to imply that a single pilot is sufficient in every circumstance. Although a single person will be at any time at the controls, it could happen that in some circumstances, the work load necessitates another person to deal with system malfunctions, to ensure the see and avoid function, etc? As redundancy is needed, in case of pilot incapacitation, this second person should better also have the adequate pilot qualification. I would suggest something like: UAV Pilot in command: The person in charge of the primary controls of the UAV. UAV Pilot: A person suitably qualified to exercise direct control of some UAV(s). Note PIC is different than commander; although it may be the same person. **Justification** Self explanatory	Partially accepted. The definition of Commander and actually the definition of pilot are not used in the policy and may be removed. The policy uses as starting basis manned certification specifications that usually contains specifications for minimum crew (Paragraph 1523) except for CS-22, VLA and VLR where the minimum crew is assumed to be 1. For certification purposes only this concept of minimum crew is important: commander/pilot/ pilot in command are defintions that are needed for operational rules only.
Paragraph **Policy for UAV systems certification** **Attachment 2 paragraph 3** **Cmt.** *Galileo Avionica SpA* "Catastrophic" or severity one event may be defined as the inability to continue flight and to induce on ground victims. **Justification** Over an uninhabited area the loss of control of UAV might not be considered as catastrophic.	Noted The proposal made by the comentator is consistent with the definition of catastrophic event in the policy.
Paragraph **Policy for UAV systems certification** **d) Procedure for UAV systems Certification** **Cmt.** *Galileo Avionica SpA* In order to obtain a TC, a Design Organisation Approval issued as required by 21A.14 (a) or Alternative Procedure to DOA as required by 21A.14(b) must be obtained. **Justification** For organizations that are designing small UAV (single piston engine, conventional configuration, etc.) should be favorable to proceed toward a DOA full passing through Alternative Procedure.	Noted The use of CS-VLA can be accepted as a starting basis: designers of CS-VLA aircraft do not need to obtain a DOA (design organisation approval) and can demonstrate their capability to design by using alternative procedures to DOA. However even if the air vehicle is of simple design, the UAV system (air vehicle, data-link, control station) is not considered as simple design. A DOA will be required in such case. It is agreed that DOA put further requirements on the designer but on the other hand it provides with privileges.

Comment	Response

Appendices

Paragraph **11 Daylight Operations (pg 4 of 11)**

Cmt. ***UVS Canada***

Restricting light UAV to daylight only operations may be unjustified.

Noted

There is no intention to do so: Type of operations means here aerial work or commercial air transportation. As such it does not belong to airworthiness: certification specifications do not assume a type of operations. However kind of operations is addressed in paragraph CS 25, VLA, VLR-1525 of the Certification Specification that reads as follows:

The kinds of operation to which the aeroplane is limited are established by the category in which it is eligible for certification and by the installed equipment.

The acceptable means of compliance for the flight manual for CS-25 (AMC 25.1581) provides further information for large aeroplanes. The information is provided below to help understanding what is meant by kind of operations
Kinds of Operations. This subsection should contain a statement similar to the following:
This aeroplane is certificated as a Large Turbine-powered Aeroplane and is eligible for the
following kinds of operations when the appropriate instruments and equipment required by the airworthiness and operating requirements are installed and approved and are in operable
condition.
The approval status of the following should be stated:
(i) Operation in atmospheric icing conditions.
(ii) Extended over-water operation.
(iii) Extended range operations with two-engine aeroplanes (ETOPS).
(iv) Day and night operations under visual flight rules (VFR).
(v) Operations under instrument flight rules (IFR).
(vi) Backing the aeroplane with reverse thrust.
(vii) Category I, II or III operations.

CS-29 and CS-27 are however more specific and reads as follows (CS-23 has a comparable wording):
The kinds of operations (such as VFR, IFR, day, night, or icing) for which the rotorcraft is approved are established by demonstrated compliance with the applicable certification
requirements and by the installed equipment.

The Flight test Guide for CS-23 (pages 2-FTG-6-9 and 10) introduces a concept of kind of operation equipment list (KOEL).

Note: the comment seems applicable to the guidelines for small UAV (below 150kg maximum take-off mass) that are included into the report of the joint initiative of JAA and EUROCONTROL on UAV: such small UAV are not in the remit of EASA.

Justification

Currently, small integrated autopilots allow the use of a light UAV to launch, fly, and land autonomously. The UAV pilot instructs the autopilot, but in many cases may never need to fly the aircraft directly. As an autonomous system, there is no reliance on daylight for any mode of the operation.

Comment	Response
Paragraph **21 Visual Reference with the light UAV (pg 5 of 11)**	
Cmt. ***UVS Canada***	
The term UAV implies more than just a model aircraft; it suggest some form of autonomous capability and the ability to perform a task beyond simply flying. By restricting the UAV to flight within visual range of the pilot, much of the utility of a light UAV will likely be lost.	Noted This comment is referring to guidelines to be used by National authorities for UAV with a maximum take-off mass below 150kg. Several commentators requested that the Agency develops guidelines for the certification of small UAV. The comment is understood however the EASA is 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 regulation based on the work done by the UK-CAA. Because it sees merit in a harmonised approach between Member States, the Agency proposes that Member States agree that EUROCAE WG-73 develops guidelines for certification of such UAV. The guidelines drafted by the joint JAA-EUROCONTROL initiative only address the case of UAV that remain in direct line of sight of their pilot (e.g. crop spraying). However today application for UAV below 150kg envisages operations that would not remain in line of sight of the pilot (e.g. coastal surveillance) and therefore the guidelines need to be updated.
Justification	
One of primary roles of a light UAV is "over the hill" surveillance. By restricting the flight of a light UAV to be within visual range of the pilot, the benefit of a small, easily deployable system is lost. Currently, Light UAVs that are designed for surveillance have a range of several kilometers and flight times of several hours. They are typically used to provide information several kilometers ahead of a convoy. Restricting the range to several hundred metres would render many of the systems useless.	

Comment	Response
Paragraph 13 Operation near aircraft; right of way rules Point (c) **Cmt.** *UVS Canada* Re: A light UAV shall not fly at a height exceeding 400ft a.g.l. Limiting the height to 400ft may unacceptably restrict the utility of a light UAV. I suggest the 400 feet be changed to at least 400 metres.	Noted The comment seems to apply to the guidelines for small UAV (below 150 kg maximum take-off mass) included into the report of the joint initiative of JAA and EUROCONTROL on UAV: such UAV are outside the EASA remit. These simplified guidelines envisage no certification but lead to strict limitations to limit risk. Several commentators requested that the Agency develops guidelines for the certification of small UAV. The comment is understood however the EASA is 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 regulation based on the work done by the UK-CAA. Because it sees merit in a harmonised approach between Member States, the Agency proposes that Member States agree that EUROCAE WG-73 develops guidelines for certification of such UAV. The guidelines drafted by the joint JAA-EUROCONTROL initiative only address the case of UAV that remain in direct line of sight of their pilot (e.g. crop spraying). However today application for UAV below 150kg envisages operations that would not remain in line of sight of the pilot (e.g. coastal surveillance) and therefore the guidelines need to be updated.
Justification It appears that the model for setting the rules governing light UAV stemmed from the model aircraft community. Routinely, model sailplanes, without any form of autopilot, have an initial launch height of greater than 400 feet a.g.l. and will typically fly to over 1000'. We should expect that a light UAV would be capable of similar flights with greater safety than even a model aircraft.	
Paragraph 24 Flight Termination System (pg 5 of 11) **Cmt.** *UVS Canada* Q: Must the flight termination system be separate from the regular flight control systems, or can it be as simple as terminating the power system and commanding a preset deflection of the control surfaces? The deflection could be drastic, causing a complete aerodynamic termination, or may be a gentle orbiting glide.	Noted; The policy does not dictate technological solutions.
Justification	

Comment	Response
Paragraph **Alternative I (Page 33)** ***Cmt.*** ***BMVBS, DE*** We don't agree with the prerequisite that the capability of a vehicle to harm any third parties is broadly proportional to is kinetic energy on impact. Isn't it more a matter where the impact is? - If it is in a populated area or on an empty field. Therefore we have to question the applicability of the Impact Energy Method on the subject UAV. Therefore, we suggest using the Safety Target approach based on UAV Safety Objectives (and supplement it; see "extension" comment). ***Justification***	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph **Alternative II (Page 37)**	

Comment	Response
Cmt. ***BMVBS, DE*** In general, we prefer the Safety Target approach to the Kinetic Energy approach. But there are some were important issues to be added to the approach: It is not enough to only consider ground victims! The possibility of a midair collision of an UAV (e.g. WASLA HALE) with an aircraft having passengers cannot be excluded! That factor must be accounted for in the method and the appropriate tables!	Not accepted Safety target versus kinetic approach: In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV. Relative to the possibility of mid-air collision, Many comments regret that EASA certification does not address ‘sense and avoid’ EASA recognise ‘sense and avoid’ as a critical issue for safety and operations but considers that 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. When such specifications are 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; minimum crew considerations also take into account collision avoidance. These specifications reflect the concept of ‘see and avoid’.

Comment	Response
	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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Comment	Response
Paragraph **Alternative II: "METHOD BASED ON UAV SAFETY OBJECTIVES"** **Paragraph 1. Context** ***Cmt.*** ***FAA, Certification*** Safety objectives developed for manned aircraft inherently include the protection of people and property on the ground and other aircraft in the airspace. This intrinsic philosophy must not be ignored when developing certification criteria for unmanned aircraft. When considering the safety of the overall airspace all participating and non-participating elements (which may be affected) must be included. ***Justification*** The integration of unmanned aircraft into the airspace will have to overcome public perception. If certain elements of the airspace are ignored then this will only hinder the integration effort while leaving gaps in the overall safety.	Accepted Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Comment	Response

Paragraph **Alternative II: METHOD BASED ON UAV SAFETY OBJECTIVES**

Cmt. *FAA, Certification*

Comment	Response
The results achieved by applying the safety objective method seem to invalidate the method itself. Furthermore, the assumptions and data used come from unreliable data sources as also recognized by the authors. Clearly a 25,000 kg unmanned aircraft has significantly different structural and operational characteristics than a small aircraft under CS-23. Once again this method also ignores the specific technological and operational aspects of unmanned aircraft.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

Comment	Response
Using the US navy as a data source will not yield appropriate results. Any such comparison to existing regulations must take into account the complexity of on-board and ground based systems, operational characteristics, human factors/interface issues and the structural design of unmanned aircraft. Any methodology that attempts to equate unmanned aircraft to manned aircraft for the purpose of applying existing standards must take into account the foundation of the existing regulations. We must answer how and why the existing regulations were developed and what their purpose is with respect to their applicability. Ignoring the unique aspects of unmanned aircraft may prove to be detrimental to their integration with manned aircraft.	

