European Union Aviation Safety Agency

Notice of Proposed Amendment 2021-11

in accordance with
Articles 6(3), 7 and 8 (Standard procedure: public consultation) of MB Decision No 18-2015

Enhancement of the safety assessment processes for rotorcraft designs

RMT.0712

EXECUTIVE SUMMARY

The purpose of this Notice of Proposed Amendment (NPA) is to provide proportionate and cost-efficient rules in the field of the safety assessment provisions for equipment, systems and installations for rotorcraft that also maintain an overall high level of safety. In addition, the intent of this NPA is also to increase harmonisation of the safety assessment provisions for rotorcraft with their Federal Aviation Administration (FAA) equivalents.

The application of stringent safety objectives to simpler small rotorcraft creates a barrier to innovation and the installation of systems and equipment, which could improve the overall safety of these aircraft. This is due to the higher and sometimes prohibitive costs of developing systems and equipment to meet the stringent safety objectives and the costs of certification. It is often the case that due to the high costs of certification the economic justification or business case would not support the introduction of safety-enhancing equipment.

This NPA proposes a solution to the above by introducing proportionality in the safety assessment objectives for the design of rotorcraft systems and equipment and the methodology that is used to identify the presence of hazards in the design. A similar approach has been introduced by the Federal Aviation Administration (FAA) through a Policy Statement.

In addition, this NPA contains proposals that improve the clarity of the requirements for electrical installations for CS-29 rotorcraft that were previously included in the safety assessment provisions.

Domain:	Design and production		
Related rules:	CS-27 and CS-29		
Affected stakeholders:	DAHs and POA holders (rotorcraft)		
Driver:	Efficiency/ proportionality	**Rulemaking group:**	No
Impact assessment:	Yes	**Rulemaking Procedure:**	Standard

EASA rulemaking procedure milestones

Start Terms of Reference	**Public consultation** Notice of Proposed Amendment	**Decision** Certification Specifications, Acceptable Means of Compliance, Guidance Material
15.10.2018	26.10.2021	2022/Q1

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1. About this NPA

1.1. How this NPA was developed

The European Union Aviation Safety Agency (EASA) developed this NPA in line with Regulation (EU) 2018/1139[1] (the 'Basic Regulation') and the Rulemaking Procedure[2]. This Rulemaking Task (RMT).0712 is included in the European Plan for Aviation Safety (EPAS) 2021–2025. The scope and timescales of the task were defined in the related Terms of Reference (ToR)[3].

The text of this NPA has been developed by EASA. It is hereby submitted to all interested parties for consultation in accordance with Article 115 of the Basic Regulation, and Articles 6(3), 7 and 8 of the Rulemaking Procedure.

The major milestones of this RMT are presented on the cover page.

1.2. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[4].

The deadline for submission of comments is **26 January 2022**.

1.3. The next steps

Following the closing of the public commenting period, EASA will review all the comments received. After taking into consideration the comments received, EASA will issue a decision in order to amend the Certification Specifications (CSs) and Acceptable Means of Compliance (AMC) for Small Rotorcraft (CS-27) and Large Rotorcraft (CS-29).

The individual comments received on this NPA and the EASA responses to them will be reflected in a comment-response document (CRD), which will be published on the EASA website[5]. A summary of the comments received will be provided in the explanatory note to the decision.

1 Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 (OJ L 212, 22.8.2018, p. 1) (https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1535612134845&uri=CELEX:32018R1139).

2 EASA is bound to follow a structured rulemaking process as required by Article 115(1) of Regulation (EU) 2018/1139. Such a process has been adopted by the EASA Management Board (MB) and is referred to as the 'Rulemaking Procedure'. See MB Decision No 18-2015 of 15 December 2015 replacing Decision 01/2012 concerning the procedure to be applied by EASA for the issuing of opinions, certification specifications and guidance material (http://www.easa.europa.eu/the-agency/management-board/decisions/easa-mb-decision-18-2015-rulemaking-procedure).

3 https://www.easa.europa.eu/sites/default/files/dfu/ToR%20RMT.0712%20Issue%201.pdf

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

5 https://www.easa.europa.eu/document-library/comment-response-documents

2. In summary — why and what

2.1. Why we need to amend the rules — issue/rationale

The safety assessment of the design of rotorcraft systems and equipment is used to identify the presence of hazards in the design, and also to help rotorcraft designers to put in place means to eliminate the identified hazards, or mitigate the associated safety risks. Technology and techniques have evolved since the inception of formal safety assessment processes and their introduction into the CSs, and it is, therefore, necessary to maximise the probability that potential safety issues are identified during the development of a new design, in accordance with state-of-the-art safety assessment processes.

Following the publication of CS-27 Amendment 4 and CS-29 Amendment 4 in December 2016, the safety assessment provisions contained in CS 27.1309 and CS 29.1309 and the associated AMC (including the references to standards) were fully aligned with FAR 27 and FAR 29 (and FAA AC 27-1B and FAA AC 29-2C).

Since then, the FAA has published a Policy Statement entitled 'Safety Continuum for Part 27 Normal Category Rotorcraft Systems and Equipment' that provides a graduated scale of safety objectives for normal (small) rotorcraft. The FAA Policy Statement defines less stringent safety objectives than those currently contained in FAA AC 27-1B in order to facilitate the introduction of new technology. Through these less stringent safety objectives, it is expected that safety-enhancing technologies will be developed in a more affordable manner and thus become more prevalent in small rotorcraft, increasing the operational safety. In order to achieve this improvement in overall safety, new subclasses for normal category rotorcraft are defined in the Policy Statement. These subclasses are used for establishing the certification standards for systems and equipment. The FAA has defined the criteria for these subclasses based on the aircraft weight, the engine type and count, and the maximum number of occupants.

During the development of the changes to CS 27.1309 and CS 29.1309, any potential differences in the regulatory systems between the FAA and EASA were carefully considered to avoid an increase in the validation effort required to certify rotorcraft between certification partners, and to avoid the need for any subsequent changes to the type design.

The FAA has also developed and proposed changes to Part 27.1309 and Part 29.1309, which were published as Notice of Proposed Rulemaking (NPRM) 2017-23360[6] in November 2017. The changes proposed by the FAA are intended to:

— allow more flexibility in the types of assessments that the applicant can provide to show compliance;

— remove the distinction between category A and category B rotorcraft since the technologies and associated failure effects are similar across both categories; and

— reflect the fact that equipment and systems installed in some Part 27 rotorcraft are now complex and highly integrated systems.

[6] https://www.federalregister.gov/documents/2017/11/01/2017-23360/normal-and-transport-category-rotorcraft-certification

These changes, if implemented as proposed, will create Significant Standards Differences (SSDs) between EASA and the FAA, and are likely to result in a lower level of regulatory efficiency (e.g. additional validation activities, evaluation of differences, etc.). This RMT is intended to review these changes and to maximise harmonisation.

In addition, this task relates to the Article 4(2) of the Basic Regulation that requires the Commission, EASA and the Member States to introduce measures proportionate to the nature and risk of each particular activity to which they relate.

It should be noted that there are no:

— safety recommendations that are pertinent to the scope of this RMT;

— exemptions that are pertinent to the scope of this RMT;

— direct references to ICAO Standards and Recommended Practices (SARPs); or

— references to EU regulatory material that is relevant to this RMT.

