NOTICE OF PROPOSED AMENDMENT (NPA) NO 2011-14

DRAFT DECISION OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY

amending Decisions of the Executive Director of the European Aviation Safety Agency:

No 2010/008/R of 28 September 2010 on Certification Specifications for Normal, Utility, Aerobatic and Commuter Aeroplanes (CS-23),

No 2010/013/R of 17 December 2010 on Certification Specifications for Large Aeroplanes (CS-25)

and

No 2008/010/RM of 17 November 2008 on Certification Specifications for Large Rotorcraft (CS-29)

'Halon — Update of CSs in order to comply with EC regulations'

EXECUTIVE SUMMARY

The scope of this rulemaking activity is outlined in the Terms of Reference (ToR) MDM.071, Issue 1, of 18 April 2011. In the Rulemaking Programme 2012-15 the task has been renumbered as RMT.0273.

The purpose of this NPA is to amend CS-23, CS-25 and CS-29 in order to be compliant with legislation of the European Union on the progressive phasing out of halon, which contributes to depleting the ozone layer.

In general terms, the approach proposed by the present NPA is to:

- remove all references to 'halon' from Book 1 of CSs (namely CS-25), which means that halon will no longer be recommended (for new designs), but not forbidden before the 'cut-off' dates established by the law of the European Union (EU);
- provide information on the development and use of alternatives to halon in the AMC material in CS Book 2, including the 'end dates' contained in the EU legislation;
- limit the proposed provisions to CS-23, 25 and 29, which means that they will apply only to new applications for type certificates and NOT to:
    - newly produced aircraft according to an existing type certificate (= no immediate compliance with the recently adopted amendments to ICAO SARPs);
    - aircraft operators and respective aircraft in operation (= no retrofit).

The above means that EU Member States will be compliant with the latest Amendment 103 to ICAO Annex 8 (ref. State Letter 2011/43).

The EU legislation implies compliance with recent amendments (i.e. State Letters 2011/44, /45 and /46) to ICAO Annex 6 (i.e. newly produced aircraft based on existing Type Certificates) only in 2020 and 2025. Through this NPA, the Agency consults the stakeholders in order to assess whether they want to anticipate the compliance with mentioned recent amendments by ICAO.

TABLE OF CONTENTS

A. Explanatory Note

I. General

1. The purpose of this Notice of Proposed Amendment (NPA) is to envisage amending the following Decisions of the Executive Director:

Decision	Certification Specification	Affected paragraphs	
		Book 1	Book 2
2010/008/R of 28 September 2010	CS-23	CS 23.851	AMC 23.851(c) and insertion of new: AMC 23.1197
2010/013/R of 17 December 2010	CS-25	CS 25.851 CS 25.1197 and Appendix F – Part II par. (g)	Title of AMC 25.851(a) Title of AMC 25.851(a)(1) AMC 25.851(a)(2) AMC 25.851(b) New AMC 25.851(c) AMC to CS 25.855 and 25.857 And new AMC 25.1197
2008/10/RM of 17 November 2008	CS-29	**None**	Insertion of new: AMC 29.851 and AMC 29.1197

2. The scope of this rulemaking activity, outlined in the Terms of Reference (ToR) MDM.071, Issue 1, of 18 April 2011[1], is described in more detail below. In the Rulemaking Programme 2012-15 the task has been renumbered as RMT.0273.

3. The European Aviation Safety Agency (hereinafter referred to as the 'Agency') is directly involved in the rule-shaping process. It assists the Commission in its executive tasks by preparing draft regulations, and amendments thereof, for the implementation of the Basic Regulation[2] which are adopted as 'Opinions' (Article 19(1)). It also adopts Certification Specifications, including Airworthiness Codes and Acceptable Means of Compliance and Guidance Material to be used in the certification process (Article 19(2)).

---

1 http://www.easa.europa.eu/rulemaking/docs/tor/mdm/ToR%20MDM.071.pdf.

2 Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.03.2008, p. 1). Regulation as last amended by Regulation (EC) No 1108/2009 of the European Parliament and of the Council of 21 October 2009 (OJ L 309, 24.11.2009, p. 51).

4. When developing rules the Agency is bound to follow a structured process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as 'The Rulemaking Procedure'[3].