Comment	Response

Paragraph **Appendix 1 to Attachment 2 – Method to select the manned airworthiness codes. (Page 33)**

Cmt. ***CAA, UK***

Significance of the Mid-Air Collision Hazard Both methods focus entirely upon the risk to people on the ground from a crashing UAV. In both cases, the impact (in terms of both kinetic energy effects and numbers of casualties on the ground and in the air) could be far greater in the event of a mid-air collision, particularly with a large commercial aircraft for example due to a failure of the UAV remote systems, control station, data links and/or sense and avoid sub-system. This aspect needs to be reflected in whichever of the methodologies is chosen	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Comment	Response
Paragraph Appendix 1 to Attachment 2 (Page 33) **Cmt.** *BMVBS, DE* The method should compare the risks presented by a UAV with the risks of conventional aircraft. The comparison of hazards (situations that can lead to a negative effect) is not helpful. **Justification**	Noted Comment not fully understood. Both alternative I and alternative II compare to conventional aircraft. In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph **Appendix 1 to Attachment 2 of the Policy. "The method to select the manned airworthiness codes"** ***Cmt.*** ***NLR*** Reply to your request for comments on the Policy and specific issues in § IV.4.a of the Explanatory Note. ***Justification*** For several reasons we prefer the impact / kinetic energy method, i.e., Alternative I: - The safety objective methodology (Alternative II) uses a multitude of assumptions and simplifications which are not well substantiated, especially because the use of such assumptions is not common practice for the certification of manned aircraft; - Alternative II is based on lethal surfaces which are derived from a very limited set of examples (Boeing 747, Falcon 2000) The reasoning and rationales behind Alternative I, on the contrary, is easier to comprehend and closer to the approach for manned aircraft to distinguish between codes of airworthiness requirements based on weight.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Paragraph **Appendix 1 to Attachment 2 to the policy, figures 1 and 2 on pages 35 and 36.** **Cmt.** *UAV DACH* Please use the SI-system. **Justification** The mixture of mass in kg and velocity in kt may lead to unnecessary mistakes and makes it harder to understand and/or compare.	Noted The text will be reviewed to ensure this. However the use of the unit allowed by ICAO annex 5 will be continued (e.g. NM, Knt, ft, ft/min, degree)
Paragraph **Appendix 1 to Attachment 2** **Alternative I: "IMPACT ENERGY METHOD FOR ESTABLISHING THE DESIGN STANDARDS FOR UAV SYSTEMS"** **Cmt.** *FAA, Certification* Based on our acceptance of the recommendation that existing airworthiness standards be applied to UAS as much as practicable we recognize that a methodology to determine which existing standards apply is necessary. This methodology must take into account the unique operation and any novel geometry of the unmanned aircraft. We must also first understand the basis of Part 23 and Part 25 and the basic assumptions considered in their development and application. The impact energy (kinetic energy) method, proposed in Alternative I, while providing a means to find some form of equivalency between unmanned and manned aircraft, ignores some very significant operational and structural factors unique to unmanned aircraft. It first ignores the capability of the unmanned aircraft to harm other manned aircraft in the airspace. As mentioned in a previous comment, a small UAS in a midair collision with a transport category manned aircraft can cause a catastrophic failure. Therefore, the proposed kinetic energy method may not be sufficient in determining the appropriate regulations. Furthermore, it also ignores some unique operational aspects such as the extended range/endurance of UAS. This exposes other aircraft in the airspace and the public on the ground to a greater probability of an unsafe condition. While the FAA is currently addressing this issue and has not developed an approach, based on precedent set in somewhat similar cases it is advisable that a thorough study/comparison of Part 23 and 25 rules should be conducted. This study must determine the technological, operational and safety basis of each rule. The result should be cross-referenced against unmanned aircraft technology and the appropriate rules identified. FAA Part 23 aircraft in general have docile handling characteristics, low stall speeds, spin resistant design philosophies, and low probability of ops in extreme weather conditions. These characteristics were basic assumptions, which set the stage for Part 23 rules and continue to do so. Part 25 have their own set of assumptions and certain basic characteristics such as a reduced stiffness to mass ratio. This unique geometry may or may not be present in similar size unmanned aircraft. **Justification** In conclusion the Kinetic energy approach is a deficient approach for a complex issue and may result in significant oversight of critical technological and operational factors specific to unmanned aircraft.	Noted The Agency considers that the proposed approach using alternative I to select the manned CS, tayloring the selected CS and complementing it by a system safety analysis and specail conditions is quite flexible. It recognise however that both the safety target method and alternative II deserve further study.

Comment	Response
Paragraph **Appendix 1 to Attachment 2, The method to select the manned airworthiness codes** **Cmt.** *Schiebel Elektronische Geraete GesmbH* Recommended method.	Accepted. In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification Alternative 1 are clear and understandable comparison criteria and methods for the selection of the applicable DS for UAV`s. Midterm integration of UAV´s in the non-segregated airspace will face enough operational hurdles and difficulties. To introduce a UAV adopted safety objective method (people ground protection only) will lead to more discussions between manned and unmanned aeronautic industry as necessary (equivalence and fairness). By knowing that something over-flying me is probably not so safe as usually expected, will stress a positive public opinion and policy towards Unmanned Aerial Vehicles. This will most likely block economical acceptable development on a generic level.	

Comment	Response

Paragraph **Attachment 2 - para 3 (Page 29)**

Cmt. ***CAA, UK***

Significance of the Mid-Air Collision Hazard This paragraph also deals only with a Catastrophic UAV hazard event relating to an uncontrolled crash potentially leading to fatalities or severe damage on the ground.' Again, the consequence of a mid-air collision causing collateral fatalities/damage on the ground should also be considered.	Partially agreed. Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.

Justification

Comment	Response
Paragraph Attachment 2 – 'Special Conditions & Interpretative Material. para 4.1 (Page 31)****	
Cmt. *CAA, UK*	
Selection Of Most Suitable Safety Assessment Approach The third sentence refers to a UAV System Safety assessment, potential failure conditions and levels of risk expressed as probabilities of occurrence. This is in the context of Emergency Recovery Capability and seems out of place as this form of safety assessment is surely applicable to all UAV aspects	Noted The reference to system safety analysis is justified because it can take credit of the existence of the emergency recovery capability. The system safety analysis is applicable to the whole UAV system.
Justification	
Paragraph Attachment 2 – 'Special Conditions & Interpretative Material. para 4.3 (Page 31)****	
Cmt. *CAA, UK*	
Scope Of UAV Certification Under the heading 'Level of Autonomy', a bulleted list, makes specific reference to Collision Avoidance and Type of Airspace - this bulleted list stands alone and would benefit from greater explanation.	Noted The purpose of the list was to give an indication of issues impacted by autonomy. Levels of UAV Autonomy may considerably vary. At one extreme, the UAV Pilot may have direct control of the UAV (RPV) similar to existing model aircraft, whereas ultimately, there may be the fully autonomous UAVs where there is no need for a permanent control link and where the UAV Commander will only in special cases intervene in the management of the UAV flight. However, with the possible exception of light UAVs, most types are expected to have some limited Autonomy capability where the UAV Pilot is still given the possibility to monitor and intervene, for example, to perform corrective actions in case of failure. Yet, fully autonomous functions could be undertaken in the case of total loss of control link. There is a need to review the impact of these various levels of Autonomy on UAV System airworthiness criteria.
Justification	

Comment	Response
Paragraph **Attachment 2 to Proposed Policy: Alternative II - Method based on UAV Safety Objectives (Page 37)** **Cmt.** *CAA, UK* Selection Of Most Suitable Safety Assessment Approach Determination of an acceptably low figure for 3rd party risks from UAVs would need to be studied separately. The figures quoted are presumably, merely for illustration. The quoted figure of 50 (passenger) victims per million flight hours does not seem useful – and the US Navy 'Range Safety Criteria' document which cites 1.8 3rd party victims per million flight hours should be referenced in full in order to allow readers to follow up on context.	Noted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification	

Comment	Response
Paragraph **Page 31, Para 4, Section 4.1** ***Cmt.*** ***UAV DACH*** - Other possible options like self-reconfiguration capabilities for regain of emergency flight capabilities are not addressed so far. - The emergency landing sites should be more detailed. ***Justification*** The emergency recovery capability is (for larger UAVs) a demanding requirement, similarly to all manned aircraft, where explicitly special procedures are foreseen and trained for a lot of different emergency cases. The Certification Procedures/Requirements should therefore include – as far as possible and in line with the size of the UAV – several self-reconfigurable recovery capabilities/procedures for different (possible) failure cases – either fully automatically operated onboard or with more or less greater support from the pilot in command (PIC) at the ground control station (GCS). In both cases this should include definitions for emergency landing sites for immediately or shortened ending of the flight, either automatically, semi-actively or actively controlled from the GCS (PIC).	Noted This paragraph is intended to provide the basis for a special condition. It may not cover all cases and therefore need to be adaopted during actual cetification projects. The further development of such paragraph should be proposed to the EUROCAE Working Group 73 on UAV.

Comment	Response
Paragraph **Page 31, Para 4, Section 4.2:** ***Cmt.*** *UAV DACH* - Security-, Protection- and Authorization- requirements should be addressed, because these issues are safety-relevant w.r.t. a more or less great number of UAVs. - The selection of frequencies for UAV operations should also be covered with respect to emergency frequencies, emergency locator transmitter (ELT), etc.	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link. The issue of obtaining the necessary bandwith will be discussed with EUROCONTROL.
Justification For all the communication- and data-links between the GCS and the UAV-“Avionic”, (incl. UAV-Payload & Ground-Station [GS]), between the UAV and SATCOM, the GCS and the ATC, and for the air-to-air-transponder, and ELT, etc. (up- & down-link architecture, being relevant for the UAV flight safe-ty) the secure transmission of all bits/Bytes and voices over the specifically selected and secured/encrypted data links on specific frequencies for uplink and downlink are essential. Protection requirements must be de-fined with respect to different secure data-links, to avoid any disturbance, intentionally or unintentionally. International authority(ies) should be responsible for the provision of specific undisturbed frequencies for UAVs with sufficient bandwidth even for the payloads. For emergency cases specific emergency frequent-cy(-ies) should be specified/required, similarly to the civil ATC.	

Comment	Response
Paragraph **Page 31/32, Para 4, Section 4.3** ***Cmt.*** *UAV DACH* All issues referred to in this paragraph depend on the probability of a failure occurrence. Better to ask: Which inherent measures are in place to protect the (UAV-) system against degradation in failure case(s)?	Noted Levels of UAV Autonomy may considerably vary. At one extreme, the UAV Pilot may have direct control of the UAV (RPV) similar to existing model aircraft, whereas ultimately, there may be the fully autonomous UAVs where there is no need for a permanent control link and where the UAV Commander will only in special cases intervene in the management of the UAV flight. However, with the possible exception of light UAVs, most types are expected to have some limited Autonomy capability where the UAV Pilot is still given the possibility to monitor and intervene, for example, to perform corrective actions in case of failure. Yet, fully autonomous functions could be undertaken in the case of total loss of control link. There is a need to review the impact of these various levels of Autonomy on UAV System airworthiness criteria. The considerations put into this paragraph are meant to provide a starting basis for discussion with applicants during a certification project. The Agency plans to ask the EUROCAE Working Group on UAV to further develop this special condition.
Justification Different levels of autonomy should be defined (see also NIAG-Study SG-75) which defines specific automated performance levels in accordance to specifically required/defined autonomy levels to handle such items, as presented with the dotted/pointed sequences (areas & issues) and more items in accordance with the specific UAV-type and -size.	
Paragraph **Page 32, Para 4, Section 4.4 within "Human Machine Interface"** ***Cmt.*** *UAV DACH* - Due to its high safety relevance the handling of warning indications and handling of emergency procedures cannot be treated as interpretative material, which means outside a future UAV Control Station (CS) in fact. - This would also be in contradiction to the philosophy and aim of other CS (e.g. 23 & 25)	Accepted. The text will be mofied to reflect that the special condition should take into account existing human factors cspecifications already included into the certification specifications
Justification Similarity and comparability to normal cockpit requirements within CS23 & 25 and the operator regulations (required number of operators and operators times) shall be the guide-line for specific requirements.	