2.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Section 2.1.

The specific objective of this proposal is to ensure that an acceptable safety level for equipment and systems as installed on the rotorcraft is achieved, defined and assessed during certification through the articulation of appropriate CSs and associated AMC. In addition, this proposal is also intended to reduce the regulatory differences between EASA and the FAA, and ultimately, to reduce the validation effort for industry.

2.3. How we want to achieve it — overview of the proposed amendments

Changes to CS 27.1309

CS 27.1309 generally applies to all systems on the aircraft that do not otherwise have specific requirements to analyse the safety aspects of a system. The proposed changes to CS 27.1309 address advances in technology and increases in performance of small rotorcraft that were not envisioned when this rule was originally developed. This rationale is similar to the one published by the FAA in NPRM 2017-23360. The intent of these changes is to improve and modernise rules to reflect the current state of the art in safety assessment, while seeking harmonisation of the wording as far as practicable with other CSs for other product classes. In addition, alignment with the FAA in terms of meaning of the requirement was pursued.

In the context of safety assessment, the differentiation between single-engine and multi-engine rotorcraft has been removed, as it is considered to be not appropriate any more considering the advances in rotorcraft technology. Complex and integrated systems with high criticality might be installed on small rotorcraft irrespective of the number of engines.

A requirement that a catastrophic failure condition shall not result from a single failure has been introduced. This requirement exists for other aircraft categories, such as large aeroplanes or small electrical VTOL. It is a standard design practice in industry and considerations on 'single failures' are also contained in FAA AC 27-1B and the FAA safety continuum policy for rotorcraft. A review was made of rotorcraft designs recently certified by EASA. The review found that the 'no-single failure' criterion had been taken into account systematically during the development of new rotorcraft products. It should be noted that the 'no-single failure' criterion proposed in CS 27.1309 only applies to systems and equipment and not to structure.

The same wording for the requirements in CS-27 and CS-29 was selected. The proposed CS 27.1309 and CS 29.1309 are objective-based requirements (i.e. the CS text provides the objective to be achieved whilst the AMC provides further details on how this objective can be achieved) and equivalent wording can be found in CSs of other product classes such as in CS 25.1309 and CS.23.2510.

A requirement has been introduced to ensure that information on unsafe operational conditions is provided to the flight crew in a timely manner, to allow them to take corrective actions. This requirement is aligned with the applicable CSs for other aircraft categories and is considered necessary in order to comply with CS 27.1309(b).

Changes to CS-27 Appendix C (reference to CS 29.1309)

The reference in CS-27 Appendix C to CS 29.1309(b)(2)(i) and (d) for rotorcraft to be certified as Category A is removed, as the provisions for safety assessment in CS 27.1309 and CS 29.1309 have been aligned. The intent of CS 29.1309(b)(2)(i), which required that a failure condition which would prevent the continued safe flight and landing of the rotorcraft had to have a probability of extremely improbable, is already covered by the newly introduced CS 27.1309(b)(1). In addition, small CS-27 rotorcraft Category A are considered as Class IV in the newly proposed classes and would have similar safety objectives to those of CS-29 rotorcraft. The partial reference to some elements of CS 29.1309 was considered to be misleading. A note was added to clarify that the AMC to CS 29.1309 should be used for Class IV CS-27 rotorcraft to clarify this requirement.

Introduction of the new AMC 27.1309

The AMC to CS-27 consists generally of FAA AC 27-1B (as referenced in Book 2 of CS-27). In order to introduce proportionality in the safety objectives, a dedicated AMC (AMC 27.1309) has been developed in Book 2 of CS-27. It should be used in conjunction with FAA AC 27-1B, but should take precedence over it, where stipulated, in the showing of compliance.

AMC 27.1309 introduces four classes of CS-27 rotorcraft in order to introduce proportionality in the safety objectives. These classes are based on the occupant capacity of the rotorcraft and the operational capabilities, which provides a bridge to the type of operation that these rotorcraft perform. Additionally, a weight limit was introduced for Class I and II rotorcraft, in order to account for the higher risk to people on ground (third parties) considering the potential impact area from heavier rotorcraft. The definition of classes differs from the definitions contained in the FAA safety continuum. This is in part due to the different operational context in the US and Europe. In addition, the classes presented in this AMC have been developed with the objective of being technology-agnostic (i.e. not taking the engine technology into account) and considering the type of operation for which the rotorcraft will be used. This was achieved by using the operational capabilities (Category A or B) as a criterion for the definition of classes.

Class I rotorcraft, for which the lowest safety objectives are set, are limited to VFR operations only (day/night), in order to offer an entry level for these types of product and be consistent with the objectives in CS-23 Assessment Level I of products with similar risk levels. In addition, Class I rotorcraft would also be eligible to use Part 21 Light (when it is published). The upper limit of Class IV is set for rotorcraft certified as Category A with the highest safety objectives. Class II and III rotorcraft are certified as Category B with the boundary of the occupant limit of 5 or the weight limit of 1 814 kg. This aligns with the FAA safety continuum policy.

A table has been introduced, which presents the safety objectives in terms of quantitative probabilities and required functional development assurance levels (FDALs), depending on the identified Failure Condition. These safety objectives have been based on several considerations:

— Alignment with other aircraft classes (i.e. the upper limit aligns with CS-29 and Special Condition (SC) VTOL for enhanced category; the lower limit aligns with CS-23 Class I);

— Alignment with the FAA safety continuum policy for rotorcraft.

A note has been added allowing the use of architectural considerations for assigning FDALs as described in ED-79A/ARP4754A; with the only exception that no FDAL D should contribute to hazardous or catastrophic failure conditions. This limitation particularly concerns Class I to III and is based on the rationale that considers FDAL D not to be appropriate to address development errors for hazardous or catastrophic failure conditions.

A note has been added to AMC 27.1309 to clarify that AMC 29.1309 should be used for Class IV CS-27 rotorcraft, to cover the intent of the deleted reference to CS 29.1309(b)(2)(i) and (d) in CS-27 Appendix C.

Changes to CS 29.1309 and the introduction of CS 29.1310

Similar to the rationale for the change of CS 27.1309, the intent of these changes is to improve and modernise the rules to reflect the current state of the art in safety assessment, whilst also harmonising the wording as much as practicable with other CSs (and SCs) for other product classes.

The same wording for the requirements in CS-27 and CS-29 was selected and the rationale for the introduction of the 'no-single failure' criterion equally applies to large rotorcraft. Single failure considerations are already addressed in FAA AC 29-2C and rotorcraft certified in accordance with CS-29 have already systematically addressed the 'no-single failure' criterion.

CS 29.1309(d) has been removed, as it contained details on the means of compliance and the scope of analysis that are already part of the AMC 29.1309 or industry standards such as ARP4761.

CS 29.1309(g) is applicable to Electrical System/Equipment and its content is already covered in CS 29.1301 and Electrical Systems CS 29.1351/1353/1355/1357/1359, which contain more detailed requirements covering the considerations that were raised by CS 29.1309(g) at equipment or rotorcraft level. For this reason, CS 29.1309(g) has been removed.