5. This rulemaking activity is included in the Agency's Rulemaking Programme for 2011-14. It implements the rulemaking task MDM.071: Update of CSs and development of Guidance Material in order to comply with Regulation (EC) No 1005/2009 and ICAO Resolution A36-12[4] (i.e. halon replacement).

6. The text of this NPA has been developed by the Agency. It is submitted for consultation of all interested parties in accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

7. The proposed rule has taken into account the development of European Union law, of international ICAO standards and the harmonisation with the rules of other authorities (i.e. FAA), as set out in the objectives of Article 2 of the Basic Regulation. In particular the proposed rule:

   a. complies with the prescription of applicable European Union law;

   b. is more stringent than the ICAO Standards and Recommended Practices applicable at the date of publication of the present NPA;

   c. is less stringent than the new ICAO Standards and Recommended Practices (SARPs) in Annex 6[5] applicable on 15 December 2011;

   d. is fully compliant with new ICAO SARPs in Annex 8[6];

   e. is harmonised with the relevant Advisory Circulars and Minimum Performance Specifications (MPS) for extinguishing agents, published by the FAA.

II. Consultation

8. To achieve optimal consultation, the Agency is publishing the draft decision of the Executive Director on its internet site. Comments should be provided within 3 months in accordance with Article 6 of the Rulemaking Procedure. Comments on this proposal should be submitted by one of the following methods:

CRT: Send your comments using the Comment-Response Tool (CRT) available at **http://hub.easa.europa.eu/crt/**.

E-mail: Comments can be sent by e-mail only in case the use of CRT is prevented by technical problems. The(se) problem(s) should be reported to the CRT webmaster and comments should be sent by email to NPA@easa.europa.eu.

Correspondence: If you do not have access to the Internet or e-mail, you can send your comments by mail to:

---

3 Management Board decision concerning the procedure to be applied by the Agency for the issuing of opinions, certification specifications and guidance material (Rulemaking Procedure), EASA MB 08-2007, 13.6.2007.

4 ICAO Resolution A36-12, adopted in 2007, has now been replaced by Resolution A37-9, adopted by the 37th Session of the ICAO General assembly in October 2010.

5 ICAO State Letters Type II, AN 2011/44, 45 and 46 of 11 July 2011: Amendment of Part I, II and III of Annex 6.

6 ICAO State Letter Type II, AN 3/5.8-11/43 of 11 July 2011: Amendment 103 to Annex 8.

Process Support
Rulemaking Directorate
EASA
Postfach 10 12 53
50452 Cologne
Germany

Comments should be submitted by **9 November 2011**. If received after this deadline, they might not be taken into account.

III. Comment response document

9. All comments received in time will be responded to and incorporated in a comment response document (CRD). The CRD will be available on the Agency's website and in the Comment-Response Tool (CRT).

IV. Content of the draft Decisions

Background

10. Halon 1211, halon 1301 and halon 2402, successfully used for decades by civil aviation for fire extinguishing purposes, are unfortunately ozone-depleting substances.

11. Their production (or import) in the EU Member States has been limited since 1985 and banned since 1994, in line with the Vienna Convention for the protection of the ozone layer[7] and the subsequent Montreal Protocol on the substances that deplete the ozone layer[8].

12. However, their use has been allowed to continue for certain 'critical uses': i.e. those for which a safe and feasible alternative for replacement was not yet available. Aviation is considered 'critical use'. Therefore, halon is still used today in civil aircraft for fire protection of:

- cargo compartments;
- portable fire extinguishers in cabin and crew compartments;
- engine nacelles and APU;
- lavatory waste receptacles.

13. The International Halon Replacement Working Group was established in October 1993. This group was tasked to work towards the development of Minimum Performance Standards (MPS) and test methodologies for non-halon aircraft fire suppression agents/systems in cargo compartments, engine nacelles, handheld (portable) extinguishers, and lavatory waste receptacles. The International Halon Replacement Working Group has been expanded to include all system fire protection R&D for aircraft and now carries the name: 'International Aircraft Systems Fire Protection Working Group'.