Comment	Response
General	
Paragraph	
Cmt. ***CAA, UK***	
Entire Document - General Our comments cover 4 main areas: - Scope Of UAV Certification - Ambiguity over ATM-Related Functions - Significance of the Mid-Air Collision Hazard - Selection Of Most Suitable Safety Assessment Approach For ease of reference, these are outlined below together with a small number of additional minor and editorial observations.	Noted Replies will be provided for each specific comments
Justification	
Cmt. ***CAA, UK***	
Scope of UAV Certification. There is a tendency for the UAV industry to think only in terms of the kind of UAV they currently manufacture. It needs to be ensured that any criteria set can cope with UAVs of all sizes, from micro-UAVs to potentially an unmanned A380 freighter. To this end the NPA should make it very clear that different failure probabilities criteria will be imposed dependent upon the size (kinetic energy) of the particular UAV.	Agreed Several comments addressed the UAV system safety analysis and its detailed objectives. The guidance relative to the safety analysis contained in attachment 2 of the policy envisaged by the A-NPA is expressed in qualitative terms. Such terms are applicable for all categories of UAV. Quantitative values to be used should be those used for the 1309 analysis contained into the manned CS that has been selected as a starting basis for the certification of a given UAV. As a result, numerical values will depend of the selected CS. However the Agency accepts that the guidance provided with the policy need improvements. It will be kept as it is for the first issue of the policy but EASA plans to ask EUROCAE WG-73 to further develop the guidance based on the comments received on the A-NPA.
Justification	

Comment	Response
Cmt. ***CAA, UK*** Ambiguity over ATM-Related Functions General comment - Notwithstanding the ambiguity in the paper over the extent to which the collision-avoidance function of a UAV should be part of the airworthiness certification (from which it could be concluded that EASAs intention is not to include this aspect) the paper has very extensive reference to airspace issues. Specifically the operation of UAVs into 'non-segregated airspace' is mentioned repeatedly. This would imply that EASA indeed considers this aspect to be an airworthiness issue. Prominent examples include - Explanatory note pt IV para 4 d: 'the ultimate objective should be to achieve in Europe a comprehensive set of UAV regulations allowing UAV operations in non-segregated airspace.' - this certainly implies heavy ATM relevance. Explanatory note section V - regulatory impact assessment: - explains an intent of this A-NPA ' - to remove barriers that may be preventing the development of UAVs and their use in a non-segregated airspace.' Again it must be assumed that ATM-related issues are considered an essential part of the airworthiness certification approach.	Noted. The references to the airspace issue was necessary to put the UAV issue into its context. The position of EASA is still that airspace is not an airworthiness issue: Many comments regret that EASA certification does not address 'sense and avoid' EASA recognise 'sense and avoid' as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems.
Justification	

Comment	Response
Cmt. ***STM*** 1. Para. IV.4.iv of A Explanatory Note 2. Attachment 4 to the Explanatory Note 3. Appendix 1 to Attachment 2 Per paragraph IV.4.iv of Explanatory Note, it was stated that two alternative methods might be used for selection of the applicable manned certification specification. When we reviewed “Safety Objective” method, we observed inconsistency between graph given in Attachment 4 to the explanatory note and method given in Appendix 1 to Attachment 2. So this graph should be revaluated.	Noted. In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification Graph was prepared in accordance to table given in paragraph 6.1 of Appendix 1 to Attachment 2. It was stated that this table provided equivalence between the UAV categories and the CS-23 aircraft categories. But even though main aim of “Safety Objective” method is to calculate UAV crash probability (based on assumption of one victim per million UAV flight hours) and to compare with manned aircraft fatal lost statistics, this table doesn’t show crash probability equivalence and accordingly graph doesn’t show the applicable equivalent manned certification specification. Another inconsistency in graph is usage of only one parameter (MTOW) to determine the applicable manned certification specification. However equivalence between the UAV categories and the CS-23 aircraft categories is shown for crash probability and two parameter (MTOW and Sref) is used during UAV crash probability calculation. So usage of only MTOW parameter is not correct for selection of the applicable manned certification specification.	

Comment	Response
Cmt. ***Thales*** This letter constitutes the THALES Aerospace answer to your consultation on the Advanced Notice for Proposed Amendment about UAV Systems certification N° 16/2005. THALES thanks the EASA for having issued this first approach to elaborate a certification policy for UAV Systems, which constitutes a major initiative and a significant step forward in the field of UAV Systems certification. THALES has supported the Euro UAV ICB in preparation of their response to the EASA A-NPA 16/2005, and feels that this represents the collective view of European UAV industry with regard to this initiative. In addition to the information sent in the letter, these collective comments cover the following points : 1) Item 1 : UAV Certification Approach – General comment on the certification approach and method for selection of a certification specification (Alternative I versus Alternative II) 2) Item 2 : Certificate of Airworthiness for Control Stations 3) Item 3 : EASA role 4) Item 4 : Sense and Avoid Requirements 5) Item 5 : Definition of UAV Meaning 6) Item 6 : Design Organisation Approval 7) Item 7 : UAV Catastrophic Event (Definition) 8) Item 8 : Communication Link However, THALES would like to underline two points : - It is clear that the views of national regulators, who are also part of the A-NPA consultation process, are not represented in the Euro UAV ICB response. THALES is a multi-domestic group, and as such will need to work in close relationship with the local regulatory bodies until such time as formally issued guidance on the application of airworthiness codes are available from EASA. It is therefore understood that local regulator views must be taken into account, which may result in compromise for short term applications. - In France, the Ministry of Defence (DGA) has issued the USAR v 3.0 UAV Systems Airworthiness Requirements, with the collaboration of French Industry. This code, which is considered as a successful initiative, should constitute a baseline to support airworthiness activities for the next short term developments of UAV Systems. This might be suggested within the A-NPA. We would like to add that THALES would be ready to participate to any Task Force organized under the leadership of EASA to set up a comprehensive regulatory framework for the certification and safe operations of UAV Systems.	Noted The Agency thanks Thales for its support. Please see replies to the ICB comments. Relative to coordination with national regulators, please note that their comments were also sollicited. Relative to the use of USAR v 3.0, 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. This code has served as a basis for the development of a NATO standard. USAR is not the comprehensive framework for UAV regulation as envisaged by option 3. It does not address 'sense and avoid', operational regulations and flight crew licensing regulations. The Agency recognise however that USAR has been developed using a methodology closely related to the one described in the policy and accept to consider USAR version 3 as an acceptable means of compliance to the policy provided that: • Its applicability is limited to the scope of present CS-23 • The safety targets included in the safety analysis reflect the ones resulting from the application of the EASA UAV policy.
Justification	

Comment	Response
Cmt. ***EADS, France*** A. Explanatory Note Chapter IV The A-NPA background purpose and selected issues Section 4 c iv Selection of the applicable manned certification specification, Page 7 B. Policy For UAV system certification Section f) Type Certification Basis, Page 27 Appendix 1 to Attachment 2 Out of the two methods proposed in Attachment 2 of Appendix 1, EADS MAS-F recommends that Alternative II shall be preferred to Alternative I as part of the Policy.	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification (a) Alternative 1 does not take into account the fact that safety objectives and criteria for UAV Systems shall be defined by considering the protection of the people on ground as opposed to the protection of people on board. (b) Alternative II, which relies on the definition of safety objectives and is based on an acceptable ground victim criterion, kinetic energy, lethal surface area and population density, is best suited to the UAV System certification process. (c) The Alternative II method shall be used to define : - different UAV categories (as in AC 23-1309), - safety quantitative objectives for each UAV category, - corresponding manned aircraft certification specification to be tailored by the TC Applicant for each category. (d) Parameters of the Alternative II method will have to be carefully defined (ideally as the consensual result of a dedicated working group involving the UAV industry representatives under EASA responsibility).	

Comment	Response
Cmt. ***Euro UAV ICB*** It is my pleasure to send you the attached joint comments of the Euro UAV ICB to your consultation on the Advanced Notice for Proposed Amendment (A.NPA) about UAV Systems certification N° 16/2005. On behalf of the Euro UAV ICB, I would like to gratefully thank EASA and congratulate yourself for having issued this first approach to elaborate a certification policy for UAV Systems. This step appears to the Euro UAV ICB as extremely important for the successful insertion of UAV systems into the European Air Traffic, and for the development of our industry. The Euro UAV ICB fully supports this major initiative and would like to encourage EASA to continue developing the definition of a certification policy for UAV Systems. For this reason, the Euro UAV ICB decided to set a specific working group in order to elaborate a joint assessment of and comments to the A.NPA. This should not prevent the members of the Euro UAV ICB to send their own comments as separate entities, and has given the working group members the opportunity to agree on a set of common comments which have been discussed and elaborated jointly by the group. The comments mainly address the issues mentioned by EASA as requiring specific comments (Explanatory Note, Chapter IV,4,a), as well as additional issues which have been identified as “Major” and which should have a significant impact on the policy. The joint comments elaborated by the Euro UAV ICB are entered on the specific form which you have recommended, and address the following points of the A.NPA : 1) Item 1 : UAV Certification Approach – General comment on the certification approach and method for selection of a certification specification (Alternative I versus Alternative II) 2) Item 2 : Certificate of Airworthiness for Control Stations 3) Item 3 : EASA’s role 4) Item 4 : Sense and Avoid Requirements 5) Item 5 : Definition of UAV Meaning 6) Item 6 : Design Organisation Approval 7) Item 7 : UAV Catastrophic Event (Definition) 8) Item 8 : Communication Link Before giving you the opportunity to read these comments more in detail, I would like to emphasize the role that we think EASA should play in the future in the field of UAV certification and ultimately, safe operations. Indeed, the Euro UAV ICB fully understands that Option 2 chosen by EASA to propose a policy is the only reasonable approach for the time being, given the present level of UAV system certification maturity. However, we would like to encourage EASA to instigate as soon as possible the developments of a comprehensive regulatory framework (Option 3), which is necessary to fly UAVs in a non-segregated airspace and which should be the ultimate goal of the policy. To achieve this, we recommend that the EASA remit be extended, in coordination with other Agencies, in order to take in account in particular the operational requirements for Sense & Avoid. This point is addressed specifically in our comments in Items 3 and 4. The Euro UAV ICB would be ready to participate in any Task Force set up to achieve such goals. Please note that at the current stage, the Euro UAV ICB working group limits the definition of catastrophic events in Item 7 to the protection of persons on the ground. However, airborne collisions, which have to be addressed in further developments of the regulatory framework (also see Items 3 and 4), will also have to be handled as catastrophic. We hope these comments will be helpful to EASA for the development of a certification policy. Feel free to contact the Euro UAV ICB for any further information you may require	Noted The EASA thanks the Euro UAV ICB for its support. Please see the replies to your detailed comments. Sweden has proposed a total system approach (TSA) and provided a rather detailed justification for it. The TAS concept 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. The Agency is of the opinion that this TSA is an attractive concept but that goes beyond UAV certification with the applications as envisaged to day. TSA may be considered in the long term when the applications described by the commentator have come to maturity. The Agency believe there is a need for an in-depth study of the TSA and based on this study will consider further actions including modifications to regulation 1502/2002. This study could be performed by the proposed group to define building blocks and road map for a comprehensive framework for UAV safety regulation.
Justification	