The requirements of CS 29.1309(e) have been introduced in the new CS 29.1310. CS 29.1309(f) has been moved to the associated AMC 29.1310 due to the fact that this subparagraph already only provided clarification and suggestions on how compliance can be achieved. These subparagraphs are concerned with the capacity of the electrical generation to supply power loads in any probable configuration. The decision to move this requirement for editorial reasons into CS 29.1310 will create consistency with CS 25.1310 and allows alignment of the text of CS 27.1309 and CS 29.1309. In addition, the wording of CS 29.1310 has been slightly changed in order to be more generic.

Introduction of AMC 29.1309

Since CS 29.1309 introduces a requirement that a catastrophic failure condition shall not result from a single failure, it is deemed necessary to provide further clarifications on single-failure criteria and common-cause considerations, similar to AMC 27.1309. In addition, AMC 29.1309 recognises ED-79A/ARP4754A as an acceptable methodology for establishing a development assurance process in order to align with the current industry practice.

2.4. What are the expected benefits and drawbacks of the proposed amendments

The expected benefits and drawbacks of the proposal are summarised below:

— Greater proportionality for the safety objectives for small CS-27 rotorcraft, thereby also promoting the installation of equipment and technology that could improve safety;

— Increase in the harmonisation of the EASA safety assessment provisions for rotorcraft contained in CS 27.1309 and CS 29.1309 with other EASA CSs (and SCs) and with their FAA equivalent.

No drawbacks are identified for this proposal.

For the full impact assessment, please refer to Chapter 4.

3. Proposed amendments and rationale

The proposed amendments are necessary to address modern designs currently used in the rotorcraft industry and to reduce the burden on applicants for the certification of new rotorcraft designs. The proposed amendments will reduce or eliminate the need for certain SCs currently required to obtain certification of modern rotorcraft. CS 27.1309 and CS 29.1309 generally apply to all systems on the aircraft that do not have specific requirements for analysing the safety aspects of a system. The proposed amendments to CS 27.1309 address advances in technology and increases in the performance of small rotorcraft. Complex and highly integrated systems incorporated in small rotorcraft designs were not envisioned when the original rule was published. The regulatory text contained in JAR-27 and then later in CS-27 originated in 1964. In addition, CS 27.1309 introduces a safety continuum approach by incorporating proportionality of safety objectives. The purpose of the safety continuum concept is to facilitate a more rapid incorporation of advances in technology for systems and equipment by recognising the need for a balanced approach between the risk and safety benefits of installing such technology.

The text of the amendment is arranged to show deleted, new or amended, and unchanged text as follows:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue;

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

3.1. Small Rotorcraft

3.1.1. Draft Certification Specifications

CS 27.1309 Equipment, systems, and installations

~~(a) The equipment, systems, and installations whose functioning is required by this CS–27 must be designed and installed to ensure that they perform their intended functions under any foreseeable operating condition.~~

~~(b) The equipment, systems, and installations of a multi-engine rotorcraft must be designed to prevent hazards to the rotorcraft in the event of a probable malfunction or failure.~~

~~(c) The equipment, systems, and installations of single-engine rotorcraft must be designed to minimise hazards to the rotorcraft in the event of a probable malfunction or failure.~~

(a) Equipment and systems required to comply with type-certification requirements, airspace requirements or operating rules, or whose improper functioning would lead to a hazard, must be designed and installed so that they perform their intended function throughout the operating and environmental limits for which the rotorcraft is certified.

(b) The equipment and systems covered by subparagraph (a), considered separately and in relation to other systems, must be designed and installed such that:

(1) each catastrophic failure condition is extremely improbable and does not result from a single failure;

(2) each hazardous failure condition is extremely remote; and

(3) each major failure condition is remote.

(c) The operation of equipment and systems not covered by subparagraph (a) must not cause a hazard to the rotorcraft or its occupants throughout the operating and environmental limits for which the rotorcraft is certified.

(d) Information concerning an unsafe system operating condition must be provided in a timely manner to the flight crew member responsible for taking corrective action. The information must be clear enough to avoid likely flight crew member errors.

Appendix C – Criteria for Category A

[…]

CS 27.2 Applicable CS-29 paragraphs. The following paragraphs of CS-29 must be met in addition to the requirements of this CS:

[…]

~~29.1309(b)(2)(i) and (d) — Equipment, systems and installations.~~

[…]

3.1.2. Draft acceptable means of compliance

AMC 27.1309 Equipment, systems, and installations

As defined in AMC 27 General (1), the AMC to CS-27 consists of FAA AC 27-1B Change 7, dated 4 February 2016. AMC 27.1309 identifies only the differences compared to FAA AC 27-1B Change 7 and in particular introduces four classes of CS-27 rotorcraft in order to introduce proportionality in the safety objectives. As such, it should be used in conjunction with FAA AC 27-1B Change 7, but should take precedence over it, where stipulated, in the showing of compliance.

This AMC is intended to supplement the engineering and operational judgement that should form the basis of any compliance demonstration. In general, the extent and structure of the analyses required to show compliance with CS 27.1309(b) and CS 27.1309(c) will be greater when the system is more complex and the effects of the failure conditions are more severe.

Applicability

CS 27.1309 is intended to be a general requirement that is applicable to any equipment or system as installed, in addition to specific systems requirements, except as indicated below.

This AMC is applicable to small rotorcraft Classes I, II and III as defined below in Table 1 to this AMC. However, small rotorcraft identified as Class IV should comply with AMC 29.1309 when demonstrating compliance with CS 27.1309.

(a) General

If a specific CS-27 requirement exists which predefines systems safety aspects (e.g. redundancy level or criticality) for a specific type of equipment, system, or installation, then the specific CS-27 requirement will take precedence. This precedence does not preclude accomplishment of a system safety assessment, if necessary. For example, CS 27.695 is a provision that predefines a required level of redundancy and an implied system reliability. However, a system safety assessment approach may still be required to show that the implied system reliability is met and to address the assessment of the failure modes.

(b) Subparts B, C, and D

CS 27.1309 does not apply to Subparts B, C, and D for aspects such as the performance, flight characteristics, structural loads, and structural strength requirements, but it does apply to any equipment/system on which compliance with the requirements of Subparts B, C, and D is based (e.g. health usage monitoring system certified for maintenance credit and stability augmentation system).

(c) Subpart E

(1) CS 27.1309 does not apply to the uninstalled type-certified engine. However, it does apply to the equipment/systems associated with the engine installation (e.g. electrical power generation, engine displays, transducers, etc.) on the rotorcraft (reference CS 27.901).

(2) CS 27.1309 does not apply to the rotor drive systems.

(d) Subpart F

(1) CS 27.1309 does not apply to stowed safety equipment such as life rafts, life preservers, and emergency floatation equipment. It also does not apply to safety belts, rotorcraft seats, and handheld fire extinguishers. However, it does apply to hazards to the rotorcraft, its occupants, and flight crew introduced by the installation/presence of this type of equipment/systems (e.g. electromagnetic-interference considerations, fire hazards, and inadvertent deployment of emergency floatation equipment) approved as part of the type design.

(2) CS 27.1309 does not apply to the functional aspects of aircraft non-safety-related equipment such as entertainment systems, hoists, forward-looking infrared (FLIR) systems, or emergency medical equipment such as defibrillators, etc. However, it does apply to hazards to the rotorcraft, its occupants, and flight crew introduced by the installation/presence of this type of equipment/systems (e.g. electromagnetic-interference considerations, fire hazards, and failure of the electrical system fault protection scheme) approved as part of the type design.