Comment	Response
Cmt. ***Dassault*** EASA A-NPA 16-20005 POLICY FOR UAV CERTIFICATION Summary This A-NPA is an opportunity for European industry and authorities to define the standards & requirements for UAV certification & operations and so to allow Europe to take the lead of the UAV activities. All aspects of the UAV airworthiness and operations must be treated using an holistic approach under the leadership of an European authority. The success will depend of the participation of the partners, to their capacity to listen to each other, and to subscribe to the project. The approach must be pragmatic, limited to essential requirements and built on a base well understood and accepted by a large majority. In the UAV considered, there is no longer any human on board, so the safety objectives will have to be oriented toward the protection of on ground population. This method is different from the civil aircraft ones. This regulation will only be applicable to civil UAV, keeping in mind that there is no reason to justify the use of different safety objectives for military UAV when they operate in non restricted airspace. DASSAULT - AVIATION GENERAL COMMENTS 1. THE GENERAL OBJECTIVE The objective is to allow routinely operations of UAV in non segregated airspace. 2. THE NEEDS To satisfy the objective there is a need for minimum requirements in the domains of: - UAV system certification - Environmental protection - Operation approvals - ATM and airports operations - UAV crew qualification - Security of operations (the purpose of the mission corresponds to the published mission purpose) The approach must define (and be limited) to the essential requirements, but must take into account all aspects and define a general policy for UAV operations. 3. METHODOLOGY & PRIORITY BETWEEN THE REQUIREMENTS. Each time that there are discussions between authorities and industry on UAV operations, the question is to define the priority in the regulation & requirement activities. In France the answer has always been "certification" and works have been done in this domain (NAVDROC & USAR). In the US the work is mostly put on the operational aspects. 4. UAV AIRWORTHINESS AND CERTIFICATION EASA describes two possible approaches of the airworthiness and certification - the conventional one - the safety target one Both methods are not contradictory. A combination of both methods can be proposed. Such method corresponds to the method used for certification of civil aircraft. FAR/CS 23 is a certification code, and inside the code there is a 1309 paragraph which defined (details in the AC23-1309-1C) safety objectives which are functions of the size of the aircraft and vary from 10-6 to 10-9 for a catastrophic event. French DGA has used this method to define a UAV airworthiness code name USAR, this code has an AMC 1309 which defines safety targets and a paragraph 5d allows the applicant to use for specific case a method based on weight or kinetic energy to substantiate the reduction of the standard safety objectives. " Where the technology and architecture used do not permit the attainment of the objectives stated in, subparagraph (5) (a) and (5) (c), the UAV System type certification should be dealt on a case by case basis, subject to the Technical Authority agreement, either, through operational restrictions or through a rationale justifying lesser value (e.g. considering weight or/and kinetic energy at impact) based upon the risk to third parties."	Noted Relative to summary: Many comments regret that EASA does no develop a comprehensive framework for UAV regulation (Option 3 of the A-NPA). However they accept as a first step the development of the Policy as envisaged in the A-NPA. The Agency agrees that option 3 is the long term solution and proposes that a group be created to identify building blocks and define a road map for a comprehensive framework for UAV regulation. Such a group should report to the Commission because the Commission is competent for all issues related to UAV regulation. It should include the main players and take into account existing or planned activities. A specific task for the group would be to develop a detailed regulatory impact assessment (in particular the safety case). The group should allocate responsibilities so that each player is responsible to organise its work. The group may also organise further studies as appropriate (e.g. Total System Approach, Safety Target approach). Concerning the safety target approach, the study should also establish its conformity with Article 2 (d) of the EASA Regulation (Regulation 1592/ 2002) Relative to general objective: this is agreed but is a long term objective. Relative to the need: this is agreed however the Agency is not yet competent for operations, licensing, ATM and airport and has no mandate for security. This is the reason why we are proposing the group mentioned above. Relative to the methodology and priority between the requirements: certification is a starting basis. Relative to UAV airworthiness and 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach. Relative to 4.1 combined method for airworthiness and certification: This

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4.1. Combined method for airworthiness & certification The method is to suggest to build a specific UAV airworthiness code initially limited to : - a skeleton defining all the items which will have to be addressed during the certification process - the applicable domains and the limits of the regulation (i.e. : weight, engine, speed…) - a 1309 advisory material similar to AC 23-1309-1C to define the safety objectives, and hardware software qualification requirements. - definition of different UAV categories and of their safety objectives (it will not be possible to have only one category covering UAV from 150 kg to 600 tons..) Purpose of the code is to provide the industry with the general rules to design a certifiable UAV. This code might be complemented by a "Special condition" which will provide in detail the specific requirements. For large UAV, USAR might be a good base to fulfill the content of the condition. This will allow the applicant to discuss again each paragraph, and so to valid them. 4.2. UAV safety objectives In all the documents and comments, UAV will be considered as UAV with no human on board at all. Note : ICAO has recently published a note on UAV where U was interpreted as Uninhabited 4.2.1. Why safety objectives have to be defined? Safety objectives as they are defined for civil aircraft (FAR/CS 25, FAR/CS 23) are oriented at the protection of onboard people which is logical. In case of a catastrophic event the first victims are the onboard people and the on ground victims if there are any represent a small proportion of the onboard victims. As there is no human onboard the UAV, the safety objectives must be reoriented to the protection of the on ground people. This explains why the UAV safety objectives must be different from the safety objectives used on civil aircraft. 4.2.2. Why this task is important? We are in a competitive world, it is important to define the applicable rules which will be the same for all participants. The today civil regulations are not adapted to UAV, as an example the weight limitation for a single engine aircraft (5700 kg) is not appropriate to UAV applications. As the UAV safety objectives are oriented to the protection of on ground people : - there is no reason to justify the use of different safety objectives for military UAV operating in non reserved airspace. - in civil aircraft safety objectives dealt only with "the certification aspects" and were only applied by the countries which operate the aircraft. For UAV it will be different, a UAV will have to satisfy the safety objectives published by the "fly over" countries. This means that an European UAV flying over USA will have to be certified in agreement with the safety objectives defined by the US authority, and vise versa. - there is no reason that the safety objectives defined for the UAV will not be close to the ones used for combat aircraft (fighters experience might be a good reference to define the UAV safety objectives values). 4.2.3. Conclusions The definition of the main safety objectives is probably the most important task of the UAV airworthiness activities. Such objectives are a necessity to organize and to develop a fair competition between the different industrial projects. The objectives must be carefully discussed, and accepted by the worldwide UAV civil and military community (industry, authorities). The objectives must not call into question the operation of existing aircraft as combat aircraft. More, the experience of all these aircraft must be used to properly set the UAV safety objective values. 4.3. Method to define the safety objectives. The method described in the A-NPA as "Alternative II : Method based on UAV safety objectives" has been used to define the main objective of UAV programs as Neuron and has also been used to validate and accept the USAR safety objectives. This method is based on kinetic energy and has as objective to establish a rule to define the global safety objective of UAV as a function of its size (energy). This method will permit to define different categories of UAV (as in AC 23-1309-1c) and to determine for each category the corresponding safety objectives. The method has no direct vocation (except on specific case) to be used by the UAV postulant, to justify their system on a case per case. The method can also be used to justify reduction of safety objectives for UAV used in specific conditions and operations (flight over ocean or	is broadly what the policy is proposing. Relative to 4.2 safety objectives: it is agreed that there is a need to define safety objectives. Several comments addressed the UAV system safety analysis and its detailed objectives. Several comments addressed the UAV system safety analysis and its detailed objectives. The guidance relative to the safety analysis contained in attachment 2 of the policy envisaged by the A-NPA is expressed in qualitative terms. Such terms are applicable for all categories of UAV. Quantitative values to be used should be those used for the 1309 analysis contained into the manned CS that has been selected as a starting basis for the certification of a given UAV. As a result, numerical values will depend of the selected CS. However the Agency accepts that the guidance provided with the policy need improvements. It will be kept as it is for the first issue of the policy but EASA plans to ask EUROCAE WG-73 to further develop the guidance based on the comments received on the A-NPA. Relative to 4.3 methods to define safety objectives: In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

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in segregated area). 4.3.1. Global safety objective It corresponds to the probability of all the catastrophic events possible on a given aircraft. For example FAR 25 transport aircraft had a global safety objective of 10-7. This objective is defined, keeping in mind that there will be no operational limitations other than the limitations today applicable on CS 23 / 25 aircraft. 4.3.2. Determination of the value of the global safety objective Following discussions between industry and the authorities for the establishment of USAR regulation it has been agreed to set the global objective at 5.10-5 (*) (*) : the 5.10-5 figure takes into account that a controlled crash in a specific area is not considered as a catastrophic event. This value corresponds to the best figures obtained on combat aircraft. This value is applicable to all UAV with no weight limitation or number of engines. If weight limitations has to be defined, we recommend to use as the base of discussion the figures suggested in the JAA / Eurocontrol task force document and provided in the "attachment 4" of the A-NPA (page 24). Multi engine UAV : 25 000 kg Single engine UAV: 20 000 kg As the UAV certification regulation will cover all UAV above 150 kg, it is necessary to reduce for light UAV the global safety objective and this as a function of the kinetic energy of the air vehicle. It shall not be logical to request the same safety objective for a UAV of the size of a F16 than for a small UAV of the size of a Sperwer. If "5.10-5" is a figure adapted to a UAV of the size of F16, it is totally irrelevant for a light UAV. Note : alternative II is only a method, the coefficients of the method will have to be tuned during the NPA discussions. 4.3.3. Catastrophic safety objective The catastrophic safety objective defines the probability of a catastrophic scenario. USAR has set this event at 10-6, this value might be a good value to initiate the future discussions. In a similar way than for the global objective the safety objective of the catastrophic event will have to be adapted using the method defined in "alternative II" . 4.3.4. Engine failure In case of single engine UAV, it might be difficult and probably impossible to satisfy the 10-6 requirement for engine failure at take off. FAR 23 has a similar concern, AC 23 1309-1C (Paragraph 4 C) provides some elements to answer to this concern. This item will have to be addressed during the establishment of the certification regulations. 4.4. System certification The regulation will not be limited to the vehicle but to the system. A similar approach has been used during the establishment of USAR regulation and this regulation might be used as a framework for the future definition of the regulation. 4.5. Operational aspects Due to the fact that there is no pilot onboard some operational aspects as : - the loss of control by the UAV pilot of the UAV - the incapacity to follow ATC requirements - the incapacity to follow ATC requirements and to assume anti-collision function. May be addressed in certification process and be analyzed and justified in agreement with safety objectives. Note: large UAV will not be directly piloted, loss of control of the vehicle in specific conditions as high altitude will have to be addressed at the system level and so be part of the safety analysis. 5. ENVIRONMENTAL ASPECTS The environmental aspect will have to be taken into account. Existing rules as ICAO annex 16 can be used and extend to all UAV and this independently of the UAV take off distance. Note: FAR 36 does not seem to have such exemption. The concern is for the UAV which don't take off or land from an airport.	Relative to 4.4 system certification: agreed Relative to 4.5 operational aspects: agreed and reflected into the policy. Relative to 5 environmental aspects: There is no principal reason why one should distinguish between a manned and an unmanned aircraft when considering environmental protection measures. Therefore, for noise at the moment it might be the best solution 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 UAVs due to their special mission cause additional annoyance to people, certain measures have to be taken. If, for example, a reasonable number of “larger” UAVs 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. Relative to 6 aircraft separation and aircraft collison avoidance: Many comments regret that EASA certification does not address ‘sense and avoid’ EASA recognise ‘sense and avoid’ as a critical issue for safety and operations but considers that 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. When such specifications are 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; 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 consequences 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 sigh 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 EUROCONTROL draft specification for THE USE OF MILITARY UNMANNED AERIAL VEHICLES AS OPERATIONAL AIR TRAFFIC OUTSIDE SEGREGATED AIRSPACE. It is