(3) CS 27.1309 does not apply to the lighting characteristics (e.g. light intensity, colour, and coverage) of the position lights, anti-collision lights, and riding lights. However, it does

apply to hazards to the rotorcraft, its occupants, and flight crew introduced by the installation/presence of this type of equipment/systems (e.g. electromagnetic-interference considerations, fire hazards, and pilot visibility impairment due to glare) approved as part of the type design.

Definition of classes of small rotorcraft

The intent is to account for the broad range of small rotorcraft certified under CS-27. The classes described below are solely used for the purpose of establishing a graduated scale for the certification standards for systems and equipment. These classes are based mainly on the occupant capacity and the operational capabilities which provide a bridge to the type of operation. Additionally, a weight limit is included for Class I and II rotorcraft.

Class	_Description_
IV	Rotorcraft Category A
III	Rotorcraft Category B with 6 or more occupants including crew or above 1 814 kg max gross weight (4 000 lb)
II	Rotorcraft Category B limited to 5 occupants including crew and limited to 1 814 kg max gross weight (4 000 lb)
I	Rotorcraft Category B limited to 2 occupants including crew and limited to 1 814 kg max gross weight (4 000 lb). Limited to VFR only (day and night).

Table 1: Definition of the small rotorcraft classes in the context of the AMC 27.1309

Safety objectives per class and failure condition classification

The table below provides the relationship between failure condition classifications and quantitative safety objectives/function development assurance levels (FDALs) that should be applied when using SAE document ED-79A/ARP4754A and ARP4761 to perform the safety analyses to show compliance with CS 27.1309. This is not intended to imply that the identified FDALs are assigned a probability value, but instead, shows a correlation to the failure condition classification.

The safety objectives for each failure condition are:

	Failure condition classifications			
Class	Minor (Note 1)	Major	Hazardous	Catastrophic
	Allowable quantitative probability (Note 2) and functional development assurance level (FDAL) (Note 3)			
IV (Note 4)	$\leq 10^{-3}$ FDAL D	$\leq 10^{-5}$ FDAL C	$\leq 10^{-7}$ FDAL B	$\leq 10^{-9}$ FDAL A
III	$\leq 10^{-3}$ FDAL D	$\leq 10^{-5}$ FDAL C	$\leq 10^{-7}$ FDAL C	$\leq 10^{-8}$ FDAL B
II	$\leq 10^{-3}$ FDAL D	$\leq 10^{-5}$ FDAL C	$\leq 10^{-6}$ FDAL C	$\leq 10^{-7}$ FDAL C
I	$\leq 10^{-3}$ FDAL D	$\leq 10^{-4}$ FDAL C	$\leq 10^{-5}$ FDAL C	$\leq 10^{-6}$ FDAL C

Table 2: Safety objectives

Note 1: The applicant is not expected to perform a quantitative analysis for minor failure conditions.

Note 2: The quantitative safety objectives are expressed per flight hour. An average flight profile (including the duration of flight phases) and an average flight duration should be defined. It is recognised that, for various reasons, component failure rate data may not be precise enough to enable accurate estimates of the probabilities of failure conditions. This results in some degree of uncertainty. When calculating the estimated probabilities, this uncertainty should be accounted for in a way that does not compromise safety.

Note 3 on FDALs: Using architectural considerations for assigning a FDAL as described in ED-79A/ARP4754A is possible for all classes, with the only exception that no FDAL D should contribute to hazardous or catastrophic failure conditions.

Note 4 on Class IV: AMC 29.1309 should be used for Class IV CS-27 rotorcraft.

Single failure and common-cause considerations

According to CS 27.1309(b)(1), equipment and systems, considered separately and in relation to other systems, must be designed and installed such that each catastrophic failure condition is extremely improbable and does not result from a single failure.

Failure containment should be provided by the system design to limit the propagation of the effects of any single failure to preclude catastrophic failure conditions. In addition, there must be no common-cause failure, which could affect both the single component, part, or element, and its failure containment provisions.

A single failure includes any set of failures, which cannot be shown to be independent from each other. Common-cause failures (including common-mode failures) and cascading failures should be evaluated as dependent failures from the point of the root cause or the initiator. Errors in development, manufacturing, installation, and maintenance can result in common-cause failures (including common-mode failures) and cascading failures. They should, therefore, be assessed and mitigated in the frame of the common-cause and cascading failures consideration.

Sources of common-cause and cascading failures include development, manufacturing, installation, maintenance, shared resource, event outside the system(s) concerned, etc. SAE ARP4761 describes types of common-cause analyses, which may be conducted, to ensure that independence is maintained (e.g. particular risk analyses, zonal safety analyses, common-mode analyses).

While single failures should normally be assumed to occur, experienced engineering judgement and relevant service history may show that a catastrophic failure condition caused by a single-failure mode is not a practical possibility. The logic and rationale used in the assessment should be straightforward and obvious that the failure mode simply would not occur unless it is associated with an unrelated failure condition that would, in itself, result in a catastrophic failure condition.

Protection from multiple failures should be provided when the first malfunction or failure would not be detected during normal operations of the aircraft, which includes pre-flight checks.

3.2. Large Rotorcraft

3.2.1. Draft Certification Specifications

CS 29.1309 Equipment, systems, and installations

~~(a) The equipment, systems, and installations whose functioning is required by this CS–29 must be designed and installed to ensure that they perform their intended functions under any foreseeable operating condition.~~

~~(b) The rotorcraft systems and associated components, considered separately and in relation to other systems, must be designed so that –~~

~~(1) For Category B rotorcraft, the equipment, systems, and installations must be designed to prevent hazards to the rotorcraft if they malfunction or fail; or~~

~~(2) For Category A rotorcraft:~~

~~(i) The occurrence of any failure condition which would prevent the continued safe flight and landing of the rotorcraft is extremely improbable; and~~

~~(ii) The occurrence of any other failure conditions which would reduce the capability of the rotorcraft or the ability of the crew to cope with adverse operating conditions is improbable.~~

~~(c) Warning information must be provided to alert the crew to unsafe system operating conditions and to enable them to take appropriate corrective action. Systems, controls, and associated monitoring and warning means must be designed to minimise crew errors which could create additional hazards.~~

~~(d) Compliance with the requirements of subparagraph (b)(2) must be shown by analysis and, where necessary, by appropriate ground, flight, or simulator tests. The analysis must consider:~~

~~(1) Possible modes of failure, including malfunctions and damage from external sources;~~

~~(2) The probability of multiple failures and undetected failures;~~

~~(3) The resulting effects on the rotorcraft and occupants, considering the stage of flight and operating conditions; and~~

~~(4) The crew warning cues, corrective action required, and the capability of detecting faults.~~

~~(e) For Category A rotorcraft, each installation whose functioning is required by this CS–29 and which requires a power supply is an 'essential load' on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations and for probable durations:~~

~~(1) Loads connected to the system with the system functioning normally.~~

~~(2) Essential loads, after failure of any one prime mover, power converter, or energy storage device.~~

~~(3) Essential loads, after failure of:~~

~~(i) Any one engine, on rotorcraft with two engines; and~~

~~(ii) Any two engines, on rotorcraft with three or more engines.~~

~~(f) In determining compliance with subparagraphs (e)(2) and (3), the power loads may be assumed to be reduced under a monitoring procedure consistent with safety in the kinds of operations authorised. Loads not required for controlled flight need not be considered for the two-engineinoperative condition on rotorcraft with three or more engines.~~

~~(g) In showing compliance with subparagraphs (a) and (b) with regard to the electrical system and to equipment design and installation, critical environmental conditions must be considered. For electrical generation, distribution and utilisation equipment required by or used in complying with this CS–29, except equipment covered by European Technical Standard Orders containing environmental test procedures, the ability to provide continuous, safe service under foreseeable environmental conditions may be shown by environmental tests, design analysis, or reference to previous comparable service experience on other aircraft.~~

(a) Equipment and systems required to comply with type-certification requirements, airspace requirements or operating rules, or whose improper functioning would lead to a hazard, must be designed and installed so that they perform their intended function throughout the operating and environmental limits for which the rotorcraft is certified.

(b) The equipment and systems covered by subparagraph (a), considered separately and in relation to other systems, must be designed and installed such that:

(1) each catastrophic failure condition is extremely improbable and does not result from a single failure, and for Category A rotorcraft, the occurrence of any failure condition which would prevent the continued safe flight and landing of the rotorcraft is considered as catastrophic;

(2) each hazardous failure condition is extremely remote; and

(3) each major failure condition is remote.

(c) The operation of equipment and systems not covered by subparagraph (a) must not cause a hazard to the rotorcraft or its occupants throughout the operating and environmental limits for which the rotorcraft is certified.

(d) Information concerning an unsafe system operating condition must be provided in a timely manner to the flight crew member responsible for taking corrective action. The information must be clear enough to avoid likely flight crew member errors.

CS 29.1310 Power source capacity and distribution

For Category A rotorcraft, each installation whose functioning is required by this CS-29 and which requires a power supply is an ‘essential load’ on the power supply. The power sources and the system must be able to supply the following power loads in probable operating combinations and for probable durations:

(a) Loads connected to the system with the system functioning normally.

(b) Essential loads, after failure of any one prime mover, or one power source.

(c) Essential loads, after failure of:

(1) any one engine, on rotorcraft with two engines; and

(2) any two engines, on rotorcraft with three or more engines.

3.2.2. Draft acceptable means of compliance

AMC 29.1309 Equipment, systems, and installations

As defined in AMC 29.1, the AMC to CS-29 consists of FAA AC 29-2C Change 7, dated 4 February 2016. AMC 29.1309 provides further guidance and acceptable means of compliance to supplement FAA AC 29-2C Change 7 § AC 29.1309. As such, it should be used in conjunction with FAA AC 29-2C Change 7, but should take precedence over it, where stipulated, in the showing of compliance.

Single failure and common-cause considerations

According to CS 29.1309(b)(1), a catastrophic failure condition must not result from the failure of a single component, part, or element of a system. Failure containment should be provided by the system design to limit the propagation of the effects of any single failure to preclude catastrophic failure conditions. In addition, there must be no common-cause failure which could affect both the single component, part, or element, and its failure containment provisions. A single failure includes any set of failures, which cannot be shown to be independent from each other. Common-cause failures (including common-mode failures) and cascading failures should be evaluated as dependent failures from the point of the root cause or the initiator. Errors in development, manufacturing, installation, and maintenance can result in common-cause failures (including common-mode failures) and cascading failures. They should, therefore, be assessed and mitigated in the frame of the common-cause and cascading failures consideration.

Sources of common-cause and cascading failures include development, manufacturing, installation, maintenance, shared resource, event outside the system(s) concerned, etc. SAE ARP4761 describes types of common-cause analyses, which may be conducted, to ensure that independence is maintained (e.g. particular risk analyses, zonal safety analyses, common-mode analyses).

While single failures should normally be assumed to occur, experienced engineering judgement and relevant service history may show that a catastrophic failure condition by a single-failure mode is not a practical possibility. The logic and rationale used in the assessment should be straightforward and obvious that the failure mode simply would not occur unless it is associated with an unrelated failure condition that would, in itself, result in a catastrophic failure condition.

Protection from multiple failures should be provided when the first malfunction or failure would not be detected during normal operations of the aircraft, which includes pre-flight checks.

AMC 29.1310 Power source capacity and distribution

In determining compliance with subparagraphs (2) and (3) of CS 29.1310, the power loads may be assumed to be reduced under a monitoring procedure consistent with safety in the kinds of operations authorised. Loads not required for controlled flight need not be considered for the two-engine inoperative condition on rotorcraft with three or more engines.

4. Impact assessment (IA)

4.1. What is the issue

4.1.1. Proportionality for CS-27 rotorcraft

Small CS-27 rotorcraft encompass a wide range of different rotorcraft, from the two-seater, 600 kg Guimbal Cabri G2 that is mainly used for recreational and training purposes up to a 7-passenger seats, 3 tons Leonardo turbine-powered AW109 that performs a wide variety of commercial operations.

Currently the safety objectives are the same for all small CS-27 rotorcraft, irrespective of their size or operational use. This creates some disproportionality due to the fact that the more stringent safety objectives are applied to much simpler rotorcraft.

The application of stringent safety objectives to simpler small CS-27 rotorcraft creates a barrier to innovation and the installation of systems and equipment, which could improve the overall safety of these aircraft. This is due to the higher and sometimes prohibitive costs of developing systems and equipment to meet the stringent safety objectives and the costs of certification. It is often the case that due to the high costs of certification, the economic justification or business case would not support the introduction of safety-enhancing equipment.

The risk, which is considered acceptable by the public, depends on the type of aircraft and type of operations. However, the current certification specifications treat all small CS-27 rotorcraft in the same manner, with the same safety objectives irrespective of the risk, complexity, number of occupants and type of operations. In contrast, the equivalent certification specifications for CS-23 fixed-wing aircraft are proportionate because they introduce four different classes of aircraft with different associated safety objectives for systems and equipment. Moreover, the recently published SC for small-category VTOL aircraft[7] applies a proportional approach by linking the classes of VTOL to passenger capacity and the type of operation. Since it is envisaged that VTOL and rotorcraft will to a certain extent cover similar types of operations in a similar operational environment and to ensure equal treatment, a proportional approach for CS-27 rotorcraft is the logical consequence.

For these reasons, there is a need to have a consistent approach to the subclassification of the types of products (i.e. aeroplanes, rotorcraft, eVTOL) and the assignment of safety objectives based upon the risk of the product and the intended operations.

The need for proportionality in CS-27 is not only due to the need to align with the approaches of CS-23 and SC VTOL but also due to the fact that EASA strives to ensure that the level of required regulatory rigour is commensurate with the risk. This aim is stated in Article 4(2) of the Basic Regulation that explicitly requests the Commission, the Agency and the Member States to introduce proportionate measures.

‘The measures taken […] shall correspond and be proportionate to the nature and risk of each particular activity to which they relate.’

More explicitly, the Basic Regulation states that measures shall take into account:

[7] The scope is person-carrying vertical take-off and landing (VTOL) heavier-than-air aircraft in the small category, with lift/thrust units used to generate powered lift and control. The Special Condition can be found on the EASA website: https://www.easa.europa.eu/sites/default/files/dfu/SC-VTOL-01.pdf.

‘(c) the complexity, performance and operational characteristics of the aircraft involved;

(d) the purpose of the flight, the type of aircraft and type of airspace used;

(…)

(f) the extent to which the persons affected by the risks involved in the operation are able to assess and exercise control over those risks;’.