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For such UAV It might be recommended to develop a special condition defining the minimum requirements for the launch and recovery zones. Independently of the safety aspect, the environmental aspects of the flight at low altitude must be addressed. The acceptable noise level limit will have to be discussed during the establishment of the certification requirements. 6. AIRCRAFT SEPARATION & AIRCRAFT COLLISION AVOIDANCE In the today ATC world, ATC Controllers are in charge of "aircraft separation" and pilots applying the "see & avoid" principle are in charge "to detect and prevent" collisions. Such a concept based on application of operational rules has been able to survive only by generalization of transponders and introduction of TCAS / ACAS, to complement and supplement pilot physiological limitations. 6.1. UAV specificity In aviation "see & avoid" principle is considered by most of the authorities as an "inadequate" principle to prevent collision. Due to death zones, and pilot physiological limitations the "see & avoid " concept allows pilots to only avoid less than 90% of the potential collisions, and in case of closing speed of more than 400kts less than 50% (figures from ATSB (Australian Authorities) "Limitations of the See-and-Avoid Principle"). It might be an illusion to believe that a similar concept based on technology (sense & avoid) and having a collision avoidance objective equal (as a minimum) to the "see & avoid" principle will be the answer to allow operations of UAV in the controlled airspace. If "see & avoid" principle is judged inappropriate, "sense & avoid" might also be. 6.2. Single European Sky & ATM Due to the inadequacy of the "see & avoid" principle, there is a need for the future ATM of the SES for a new approach of aircraft separation and collision avoidance. UAV by its specificity might be used as a spur to promote and request such a new concept. A concept which will no longer be based on application of operational rules, but on application of a method similar to the method used for certification of aircraft systems (1309 paragraphs). A method using safety analysis to demonstrate the safety objectives, and allowing elimination of all common points. 6.3. Action Dassault Aviation recommends that EASA takes an initiative in this direction. The EC SESAR program can be an excellent opportunity to develop such a new concept for "Aircraft Separation and Collision Avoidance". 7. OPERATIONAL ASPECTS EASA recalls that operational activities are not today part of the EASA activities. Nevertheless as the "general objective is to allow "routinely operations of UAV in non segregated airspace". The operational aspects must be treated during the same time frame than the establishment of the certification regulations. As suggested in (IV 4 d) of the explanatory note, EASA must take the initiative "to act as a coordinator of the various organizations potentially involved in the regulations of this type of activity". Eurocontrol, JAA, and may be FAA & ICAO might be involved in the process which will involve also the industry associations as Eurocaé, ASD & Euro UAV ICB. A close coordination with the US (Access 5, RTCA, & FAAA) might probably be necessary. 8. CREW FORMATION AND LICENSE EASA must also take the initiative to act as a coordinator for adoption of minimum requirements for the definition of the role and responsibility of each UAV crew member, and on the content of the pilot program syllabus qualification and license. 9. SECURITY ASPECTS Again EASA must also take the initiative to act as a coordinator for the definition of the requirements in the domain of security. JAA/Eurocontrol task force has initiated the work. Definition of minimum requirements on the security aspects is mandatory to allow normal operation of the UAV in the non segregated airspace. And to allow routinely operations independently of the request to obtain approval for each mission of all the concerned states. *** SEE ALSO ATTACHED CHART ***	proposed to do so by reviewing the specifications of the above mentioned document that have an impact on 'airworthiness' and built on this review. A very preliminary review of the EUROCONTROL document (Reference 07/08/09-42 version 1.0) indicates that its specifications UAV2, UAV3, UAV5, UAV6, UAV7, UAV8, UAV9, UAV11, UAV12, UAV13, UAV14, UAV15, UAV18, UAV19, UAV20, UAV22, UAV 29, UAV31 would have an impact on the design of the UAV and its systems. Relative to 7 and 8 operational aspects and crew formation and license: theses issues will be handled by EASA when it will become competent for them. They are part of the building blocks and road map for a comprehensive framework for UAV regulation. Relative to 9 security aspects: Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Justification

Comment	Response
Cmt. ***Dassault*** COMPARISON BETWEEN THE TWO ALTERNATIVES REASONS TO SELECT “ALTERNATIVE II” The purpose of the methods (both) is to determine the most appropriate regulation applicable to a given UAV. By regulation it might be understood, regulation code and global safety objectives. Both methods use kinetic energy to characterize the crash lethal area and so to define the objectives. The purpose of alternative I is to define for a given UAV the civil regulation to be used (CS-23 or CS-25). Consider a medium size (8 tons) twin engine business jet, aircraft modified to become an UAV. Application of alternative I will permit to determine that the aircraft and the UAV have the same kinetic energy and so have to use the same certification regulation code ; in this case the CS 25. The global safety objective will be set around 10-7. This example demonstrates that alternative I method does not take into account the absence of people on board to reduce the global safety objective applicable. In the same conditions, application of alternative 2 method will provide a different result. The global safety objective for the UAV will be reduced compared to the business jet aircraft and will be set around 5.10-5. As stated in the explanatory note of the A-NPA, unlike civil aircraft which have safety objectives oriented to the protection of onboard people, UAV (no people on board) will have their safety objectives oriented to the protection of on ground people. In this context, the safety objectives must not be the same for a civil aircraft than for a UAV. So to come back to our "8 tons business jet", it is logical that when operating as an UAV the safety objective will be reduced compared to the objective requested when it operates as a transport aircraft. Only alternative II is able to permit and to provide the elements to compute the safety objective reduction. note : In addition the UAV safety objectives must be coherent with the safety objectives of the flying aircraft (i.e.: combat aircraft) and in no case these objectives must call into question the airworthiness of existing aircraft as the military aircraft. CONCLUSIONS As alternative I does not take into account any evolution in the methodology of determining safety objective of UAV compared to aircraft. This method is only adequate for application on UAV with people onboard and inadequate for UAV with no people on board. Alternative II is a pragmatic method which will permit to evaluate for each UAV the global safety objective. Alternative II is a method which will allow creation and determination of UAV categories and definition for each category of the corresponding safety objectives. The method has no direct vocation (except on specific case) to be used directly by the UAV postulant, to justify their system on a case per case. The method can also be used to justify reduction of safety objectives for UAV used in specific conditions and operations (flight over ocean or in reserved area). (*)It might be interpreted based on some elements of the explanatory note, that kinetic energy should be an argument of comparison between the two alternatives. Understanding that the first one will be based on kinetic energy by opposition to the second which will not be. “Alternative 2” is purely and only based on kinetic energy. ***Justification***	Not accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Comment	Response
Cmt. ***Israel Aircraft Industries Ltd*** Dear Yves Morier I am pleased to send you hereafter my comments, on behalf of Israel Aircraft Industries, Malat Division on the A-NPA 16/2005 about UAV System Certification Policy. Please note that some of the attached comments parallel or complement those sent to you by Euro UAV ICB (to which we were also involved and that we thus obviously share as well), bringing some additional perspectives and suggestions. As someone having been privileged to actively participate to the work of the JAA Eurocontrol UAV Taskforce on behalf of USICO EC project, I have been especially pleased to see that the A-NPA concretely proposes a continuation and I would like to sincerely thank EASA and you for your personal efforts in bringing about this A-NPA. As UAV manufacturer, we hope this will eventually open the door to the concrete handling of Civil UAV Airworthiness Certification process and this is the reason why we fully support the “Option 2” approach. We are nevertheless not less aware that this a necessary step but not a sufficient one, and that all other operational aspects have to be equally treated. This also the reason why we support the idea of going further than this welcome first step towards a more comprehensive set of rules allowing UAV operations with no or with a minimum set of operational restrictions. This is the rationale behind our attached comment on EASA role. I remain at your entire disposal for any further clarifications or technical support you may need, Yours faithfully Michael Allouche IAI-Malat Airwort	Noted. The Agency thanks the commentator for his support.
Justification	