4.1.2. Harmonisation with the FAA

The EASA provisions for the safety assessment of rotorcraft are currently contained in CS 27.1309 and CS 29.1309. The Acceptable Means of Compliance (AMC) consist of a direct reference to the FAA Advisory Circulars AC 27-1B and AC 29-2C respectively. In December 2016, following the publication of CS-27 Amendment 4 and CS-29 Amendment 4, the safety assessment provisions contained in CS 27.1309 and CS 29.1309 and the associated AMC (including the references to standards) were fully aligned with FAR 27 and FAR 29 (and FAA AC 27-1B and 29-2C). It should be noted that the current regulatory text and requirements for safety assessment contained in CS 27.1309 date back to 1984.

In 2016, the FAA published a Policy Statement entitled ‘Safety Continuum for Part 27 Normal Category Rotorcraft Systems and Equipment’ that provides a graduated scale of safety objectives for normal (small) rotorcraft. The FAA Policy Statement defines less stringent safety objectives than those currently contained in FAA AC 27-1B in order to facilitate (through lower certification costs) the introduction of new technology[8] which could improve the overall safety. It is foreseen that by encouraging the installation of technology that improves the pilot’s situational awareness and reduces the pilot’s workload, there will be an overall improvement in safety. This is achieved by defining new subclasses for normal (small) category rotorcraft and assigning incrementally more stringent safety objective for each subclass for systems and equipment.

By introducing this policy statement, an SSD was created, which leads to an increase in the validation effort required to certify rotorcraft between certification partners, and potentially the need for subsequent changes to the type design prior to EASA certification.

The criteria in the FAA Policy Statement for defining these subclasses are based on the aircraft weight, the number of engines, the engine type, and the maximum number of occupants.

Table 1: Normal category rotorcraft classes from the FAA Safety Continuum Policy Statement

Class	Description
I	Reciprocating Engine Occupants 5 or less including crew
II	Single Turbine Engine Occupants 5 or less including crew Up to 4000lbs Max Gross Weight
III	Single Turbine Engine

8 Such as autopilot systems, SAS, and systems supporting crew in situational awareness.

	Occupants 6 or more including crew 4001-7000lbs Max Gross Weight
IV	Twin Turbine

In addition, the FAA has also developed and proposed changes to the safety assessment provisions contained in Part 27/29.1309, which were published as a Notice of Proposed Rulemaking (NPRM) in November 2017. The changes proposed by the FAA are intended to allow more flexibility in the types of assessments that the applicant can provide to show compliance, and to reflect the fact that equipment and systems installed in Part 27 rotorcraft can contain some complex and highly integrated systems. At the time of the preparation of this NPA, the FAA has not released the final change to Part 27 and Part 29. When published as proposed, this will further increase the regulatory misalignment between the FAA and EASA. This regulatory difference will create a disadvantage for European industry.

These Part 27/29 changes, if implemented by the FAA as proposed, will create further SSDs between the EASA CSs and the equivalent FAA Parts, and are likely to result in a lower level of regulatory efficiency (i.e. the efficiency of the regulated process to achieve certification) due to the increase in the validation activity required for certification.

4.1.3. Safety risk assessment

The EASA Rotorcraft Safety Roadmap identified the safety improvement of small CS-27 rotorcraft as a key priority. A safety review was conducted of the fatal and non-fatal rotorcraft accidents in Europe covering the period from 2009 to 2017 and the conclusion was that operational factors are the most prevalent cause of these accidents.

There is an opportunity through increasing proportionality that safety equipment for the lower end of the CS-27 spectrum could be more easily and affordably introduced, which could increase the overall operational safety of this class of rotorcraft mainly due to the increased economic viability of these safety improvements. Examples could include equipment which would reduce pilot workload and increase situational awareness such as: stability augmentation systems, autopilots and other pilot cueing devices, which could have had a positive impact on the loss of control and collision with terrain and obstacles accidents that have occurred.

The examples of equipment that could improve safety that are mentioned above are not required to be installed by the certification specifications but the current more stringent safety objectives create a barrier to their incorporation into small CS-27 rotorcraft. If the current status quo is not rectified, then there would be no significant safety improvements in the current designs of small CS-27 rotorcraft, and equipment and technology that is available on larger rotorcraft or fixed-wing aircraft would not be installed.

4.1.4. Who is affected

The manufacturers of small CS-27 rotorcraft and large CS-29 rotorcraft as well as equipment and system manufacturers for these rotorcraft will be affected.

For the CS-27 proportionality elements of this RMT, it can be seen from Table 2 below that CS-27 types are the most prevalent in Europe and they would benefit the most from alleviation in the safety objectives.

Table 2: Top 10 European rotorcraft (by type)[9]

Type	Number registered	Certification Basis	EU Product
R44	1 014	CS-27	No
H125 / AS350	670	CS-27	Yes
R22	611	CS-27	No
H135 / EC135	379	CS-27	Yes
Bell 206	357	CS-27	No
Hughes 269	283	CS-27	No
AW109	280	CS-27	Yes
AS355	200	CS-27	Yes
H120	200	CS-27	Yes
H145 / EC145	136	CS-29	Yes

4.1.5. How could the issue/problem evolve

Proportionality was introduced in CS-23 and more recently in the SC VTOL. If no action is taken to introduce proportionality for CS-27, an inconsistency would be maintained for this category of products.

By not introducing proportionality into CS 27.1309, some new safety-enhancing equipment cannot be introduced in the lower end of small CS-27 rotorcraft because of the associated high costs of meeting the current stringent (and not proportionate) safety objectives. Therefore there would be no significant improvements in safety for small CS-27 rotorcraft despite safety-improving technology being available.

Moreover, there will be an increased discrepancy between the applicable certification requirements between the FAA and EASA for both small CS-27 rotorcraft and large CS-29 rotorcraft, leading to greater validation burden and a disadvantage for the European industry. The new generation of the latest equipment and systems will be developed for the US market and the European operators will not benefit from the technological advancements due to the increased certification costs and the increased validation burden.

4.2. What we want to achieve — objectives

The overall objectives of the EASA system are defined in Article 1 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives identified in Chapter 2.

Furthermore, the more specific objectives are:

— to foster the installation of equipment and technology that could improve safety through increased proportionality in the safety objectives for the CS-27 small rotorcraft;

[9] Source: EASA Rotorcraft Roadmap

— to increase the harmonisation of the EASA safety assessment provisions for rotorcraft contained in CS 29.1309 and CS 27.1309 with their FAA equivalent rules; and

— to consider aligning the CS-27 safety objectives with those of other product classes.

4.3. How we want to achieve it — options

To meet these objectives, the relevant CSs for small CS-27 rotorcraft and large CS-29 rotorcraft, as well as the associated AMC for Equipment, Systems and Installations, need to be amended. To which extent the CSs and AMC will be harmonised with those of the FAA is described in the options below.