Comment	Response
Cmt. ***CEV***	
A-NPA Analysis Advanced notice of proposed amendment (A-NPA) N° 16/2005 The Advanced notice of proposed amendment (A-NPA) N° 16/2005 is an EASA project that will allow to explore all possible ways in order to settle an airworthiness regulation applicable to UAVs. The A-NPA asks the readers for comments on the proposed solutions. UAV definition is given at page 25, paragraph B.c) : "an aircraft that is designed to operate with no human pilot on board". This definition includes two categories of UAVs : those who bring no human being on board and those who may (passengers for example). No known UAV currently belongs to the second category. Social and psychological factors from the professional aircrew community as well as from the public are such that this type of UAV does not constitute today any urgent technical or commercial pressure. Such is not the case for totally unmanned UAVs. These UAVs represent a growing activity that demands urgently the creation of regulations to reach integration in general airspace. This first category of UAVs, strictly unmanned, will only be considered in the rest of this document. For this category, the regulation will have to define very accurately the applicable safety criteria. The A-NPA introduces in page 10, paragraph A.V.2.a) three possible options : - The first option, "do nothing", is not reasonably imaginable; - The second option suggests to adapt civil type certification on a case by case basis. This adaptation would be based on general principles of current civil certification and on special conditions that would be written for all special features of the UAV; - The third solution, presented as the ultimate goal, consists in the elaboration of a complete airworthiness regulation that would be applicable to UAVs. This solution is presented as very ambitious, based on the fact that "mature drafts are not yet available". Solution 2 is, as it was stipulated in the A-NPA, a short term vision that will not allow to reach integration of UAVs in general airspace. The complete development of an airworthiness code applicable to UAVs (third solution) is the only way that can lead on a short term basis to this integration. Thus this third way is the one that should be followed starting from an existing foundation : the UAV Systems Airworthiness Requirements (USAR) is a complete airworthiness code applicable to UAVs. It was elaborated by CEV with the support of French aeronautical industry (EADS, Dassault Aviation, Thalès and Sagem). The latest version of this document, 3.0, is recognised and applicable since it was published early 2005 for all new French MOD UAV systems falling within its applicability boundaries. The USAR code is a mature document and is currently being studied at NATO by the "USAR Specialist Team" working group that aims at giving to this document an international applicability. The USAR code is based on the CS-23, established by EASA, and is thus fully coherent with EASA regulation to which it could be integrated as a complete airworthiness code applicable to unmanned UAV systems. By definition, the USAR code respects a conventional approach as described page 6 paragraph A.IV.4.c.iii.a). As very rightly concluded in paragraph A.IV.4.c.iii.c), this conventional approach is to be preferred, generally speaking, to a safety target approach that would be associated with operational limitations. However, as also mentioned in the A-NPA (attachment 2 of the explanatory note), CS-25.1309 or FAA AC23-1309 type safety objectives should be taken into consideration. The USAR code is again fully compliant with this request : USAR.1309 completed by its AMC1309 (b) precisely integrates safety target notions as recognised currently worldwide in civil aviation. Furthermore, USAR is totally coherent with the logic detailed in the A-NPA : by conception, the USAR code respects equity and equivalence (paragraph A.IV.4.c.i) page 6). Responsibility and transparency as far as aeronautical traffic is concerned do not belong to airworthiness issues and will have to be treated with the relevant authorities involved with operational matters. However, the USAR code has no reason to be less compliant with these requirements than CS-23 on which it is based. USAR specifically deals with the complete UAV system. Ground control stations, communication links for UAV(s) control and launch and recovery elements (as mentioned in paragraph A.IV.4.c.ii) page 6) are dealt with in dedicated USAR paragraphs. The A-NPA, favouring hypothesis n°2, offers a choice between two methods in order to select the appropriate civil airworthiness code for each type of UAV : the "Kinetic Energy" method is based on the calculation of kinetic energy in the cases of unpremeditated descent and loss of control. A direct comparison with manned aircraft kinetic energy gives the applicable code for the involved UAV. The second method, called "method based on safety objectives", conducts a complete calculation of the risks encountered by the population on the ground. The lethal area is calculated from the kinetic energy of the aircraft and the dimensions of the UAV. A comparison with the corresponding lethal area for known manned aircraft allows to choose the appropriate code. In comparing the choice given by these two methods, it is necessary to go back to the initial purposes of an airworthiness regulation : the goal of airworthiness is to guaranty a level of safety, i.e. a number of victims per flight hours that is deemed acceptable. Today, this probability calculation, that only applies to manned aviation, only takes into account people on board the aircraft. The current probability calculation is thus essentially irrelevant for unmanned UAVs that do not have any human being on board by definition. The "Kinetic Energy" method that is based on these manned aviation principles is thus hardly justifiable for unmanned UAVs. The probability of victims per flight hours has to be recalculated from the start based on real potential victims that are, by definition, people on the ground. In this context, the "method based on safety objectives" that takes into account on ground populations is the only one that is applicable to unmanned UAVs. This method leads to choosing CS-23 as the equivalent for all currently existing UAVs' airworthiness, which is the reason why the USAR code was based on the CS-23. Although the "Kinetic Energy" method leads to applying CS-25 for the heaviest UAVs, the application of CS-23 following the second method would not in the least constitute an "un-equal treatment" compared to civil aircraft on the contrary to what is suggested in page 13 paragraph A.V.4.a.ii) : it is the mere application of the most rational method. On the contrary, it is unrealistic as well as inequitable to demand from industry over-	Partially acepted 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. This code has served as a basis for the development of a NATO standard. USAR is not the comprehensive framework for UAV regulation as envisaged by option 3. It does not address 'sense and avoid', operational regulations and flight crew licensing regulations. The Agency recognise however that USAR has been developed using a methodology closely related to the one described in the policy and accept to consider USAR version 3 as an acceptable means of compliance to the policy provided that: • Its applicability is limited to the scope of present CS-23 • The safety targets included in the safety analysis reflect the ones resulting from the application of the EASA UAV policy.

Comment	Response
specified safety standards that are based on hypotheses not applicable to UAVs. Conclusions : European airworthiness authorities must have the ambition of allowing UAVs to be integrated into general airspace. The case of strictly unmanned UAVs has to be dealt with urgently. To this aim, a complete airworthiness code applicable to UAVs has to be published. It must be based on a conventional approach, i.e. on the adaptation of an existing and recognised regulation that would take into account UAVs' specificity (ground control station, communication link, ...). Safety objectives such as those of FAA AC23-1309 or CS-25.1309 must be included in this adaptation. Using such an approach will allow equity and equivalence principles to be respected compared to manned aviation. Today a mature document meets all of these requirements : the USAR code. ***Justification*** ***Cmt.*** ***CEV*** Following the request for comments on the Advanced Notice of proposed amendment, A-NPA N°16/2005 (reference a), please find hereafter the French flight test centre's (CEV) A-NPA 16/2005 analysis. This initiative from EASA will be an inevitable step for the development of modern unmanned aerial vehicles (UAVs). Concretising such steps in UAV airworthiness will allow subsequent technological progress that will be the foundation stone for integration of UAVs in general airspace. Solving "sense and avoid" issues will be one of the most important means to that aim. Manned aircraft could then directly benefit from such progress, necessary to UAVs : the application of "sense and avoid" technologies to manned aircraft could bring an efficient solution for the prevention of mid-air collisions that are an important concern to all airspace users amongst which the CEV. For the purposes of UAV flight tests, CEV experts had to apprehend concretely all aspects connected to flight safety. These safety concerns led to the creation and application of specific rules to deal with new issues. It also appeared that UAV integration in general airspace will not be possible without an equivalent to manned aviation airworthiness rules. Drawing this conclusion led the CEV, under the direction of the programs offices of the French defence procurement agency (DGA), to elaborate the UAV Systems Airworthiness Requirements or USAR code. This code, adapted mainly from CS-23 was approved by main French industries involved in UAV activities and is also recognised by French official services. The USAR will be the base for future French or even European UAV programs. It is also being studied by the NATO-FINAS "USAR Specialist Team" (UST) working group. If agreed by all participating nations, the USAR code could have a NATO legitimacy at the end of this working group by 2007. In this context, I am very honoured to offer the experience acquired by CEV for the purposes of EASA so that development of UAVs' activities can be completed. Steps forward in this domain could be extremely valorous to solve current general aviation issues such as prevention of mid-air collisions. ***Justification***	Noted The encouragements form the commentator are welcome.

Comment	Response
Cmt. ***IFATCA*** Attachment – IFATCA response to ICAO AN 13/55-IND/05/15 SECTION 4–Need for development of ICAO provisions and guidance material A. Yes. There is a requirement to have an ICAO definition of a UAV. Some definitions of UAVs refer to “no human pilot onboard” (as opposed to “no person on board”). Provisions should require that operation of UAVs in non-segregated airspace must be in full compliance with ICAO requirements for aircraft, include requirements to comply with Air Traffic Control clearances and instructions. Provisions must specify what, if any, limitations are placed on UAVs as an aircraft – for example if UAVs may carry dangerous cargo or passengers, operate other than Instrument Flight Rules (IFR), etc. or alternatively what requirements must be met in order for these types of operations. If UAVs are permitted to operate in non-segregated airspace where UAVs do not receive a separation service, then provisions must be established for when, if ever, “sense and avoid” qualifies as “see and avoid”. Provisions for collision avoidance requirements for all UAVs operations must be developed. Early sections of this questionnaire were limited to international airspace, however the mixed operations of UAVs with other traffic on aerodromes must also be addressed in due course, in particular if UAVs use taxiways and runways then compliance with aerodrome signs and instructions at controlled aerodromes. Byes Provisions regarding “Due Regard” operations should be reviewed considering applicability for UAV operations. SECTION 5-Any other comments The frequency of state, and in due course civil, UAV operations is expected to continue its rapid growth. It is considered that a major reason for the slow growth of civilian UAV operations is alack of regulatory framework. UAV operations are very broad and so there may need to be provisions developed for various categories, and even the categories need to be defined. UAVs vary in weight (a few kilos to several tonnes), in flight time (a few minutes to several days or even longer), in altitude (from a ceiling of a few hundred feet to high altitude operations), and, type of lift generation (lighter than air, rotor craft, para-foil, fixed wing). It is a generalisation to a broad category, however UAV operations do not appear as yet to be as reliable as other aircraft operations. Particular consideration should therefore be given to UAV flights that malfunction or are in any other way unable to comply with authorised instructions (for example flights in controlled airspace). There may be the need for special termination of flight procedures for some UAVs, especially if humans are placed in danger. IFATCA last year commenced development of policy on UAVs. Policy developed so far states “All Unmanned Aerial Vehicle operations in non-segregated airspace must be in full compliance with ICAO requirements. Air Traffic Controllers must not be expected to handle a UAV in a different way from any other aircraft for which they are providing a service.” IFATCA prioritised development of policy on “sense and avoid” as the next step, expected for completion in March 2006. IFATCA identified other issues, inter alia,that need to be addressed for UAVs to operate in a safe manner as: a) Ability to comply with the rules of the air; b) Airworthiness; c) Control method, controllability and maneuverability; d) Flight performance; e) Communications procedures and associated links; f) Security; g) Emergency actions, reversionary or failure modes in the event of degradation of any part of the UAV and its associated control and/or relay stations; h) Actions in the event of lost communications and/or failure of onboard ‘sense and avoid’ equipment; i) Ability to determine real-time meteorological conditions and type of terrain being over flown; j) Nature of task and/or payload; k) Autonomy of operation and control; l) Method of sensing other airborne objects; m) UAV operator level of competence; n) ATC communications, procedures and links with control station; o) Means of launch/take-off and recovery/landing; p) Reaction logic to other airspace objects; q) Flight termination; r) Description of the operation and classification of the airspace in which it is planned to be flown; and s) UAV physical characteristics. These have not yet been prioritised.	Noted This reply was prepared for the ICAO survey. Several of the elements mentioned in the comment are already taken into account by the policy.
Justification	

Comment	Response
Cmt. ***UAV DACH*** During review of the A-NPA it was found that different people had a quite different understanding or interpretation of the same wording. One general reason is that a "policy" is always a kind of conceptional approach which can never be as clearly defined as a fixed "certification standard", but these differences were also caused by - multiple cross-references - multiple recurrences of the same circumstances in different parts of the A-NPA (explanatory note, policy, and appendices) - the complex (somewhat confusing) structure of the A-NPA - the language: For most people dealing with the A-NPA English is not their native tongue, which may lead to different readings. Please consider that all comments to the A-NPA must naturally be based on what the reader of the A-NPA has understood. If the reader understood the A-NPA differently from what EASA has originally meant, then EASA might get the feeling that the comment does not fit, and consequently reject the comment, but this could also be a hint for a general misunderstanding between the author and the reader of the A-NPA. ***Justification***	Accepted The Agency agrees that the A-NPA was not an easy document to read. The policy will be published with its two attachments separately and should be easier to read. The CRD will be published for two months for comments and that will alleviate the risk of mis-undersatnding by allowing the commentators to see the reply made to their comments.
Paragraph **All paragraphs** ***Cmt.*** ***Dassault*** Purpose of this item is to provide EASA with Dassault Aviation general point of view on all aspects of UAV certification & operation. These comments are provided as an annex to this document annex : SL2006-07d A-NPA General Comments.doc ***Justification***	Noted Please see the detailed reply to your comments.

Comment	Response
Paragraph **Alternative II, Paragraph 1 – Context (Page 37)** **Cmt.** *CAA, UK* Acceptability of departing from the standards for manned aircraft. The fact that civil aircraft continue to be allowed to fly must mean that the safety targets defined or implied by JARs and FARs are acceptable, at least for the time being. The JARs and FARs represent the minimum acceptable standard that must be achieved before an aircraft will be granted certification. Aircraft Design Organisations will of course try to produce the safest design, which should therefore be well in excess of the defined standards. Apart from the natural tendency for designers to try to produce the best solutions, in the event of accidents they may be called upon to demonstrate in a Court of Law that they did everything that they could reasonably be expected to do to ensure safety. This leads to the widely recognised “ALARP” concept of reducing risk to “As Low As Reasonably Practicable”. Manned aircraft continue to be certificated to the JARs and FARs and so their systems are complying with the existing JAR xx.1309 criteria. It follows that it is “reasonably practicable” to meet those criteria with today’s technology. Why then should there be any consideration of setting less demanding standards for UAVs? It is almost certain that at some time in the future someone on the ground will be killed by a UAV. When that accident occurs and the UAV designers and airworthiness regulators are called to give evidence to the inquiry, how will it be justified that standards were set for UAVs that allowed their systems to be less reliable, (perhaps by factors of 10 or 100), than those of equivalent manned aircraft? Military pilots welcome UAVs when they are used to complete the most hazardous missions in place of manned aircraft. In the civil market benefits to pilots are less obvious and UAVs may instead be seen simply as a major threat to their continued employment. Bodies representing the interests of pilots may look for means to discredit UAVs, and the safety of UAVs would be an obvious area for them to concentrate on. If civil UAVs are to become a reality the industry must gain the acceptance and confidence of other airspace users, and the general public, (through the news media). Setting and meeting standards for UAVs that are equal to or more demanding than those for manned aircraft is a good starting point for acceptance. To set standards for UAVs that are less demanding than for manned aircraft is to start from a position of weakness and invite criticism. Conclusion - Attempting to justify less demanding reliability criteria for UAVs compared with manned aircraft may be an obstacle to the acceptance of UAVs for civilian use and may damage the interests of their manufacturers.	Noted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification	

Comment	Response

Paragraph **Alternative II, Paragraph 1 Context (Page 37)**

Cmt. ***CAA, UK***

The basis of civil safety targets Under paragraph 1 “Context” the proposal states that the existing civil aircraft safety objectives as defined by FAR/JAR 25/23 are “oriented to on board people protection”. This is not a correct statement. The FARs and JARs are notified to ICAO as meeting the provisions of Annex 8 to the ICAO Convention. The “Foreword” to Annex 8 to the ICAO Convention says: According to this policy: a) the objective of international airworthiness Standards is to define, for application by the competent national authorities, the minimum level of airworthiness constituting the international basis for the recognition by States under Article 33 of the Convention, of certificates of airworthiness for the purpose of the flight of aircraft of other States into or over their territories thereby achieving among other things, protection of other aircraft, third parties and property;” It should be noted that the safety of occupants is not mentioned. This is because the main reason for setting up ICAO was to allow aircraft to cross borders without inspection by the officials of every State to be overflown. Agreement of the member States to this freedom of overflight was conditional upon standards being set that would protect the people being overflown. So in fact, JARs and FARs contain ICAO requirements to protect people on the ground, plus cabin safety requirements to protect the occupants of aircraft. Conclusion - The argument for making the requirements less demanding because there are no occupants is not well founded.	Noted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

Comment	Response
Paragraph Attachment 2 general (Page 18) **Cmt.** *CAA, UK* This says that a safety target will have to be established to meet 1309. It is fundamentally important that the same safety objectives should be used as for manned aircraft i.e. the risk of a catastrophic failure (an aircraft hitting the ground even if no fatalities) should be extremely improbable etc and the safety target for extremely improbable should be the same as for a manned aircraft of comparable size. (Size matters see Lockerbie.) Otherwise the risks to third parties will change. The logic behind this is that we don't really know what the risks are to third parties (especially on the ground away from airports). But we do know that we don't want the risk to these people to be any greater than from a manned aircraft. If the same safety requirements and safety targets are applied as for a manned aircraft this should be achieved. **Justification**	Accepted Several comments addressed the UAV system safety analysis and its detailed objectives. The guidance relative to the safety analysis contained in attachment 2 of the policy envisaged by the A-NPA is expressed in qualitative terms. Such terms are applicable for all categories of UAV. Quantitative values to be used should be those used for the 1309 analysis contained into the manned CS that has been selected as a starting basis for the certification of a given UAV. As a result, numerical values will depend of the selected CS. However the Agency accepts that the guidance provided with the policy need improvements. It will be kept as it is for the first issue of the policy but EASA plans to ask EUROCAE WG-73 to further develop the guidance based on the comments received on the A-NPA.

Comment	Response

Paragraph **Chapter IV The A-NPA background purpose and selected issues**
Section 4 c iii a) Two possible approaches for UAV, Page 6

Cmt. ***EADS, France***

The “conventional approach” and “Safety Target approach” presented in the A-NPA for supporting the UAV System airworthiness and certification process shall not be opposed but considered as complementary.	Partially accepted Some comments queried the detailed presentation of the two approaches when the Agency seemed to have decided to use the conventional approach. 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.

Justification

EADS MAS-F agrees with the Policy proposal related to the establishment by any Applicant of a UAV System Type Certification Basis on the grounds of :
(a) the selection of appropriate existing certification specification for manned aircraft (see EADS MAS-F Comment Form 2),
(b) the definition of UAV System safety objectives and criteria (adapted from AMC 1309),
(c) Special conditions & interpretative materials related to UAV specifics.
Special conditions in (c) will define the detailed airworthiness requirements based on existing regulations and tailored to UAV categories.
EADS MAS-F considers USAR Version 3.0 (January 2005) as a sound candidate reference document to enable the Applicant to review, consolidate and justify the airworthiness requirements, at least for long endurance UAVs.
The “conventional approach” will then be respected according to (a) and (c) above, but the emphasis shall be put on the “Safety Target approach” for selecting the manned aircraft requirements to be tailored in (a) and the safety objectives and criteria in (b).

Comment	Response
Paragraph Cover page **Cmt.** *BMVBS, DE* The abbreviation UAV is spelled out as Unmanned Aerial Vehicle. It should be repeated in the text under definitions again. In addition the now common used term Uninhabited Aerial Vehicle could be used instead. **Justification** In accordance with Articles 2 and 3 of the EC Treaty (gender mainstreaming) as well as Article 141 and Article 13.	Noted Some comments have raised the issue of the acronym that should be used. The policy presented by the A-NPA uses the acronym UAV. Other bodies such as FAA or the EUROCAE WG-73 are using UAS for Unmanned Aerial Systems. The Agency policy is to approach the UAV as a system and the policy uses several times the words UAV systems. Therefore the Agency will use UAS to align with other important partners and the policy will be modified accordingly.
Paragraph everything - general comment **Cmt.** *UAV DACH* During review of the A-NPA it was found that different people had a quite different understanding or interpretation of the same wording. One general reason is that a “policy” is always a kind of conceptional approach which can never be as clearly defined as a fixed “certification standard”, but these differences were also caused by - multiple cross-references - multiple recurrences of the same circumstances in different parts of the A-NPA (explanatory note, policy, and appendices) - the complex (somewhat confusing) structure of the A-NPA - he language: For most people dealing with the A-NPA English is not their native tongue, which may lead to different readings. Please consider that all comments to the A-NPA must naturally be based on what the reader of the A-NPA has understood. If the reader understood the A-NPA differently from what EASA has originally meant, then EASA might get the feeling that the comment does not fit, and consequently reject the comment, but this could also be a hint for a general misunderstanding between the author and the reader of the A-NPA. **Justification**	Accepted The Agency agrees that the A-NPA was not an easy document to read. The policy will be published with its two attachments separately and should be easier to read. The CRD will be published for two months for comments and that will alleviate the risk of mis-undersatnding by allowing the commentators to see the reply made to their comments.
Paragraph Explanatory Notes Section V para 2 a (Page 10) **Cmt.** *CAA, UK* This para suggests that the limited operation of UAVs as at present in segregated airspace ‘will not introduce new safety risk’. This statement is too sweeping and should be removed. **Justification**	Accpeted The taxt will be modified accordingly

Comment	Response
Paragraph IV. 4 c. (iii) UAV airworthiness and certification (Page 6) **Cmt.** *CAA, UK* 2. Lethal Area 2.1 The figures calculated for lethal area do not seem to make sense: 2.2 Take the case of the single-piston engine light aircraft of 800 kg. The quoted calculated area is 37m2 . If this area is a circle it has a diameter of 7m. Most aircraft of this class have a wingspan in excess of this. The lethal area stated is not large enough to contain the aircraft. For the calculated lethal areas to be so small there must be an assumption in the method that the crash velocity is mostly vertically downwards. This does not address the typical emergency landing case that is a very common occurrence with part 23 single piston aircraft: - A typical single-engine Part 23 aircraft that has suffered loss of power will seek to land in a suitable field. The typical ground roll for such a landing is about 250 metres. The wingspan of the aircraft is about 10 metres, so the lethal area swept by the aircraft during the most typical potentially hazardous emergency is 2500m2. This is much more than the 37 m2 calculated by the method. Conclusion - The calculation of lethal area does not make sense for all classes of aircraft in the table, and does not address the most common emergency scenarios.	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

Comment	Response

Paragraph **IV. 4 c. (iii) UAV airworthiness and certification (Page 6)**

Cmt. ***CAA, UK***

Specific Issues: 1. Crash Energy - 1.1 The relationship between crash velocity and lift coefficient (or wing loading) is only valid if the aircraft is upright and the flight path is within about 30 degrees of horizontal. When an aircraft is descending out of control its lift coefficient may be near zero and may be oscillating between positive and negative. Also there are conditions where there is no relationship between velocity and lift coefficient - e.g. an aircraft that is spinning has a low lift coefficient but also a relatively low velocity. 1.2 If an aircraft crashes following a descent during which the relationship between lift coefficient and velocity is maintained the largest component of velocity will be parallel to the surface rather than at right angles to it; in which case the lethal impact area will resemble a rectangle with the small side approximating to the wingspan of the aircraft, and the long side the distance taken to come to a halt - see 2.2 on comment page 11. Conclusion - The assumed relationship between crash energy and wing loading is not reliable	Accepted In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.

Justification

Comment	Response
Paragraph IV. 4 c. (iii) UAV airworthiness and certification (Page 6) **Cmt.** *CAA, UK* Population Density - The proposal suggests a standard population density of 100 persons per km2, varying between 30 per km2 for rural areas and 200 per km2 for "overpopulated" areas. Representative large UK towns are not as densely populated as a typical UK city. A UK town with a population of about 100,000 may cover an area of about 40 km2, (a square with sides 6.4 km). So the population density is about 2500 per km2. A typical UK city would have a higher population density. Conclusion - The proposed maximum population density of 200 per km2 for "overpopulated" areas is far too low. For towns in the UK the figure should be at least 12 times greater, and for cities higher still.	Accepted The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results therefore there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make an informed decision. The review of all comments relative to the appropriate method for selecting airworthiness codes indicate 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 does not reflect population densities in several countries of Europe. The criteria selected for the lethal crash area does not reflect a forced landing. In addition as this methods leads to unequal treatment of manned and unmanned aircraft of identical maximum take-off mass there will be public perception issues. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification	
Paragraph **para IV 4 c v of the explanatory note** **para d of the policy** **Cmt.** *Euro UAV ICB* Definition: Control Station (CS): A stand-alone variant of "Command & Control Element" from which a UAV is subject to command and control for all phases of flight. There may be more than one control station as part of a UAV System. A Command & Control Element may deal with two or more UAV. The CS shall be considered as an aeronautical product, which has significant influence on the level of flight safety of an UAV System (pending on the ability of the airborne element(s) to execute processes or missions using on-board functional capabilities). The UAV system integrator has to show during the type inspection process that the UAV System as a whole [airborne element(s), CS(s), data link element(s) and other elements as launch and recovery elements(s)] is airworthy. The CS has to be certified together with the UAV System, which will be approved by the certification authority by a 'Type Certificate' for the relevant UAV System. This is recommended as the initial approach with the possibility to have a certification basis for UAV in a relatively short time. As a future step it would be beneficial to have the possibility to certify the CS separately from the air vehicle and the other UAV system elements. This could help type certification of the same CS with different	Not accepted Several views were expressed here and not all views were in line with the present EASA Regulation (1592/2002). 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. The Agency accepts that this leads to operational limitations. The policy may be re-evaluated in the future taking into account experience gained but this will need to modify the existing regulatory framework.
Justification	