Table 3: Selected options

Option	Short title	Description
0	No policy change.	No change to the EASA CSs or the AMC relating to safety assessment and the associated safety objectives. There would be no alignment or harmonisation with the FAA along with the associated increase in validation effort.
1	Adopt the FAA approach to proportionality and align with the FAA safety assessment provisions.	Recognise and adopt the FAA Safety Continuum Policy Statement including the assignment of the FAA subclasses and also align with the FAA proposed changes to the safety assessment provisions.
2	Introduce a European approach to proportionality of safety objectives in CS-27 and strive to align the safety assessment provisions with those of the FAA.	Introduce a European-centric approach to proportionality in the safety objectives of CS-27 which consider the type of operation of the rotorcraft. The updated AMC 27.1309 would ensure alignment with the proportionality approach that is contained in the SC VTOL and CS-23. For the safety assessment provisions contained in CS 29.1309 and CS 27.1309, alignment with the FAA equivalent is envisaged to harmonise the rules.

4.4. Methodology and data

4.4.1. Methodology applied

The methodology applied for this impact assessment is the multi-criteria analysis (MCA), which allows all the options to be compared by scoring them against a set of criteria.

The MCA covers a wide range of techniques and combines a range of positive and negative impacts into a single framework to allow scenarios to more easily be compared. Essentially, it applies a cost–benefit assessment (CBA) to cases where there is a need to present multiple impacts that represent a mixture of qualitative, quantitative and monetary data, and where there are varying degrees of certainty. The key steps of an MCA generally include:

— establishing the criteria to be used to compare the options (these criteria must be measurable, or at least comparable in qualitative terms); and

— scoring how well each option meets the criteria; the scoring needs to be relative to the baseline scenario.

The criteria used to compare the options were derived from the Basic Regulation, and the guidelines for the impact assessment were developed by the European Commission. The principal objective of EASA is to 'establish and maintain a high uniform level of safety' (as per Article 2(1) of the Basic Regulation). As additional objectives, the Basic Regulation identifies environmental, economic, proportionality and harmonisation aspects, which are reflected below.

The scoring of the impacts uses a scale of –10 to +10 to indicate the negative and positive impacts of each option (i.e. from 'very low' to 'very high' negative/positive impacts). Intermediate levels of benefit are termed 'low', 'medium', and 'high', with also a 'no impact' score possible.

4.5. What are the impacts

The various impacts of the identified options have been considered below.

4.5.1. Safety impact

Option 0: No policy change

Opportunities to achieve positive safety improvements would be missed because new systems and equipment, which could improve operational safety (e.g. autopilots and other workload-reducing technology) would not be installed on many lower end CS-27 rotorcraft due to the barrier that non-proportionate safety objectives creates to their development and certification.

Option 1: Adopt the FAA approach to proportionality and align with the FAA safety assessment provisions

The adoption of the FAA's approach to proportionality would enable the manufacturers of safety-enhancing technology to more cost-effectively develop their products, thereby promoting their installation on small CS-27 rotorcraft. Thus, such technology would be more prevalent and thereby improve the overall safety. However, the safety objectives that are proposed for FAA Subclass 1 helicopters would not be aligned with the safety objectives that have been developed for VTOL Class I. It is considered that although there could be an overall improvement in operational safety, there might be a lower integrity of the systems and equipment that would be installed.

Based upon this rationale, it is considered that Option 1 will overall provide a **low positive** safety impact.

Option 2: Introduce a European approach to the proportionality of safety objectives in CS-27 and strive to align the safety assessment provisions with those of the FAA

The development and introduction of a European approach to the proportionality of safety objectives for small CS-27 rotorcraft would enable the manufacturers of safety-enhancing technology to develop, certify and market their products more cost-effectively. This would result in the installation of safety-enhancing technology for small CS-27 rotorcraft becoming more affordable and thus more prevalent. The European-centric approach to proportionality would result in a lower level of design rigour for the certification of systems and equipment installed in the lower end of CS-27 rotorcraft which would no longer be required to demonstrate the same high reliability and integrity levels as the more complex small CS-27 category rotorcraft. This would foster the installation and certification of new technologies into lower-class rotorcraft and thus provide the operators of those rotorcraft with an overall enhanced level of operational safety. The expected effect is an overall increase in safety for CS-27 rotorcraft.

The development of a European approach to proportionality for small CS-27 rotorcraft would deviate from the FAA safety continuum policy and therefore:

— ensure alignment with the safety objectives that have been developed for VTOL Class I (for FAA Subclass 1 helicopters);

— would not be technology-centric and avoid relying on the type of propulsion to determine the level of risk and therefore the safety objectives to be met;

— permit the type of operation for which the rotorcraft will be used to be considered;

— align with the approach used by EASA for eVTOL aircraft.

A European approach to proportionality would take into account the differences in the operational rules in the US and Europe. This would allow the possibility to consider different safety objectives for small rotorcraft that are solely used for General Aviation or recreational usage and they would not be subject to the same level of certification rigour (due to the same safety objectives) as the same class of small rotorcraft that is used for commercial operations. There would be an opportunity for an alternative approach to achieving proportionality if the FAA safety continuum policy is not adopted as is. It is recognised that the operational rules in the US and in Europe are different and this would be taken into account if this option were selected.

In addition, EASA sees the benefit from avoiding maintaining linkages between the safety objectives and the type of technology used for the engine. In the case of the FAA safety continuum approach, the safety objectives are distinctly linked to the type of propulsion used (i.e. piston engine, turbine engine). This would result in non-performance-based safety objectives being assigned purely based upon the type of technology. A European approach to proportionality for small CS-27 rotorcraft would allow EASA to establish subclasses of small CS-27 rotorcraft that are not technology- but risk-based.

Based upon the considerations above, the overall safety impact of Option 2 is **medium positive**.

Option 0	***Option 1 — FAA approach***	***Option 2 — Customised European approach***
0	*+2*	*+4*

4.5.2. Environmental impact

There is no environmental impact foreseen with any of the options that are proposed.

4.5.3. Social impact

There is no social impact foreseen with any of the options that are proposed.

4.5.4. Economic impact

<u>Option 0: No policy change</u>

There would be no increase in the costs of the certification of these products by not introducing proportionality into the safety objectives for small CS-27 rotorcraft. However, there would be no reduction in the costs of certification for simpler rotorcraft at the lower end of the small CS-27 rotorcraft spectrum.

Not performing regulatory alignment with the FAA will generate additional cost for the industry, as there will be an increase in the validation effort required to certify rotorcraft between certification partners, and possibly there could be a need for subsequent changes to the type design. This will increase over time, as it is expected that the development of future systems and equipment will make use of the FAA safety continuum policy in a more systematic manner.

There would be reduced harmonisation with the FAA proposed changes for safety assessment and therefore there would be no overall reduction in validation costs and no associated economic benefits for industry. The overall economic impact of Option 1 is considered to be **low negative**.

Option 1: Adopt the FAA approach to proportionality and align with the FAA safety assessment provisions

The adoption of the FAA's approach to proportionality would provide economic benefits due to a reduction of the costs of certification for simpler rotorcraft at the lower end of the small CS-27 rotorcraft spectrum. Compared to Option 2, this option would result in lower certification costs due to the safety objectives being less stringent than Option 2.

There would also be a positive economic impact due to the greater alignment with the FAA and the elimination of the additional validation activity to achieve EASA certification.

Due to the fact that safety-enhancing equipment and systems are expected to become more affordable and there would be a reduction in certification costs along with reduced validation activity, Option 1 will provide an overall **medium positive** economic impact.