Comment	Response
Paragraph **Policy § d, f, Attachment 2 Refer also to Explanatory Note IV 4c iii and iv, Attachment 2 and Attachment 4.**	

Comment	Response
Cmt. ***Euro UAV ICB*** - ICB agrees that the UAV Type Certification Basis shall be defined based upon a set of applicable requirements comprising the three "ingredients" identified in the proposed NPA policy § f 3 - It is however proposed to use the System Safety Objectives and Criteria (affecting both the UAV system as a whole and its elements) as a starting point in order to select the manned aircraft requirements to be tailored (for the Air Vehicle element and partially for the Ground Control Station element), to which should be added special conditions covering specific UAV system features as stated in the proposed NPA policy, Attachment 2 § 4. - The principles of the "Alternative 2" method provided in Attachment 2, Appendix 1 should be used to define three basic UAV categories, to which shall be associated o Appropriate Quantitative System Safety Objective (defined as indicated in Attachment 2 § 3 i.e. the probability of the sum of all system failure conditions leading to a UAV Catastrophic event. O Relevant Manned Certification Specification to be tailored (being understood that the relevant CS "1309" will be aligned with those System Safety Objectives and Criteria). - The parameters presented in "Alternative 2" method i.e. acceptable ground victim criterion, kinetic energy, lethal surface area and population density constitute the principles for an appropriate rationale to determine the Overall System Safety Objectives of different UAV categories (as already implied in Attachment 2 § 3). Final values of these parameters should however be fine tuned and established on a consensual basis (e.g. through a dedicated Working Group). - It is expected that an appropriate order of magnitude for the System Safety Objective would be in the region of 5.10-5 /h : such System Safety Objective would be defined as the probability of UAV Catastrophic Event resulting from the sum of all individual Catastrophic system failure conditions.	Accepted for the 'ingredients' not accepted for alternative II In the conventional approach, one issue is to select 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 it would retain only after having reviewed the comments: • One method is based on kinetic energy consideration • One method is based on safety objectives consideration. The Agency believes that the two methods proposed for selecting the relevant manned CS will not lead to equivalent results (For example the safety objective method would allow to certify a UAV with a maximum take–off mass of 20 000kg using CS-23 when the kinetic energy considerations method would require in such case the use of CS-25). As a consequence there is a need to make a choice. The purpose of the consultation was to get further information to allow the Agency to make such choice in an informed manner. 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: as explained above, 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.. The Agency concurs with these comments and will include in the policy only the kinetic energy method. However the Agency plans to further study the method based on safety criteria in cooperation with the EUROCAE WG-73 on UAV.
Justification - UAV Type Certification shall address the UAV System as a whole and then its various elements i.e. Air Vehicle, Communication Link and Ground Control Station. - It is thus natural that the UAV System Safety Objectives should be used as a driving factor in establishing the Type Certification Basis and then derive appropriate airworthiness requirements for UAV System elements, including tailored manned Certification Specification for the Air Vehicle. - Alternative 1 method first focus on the Air Vehicle and then derives System Safety Objectives to be applied from the selected Certification Specification. It does not allow to primarily deal with the specific safety issue related to UAV i.e. protection of the people on ground as opposed to protection of onboard passengers. This in line with the proposed NPA policy Attachment 2 § 3 which states that the overall quantitative System Safety Objectives may take account (among other factors) the potential subsequent ground fatalities resulting from a UAV Catastrophic event. - The proposed comments only emphasize and somewhat enlarge what the current proposed policy already acknowledges under Attachment 2 § 3 i.e. that "System Safety Criteria set forth may be considered when assessing specific sections of the EASA selected Certification Specifications'. - At last, these ICB comments (which do first acknowledge the need for a complete set of airworthiness requirements, including tailored Certification Specification for the Air Vehicle) should not be interpreted as favoring the Safety Target Approach versus Conventional Approach. They rather aimed at providing the System Safety Objectives with their appropriate weight and focus within the complete set of UAV System Airworthiness requirements.	

Comment	Response

Paragraph **Policy d, f**
Explanatory Note IV 4c iii , Attachment 2 and Attachment 4.

Cmt. ***Israel Aircraft Industries Ltd***

- The debate “Safety Target” versus “Conventional Approach” should, eventually, not be presented as “one approach against the other” but rather as complementing each other. - s long as dedicated UAV System Certification Specifications are not established, it is agreed, as stated in A-NPA Policy paragraph d, that the UAV System Type Certification Basis shall include three main components : “manned” certification specification duly tailored (in some cases), System Safety Objectives and Criteria and Special Conditions to handle specific UAV features. - Considering the fact that the UAV System is to be certified as a whole, it is only natural that the System Safety Objectives play a preponderant role, not only as design & cost driving factor, but also in defining the way reference “manned” certification specification (that essentially cover one part of the system i.e. the Air Vehicle itself) should be chosen and tailored. - In some cases (e.g. light UAV systems in the region of 200-400 kg, less complex system), the UAV manufacturer should be allowed to present as Type Certification Basis a set of essential airworthiness requirements, based upon a rationale showing that these essential requirements adequately cover the three above mentioned main TC components.	Noted 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 has tried to present both options and their evaluation in an objective way. The Agency expressed also the view that it has 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 presentation of the two options was done for transparency reasons to explain the choice made by the Agency. The purpose of asking comments was to identify if no major issue would result from the choice of the conventional approach. The review of comments on this issue reflects a general support to the conventional approach. The idea is that the conventional approach leads to certificates of airworthiness and that the safety target approach leads to restricted certificate of airworthiness. The safety target approach is mainly meant for operations above remote areas and for operations in segregated airspace. The group to develop the road map for a comprehensive framework for UAV regulations could further study the safety target approach.

Justification

- While the aim is to provide a Type Certification with a minimum dependence on operational restrictions, UAV would not be the first case where there will be some overlay between airworthiness requirements and operational conditions or limitations. The JAR AWO (CatI, Cat II, Cat III with or with no decision height) is an excellent example, where operational restrictions dictate the level of safety and redundancies required for airworthiness approval and reciprocally. ETOPS is another example. - All recent new technology related special conditions on manned aircraft (e.g. fly by wire, new cockpit displays, or even ETOPS) have made an extensive use of the 1309 approach (i.e. the safety objective approach), since it was considered as the best tool to overcome the inadequacy of conventional airworthiness requirements. In the case of fly by wire, it was recognized that the 1309 criteria may be conflicting with specific JAR requirements and this was weighed on case by case basis. The same should be true for UAV, where the 1309 approach, as tailored to UAVs, could provide an acceptable way to select manned specification to be tailored and to tackle specific code requirements which may not be appropriate or unnecessarily penalizing - It is worth being noted that the French DGA USAR Code (currently the only existing fully completed airworthiness code on UAV systems) and that should be considered as an acceptable Type Certification basis complying with the methodology presented in the A-NPA has also put great emphasis in tailoring the AMC 1309 to UAV Systems. - Light UAV systems (even above 150 kg, in the region of 200-400 kg) with safe Emergency Recovery Procedures cannot be dealt with the exact same way UAV with MTOW of 20 000 kg and the Policy should present provisions of a simplified method to establish their Type Certification Basis through the definition of essential airworthiness requirements covering all the disciplines of Air Vehicle, Ground Control Station, Communication Link.

Comment	Response
Paragraph **Policy For UAV system certification Attachment 2, Section 4.2 Page 31** ***Cmt.*** ***EADS, France*** The Policy should address the technical requirements which the UAV System has to meet in order to achieve a reasonable level of Security. EADS DS recommends to add a new consideration "Security requirements" to the section in the list of Special Conditions and Interpretative Materials related to UAVs, in addition to the "Communication link" requirements (Policy, Attachment 2, Section 4.2 page 31). ***Justification*** The need for security requirements to be taken into account by a comprehensive regulation framework for UAV Systems certification is acknowledged. Security requirements have not been included by the Agency within the current version of the Policy as : - security requirements are understood as being outside the Agency remit, - there is currently no mature security requirements document to directly support the Policy. Consequently, three options can be considered : a) Security requirements to be defined within the current Policy (including the risk that no Policy will be issued in absence of such requirements definition), b) Security requirements to be addressed by the current Policy (i.e. requirements to be submitted by the Applicant for a Type Certificate as part of its proposed Certification Basis, under the Special Conditions regime), c) Security requirements to be defined within a (future) more comprehensive regulation allowing UAVs to fly in non-segregated airspace. - EADS MAS-F does not support option a), as it will prevent the Agency to issue any Policy before months / years to come. - Option b) is considered as the best alternative (i.e. adding a new consideration "Security requirements" to the list of Special Conditions and Interpretative Materials related to UAVs). The validity of this option is however dependent on the role / evolution of the Agency as security requirements authority - currently outside EASA remit. - In absence of validity of the above alternative, option c) should be considered for the time being as part of the proposed Policy, including mitigating factors as part of the Special Condition - "Communication link" requirements (Policy, Attachment 2, Section 4.2 page 31).	Noted Many comments regret that EASA certification does not address Security issues. The Agency agrees that security is a key issue for UAV but the Agency has no remit for Security. EASA can not 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 group envisaged to develop the road-map for a comprehensive framework for UAV regulation could be used to identify how and by whom the security concern would be addressed The Agency draws the attention of the commentator to the work of the EUROCAE WG-72 Aeronautical System Security that is developing guidelines addressing security related to aeronautical systems including relevant airborne systems, relevant ground systems and their related environment but excluding land side equipment such as baggage screening for instance). UAV designers may elect to voluntarily comply with this standard when adopted to improve the security of the data-link.

Comment	Response
Paragraph UAV Task Force Final Report. 6.3.5 Aerodromes (Page 27) and 8.6 Aerodromes Recommended Actions (Page 70) **Cmt.** CAA, UK This recommended action is applicable only if the GAR is eventually adopted as the EASA IR. Of more immediate concern is that the ERs currently being drafted for aerodromes take account, as necessary, the possibility of UAV operations. In this case, the priority should be urgent as the ERs are due to go out for consultation in April 2006. It may be considered prudent to have separate landing/take-off areas, such as for Helicopters. **Justification**	Noted The comment will be passed to the experts in charge of developing the Aerodromes essential requirements
Paragraph UAV Task Force Final Report. 8.0 Aerodromes (Page 27) and 8.6 ATM Recommended Actions (Page 70) **Cmt.** CAA, UK There needs to be strict liaison between the UAV Operator and ATC. As such the technical issues suggest that operations in non-segregated areas must be under direct ATC control or close liaison. Co-ordination with Flight Information Service Offices or Air to Ground Radio Operators would not seem to be appropriate, as they do not have the same levels of authority to control the movement of aircraft. **Justification**	Noted This is not covered by the policy but will be taken into account into the development of the road map for a comprehensive framework for UAV regulation.