Option 2: Introduce a European approach to the proportionality of safety objectives in CS-27 and strive to align the safety assessment provisions with those of the FAA

The development and introduction of a European approach to the proportionality of safety objectives for small CS-27 rotorcraft would reduce costs of certification of technology that could improve the overall safety. This would provide economic benefits for small rotorcraft manufacturers and for companies that would like to offer safety-improving equipment.

The development of a European approach to proportionality would not fully align with the FAA approach and may result in some validation activity to achieve EASA certification. However, the European approach would be developed taking into account European operations and the European context which could offset any additional validation activity. The development of a European approach would allow the type of operation to be considered and allow less stringent safety objectives for rotorcraft that are not used for commercial operations. This would provide greater economic benefits for rotorcraft manufacturers that target this sector of the market as they would not have the regulatory burden of being required to meet the same objectives as manufacturers of rotorcraft used for commercial operations.

A European approach to proportionality would also allow the development of subclasses of small CS-27 rotorcraft that are not differentiated by the propulsion type (as used by the FAA approach) or other technology. This would allow for innovation and not introduce arbitrary technology barriers between subclasses thereby allowing the risk of the operation to drive the safety objectives for the different subclasses.

The implementation cost impact is very low when considered in relation to the overall turnover of the organisation. Although there may be a small increase in the validation costs due to not being fully aligned with FAA's safety continuum approach, these costs would be offset by the possibility to optimise the approach to proportionality to take into account the European context and the ability to consider the type of operation.

Therefore, the overall economic impact will be a **medium positive** economic impact.

Option 0	*Option 1 — FAA approach*	*Option 2 — Customised European approach*
-2	*+4*	*+4*

Question to stakeholders on economic impacts

Stakeholders are invited to provide quantified justification elements on the possible economic impacts of the options proposed, or alternatively to propose another justified solution to the issue.

4.5.5. General Aviation and proportionality issues

Option 0: No policy change

Not implementing proportionality in the safety objectives for CS-27 rotorcraft is not in line with the objectives of this RMT to establish proportionate rules.

The aim of the task is to introduce proportionality in the safety objectives for the different classes of small rotorcraft. Currently, CS-27 considers the same safety objectives for all rotorcraft types. This creates disproportionality due to the fact that the more stringent safety objectives are applied to much simpler rotorcraft. This will increase over time, as product classes with similar operational context will be using a proportionate approach for establishing the safety objectives.

Therefore, this option would result in a **low negative** proportionality impact.

Option 1: Adopt the FAA approach to proportionality and align with the FAA safety assessment provisions

The introduction of proportionality for General Aviation is the main goal of this RMT. The proportionality approach recognises that not all rotorcraft are the same and, therefore, they should not be viewed in the same light or treated in the exact same manner when it comes to their certification.

Through this approach, the lower end of the CS-27 rotorcraft category would benefit from safety-enhancing technology through lower costs, which in turn would increase the overall safety of those rotorcraft.

The adoption of the FAA approach to proportionality would positively increase proportionality and provide some alleviation for aircraft used for General Aviation. However, the FAA approach does not take into account the type of operation that the rotorcraft will be used for and does not provide any alleviation of the safety objectives for rotorcraft that are used for non-commercial operations.

In addition, the FAA approach divides small rotorcraft into subclasses based upon the propulsion type (i.e. piston engine, turbine engine) and the number of engines. This approach does not provide full alleviation for General Aviation aircraft due to the fact that the main alleviation is for piston-engine-powered rotorcraft.

Based upon this assessment, a **low positive** proportionality impact is assigned to Option 1.

Option 2: Introduce a European approach to the proportionality of safety objectives in CS-27 and strive to align the safety assessment provisions with those of the FAA

A European approach to the proportionality of safety objectives for small CS-27 rotorcraft would allow the type of operations to be considered when assigning safety objectives, including rotorcraft used for non-commercial operations and General Aviation. Alleviation of the current safety objectives would encourage the incorporation of equipment that would improve safety. Overall, a benefit is particularly foreseen for rotorcraft that are used for General Aviation. This is due to the fact that equipment that could reduce pilot workload and improve pilot awareness could have a significant safety impact for pilots that generally are not as experienced (or have reduced currency) as pilots that conduct commercial operations.

In addition, through this approach, the proportionality — taking into account the type of operation — would be in line with the SC VTOL that has recently been published.

A European approach that takes into account European operations and does not assign subclasses based upon technology is considered to have a **high positive** proportionality impact.

Option 0	**Option 1 — FAA approach**	**Option 2 — Customised European approach**
-2	+2	+6

4.6. Conclusion

4.6.1. Comparison of options

The implementation of a proportionality approach for small CS-27 rotorcraft and the alignment with the FAA rules for safety assessment will have both positive effects on the overall rotorcraft safety through a reduction in costs associated with the certification of equipment and technology that can improve safety as well as increase efficiency during certification and validation processes.

Criteria	***Option 0 No policy change***	***Option 1 Adopt the FAA approach to proportionality and align with the FAA safety assessment provisions***	***Option 2 Introduce a European approach to the proportionality of safety objectives in CS-27 and strive to align the safety assessment provisions with those of the FAA***
Safety impact	0	+2	+4
Economic	-2	+4	+4
Proportionality	-2	+2	+6
Total	**-4**	**+8**	**+14**

Based upon the outcome of the regulatory impact assessment, **Option 2** is the preferred option.

Question to stakeholders

Stakeholders are also invited to provide any other quantitative information they may find necessary to bring to the attention of EASA.

As a result, the relevant parts of the impact assessment might be adjusted on a case-by-case basis.

5. Proposed actions to support implementation

EASA is considering organising an information session after the publication of the decision amending CS-27 and CS-29 related to this RMT. The objective of this event would be to present the new specifications for safety assessment, and to provide clear guidance and best practices on how to implement them in future certification projects.

6. References

6.1. Related decisions

— Executive Director Decision No. 2003/15/RM of 14 November 2003 on certification specifications for small rotorcraft (« CS-27 »)

— Executive Director Decision No. 2003/16/RM of 14 November 2003 on certification specifications for large rotorcraft (« CS-29 »)

6.2. Other reference documents

— FAA policy statement PS-ASW-27-15 'Safety Continuum for Part 27 Normal Category Rotorcraft Systems and Equipment'

— FAA Notice of Proposed Rulemaking (NPRM) FAA-2017-0990 dated 01/11/2017, RIN: 2120-AK80.

7. Quality of the NPA

To continuously improve the quality of its documents, EASA welcomes your feedback on the quality of this NPA with regard to the following aspects:

7.1. The regulatory proposal is of technically good/high quality

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

7.2. The text is clear, readable and understandable

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

7.3. The regulatory proposal is well substantiated

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

7.4. The regulatory proposal is fit for purpose (capable of achieving the objectives set)

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

7.5. The impact assessment (IA), as well as its qualitative and quantitative data, is of high quality

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

7.6. The regulatory proposal applies the 'better regulation' principles[1]

Please choose one of the options below and place it as a comment in CRT; if you disagree or strongly disagree, please provide a brief justification.
Fully agree / Agree / Neutral / Disagree / Strongly disagree

7.7. Any other comments on the quality of this NPA (please specify)

Note: Your comments on Chapter 7 will be considered for internal quality assurance and management purposes only and will not be published in the related CRD.

[1] For information and guidance, see:
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en
- https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how/better-regulation-guidelines-and-toolbox_en
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