14. Alternatives are available for lavatory extinguishing (lavex) systems and handheld fire extinguishers for use in aircraft. Research is however still underway to identify suitable alternatives for engine/APU and cargo, as well as better solutions for handheld fire extinguishers used in cabins and crew compartments.

---

7 http://ozone.unep.org/new_site/en/Treaties/treaty_text.php?treatyID=1.

8 http://ozone.unep.org/new_site/en/Treaties/treaty_text.php?treatyID=2.

Alternatives to halon for aviation use

15. The UNEP 2010 Report of the Halons Technical Options Committee (HTOC) – 2010 Assessment[9], recognises that, although the incidence of in-flight fires is low, the consequences in terms of loss of life are potentially devastating, and the use of halon to help guard against such events has been extensive.

16. Aviation applications are among the most demanding ones in terms of extinguishing agent characteristics. Particularly important are the following requirements:

- Dispersion and suppression effectiveness, against different fire classes, which must be maintained in the flight environment, including at extreme temperatures and very low pressure encountered at high altitude, as well as in presence of continued sustained vibrations;
- Minimal toxic hazard to the health and safety of ground maintenance staff and also of passengers and flight crew, who could be exposed to the agent and any decomposition products for periods as long as several hours;
- Weight and space requirements of the agent and associated hardware, which could also indirectly be detrimental to the environment, in terms of additional gaseous emissions for their carriage;
- Also significant are short and long term damage to aircraft structure or contents resulting from the agent or from its potential decomposition products in a fire and avoidance of clean-up problems.

17. Furthermore, while the alternatives to halon developed so far are much better in terms of depletion of the ozone layer, some of them have a considerably higher greenhouse gas potential and therefore their global impact on environment is still under discussion.

EU Regulations on substances that deplete the ozone layer

Cut-off and end dates

18. Already in 1985 the European Community together with several of its Member States signed the Vienna Convention for the protection of the ozone layer and subsequently adopted the first regulation limiting the production and use of halon[10], later replaced by other regulations. In said regulations the use of halon for aviation was not prohibited.

19. In June 2000 the legislator of the European Union, based on the developments of the Montreal Protocol, prohibited in general any further use of halon[11]; however, exempting from this prohibition the use of halon recovered, recycled or reclaimed in existing fire protection systems, until for some 'critical uses', as set out in Annex VII therein, suitable alternatives have not been found.

---

9 http://ozone.unep.org/teap/Reports/TEAP_Reports/teap-2010-progress-report-volume2-May2010.pdf referred later in resent NPA as 'HTOC 2010 Report'.

10 Council Regulation (EEC) No 3322/88 of 14 October 1988 on certain chlorofluorocarbons and halons which deplete the ozone layer (OJ L 297, 31.10.1988, p. 1).

11 Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer (OJ L 244, 29.9.2000, p. 1).

20. Said Annex VII to Regulation 2037/2000 allowed the continuing use of halon, as an exception to the general prohibition, in particular for:
    - halon 1301:
        - o in civil aircraft for the protection of crew compartments, engine nacelles, and cargo bays;
    - halon 1211:
        - o in handheld fire extinguishers and fixed extinguisher equipment for engines for use on board aircraft;
        - o in aircraft for the protection of crew compartments, engine nacelles, and cargo bays.

21. The exemption of halon for aviation use was maintained in Article 13(1) of Regulation (EC) No 1005/2009[12], but in subsequent par. 13(2) therein, the EU legislator tasked the Commission to review the exemptions for 'critical uses' and, where appropriate, to progressively adopt phase-out dates even for those 'critical uses', taking into account the availability of technically and economically feasible alternatives.

22. Hence, using the delegation of authority mentioned above, and the technical developments which had meanwhile been achieved, the European Commission in 2010 has adopted Regulation (EU) No 744/2010[13], which establishes, for each application:
    - **cut-off dates** after which the use of halon for new equipment or products (i.e. related to new applications for type certification) would no longer be permitted;
    - **end dates** after which the use of halon would no longer be permitted: i.e. all halon fire extinguishers and fire protection systems should be replaced, converted or decommissioned by the end date (i.e. retrofit may be required). This also implies that halon can no longer be implemented on newly produced aircraft, on the basis of existing TCs.

23. However, in Regulation (EU) No 744/2010 there is no mention of any intermediate termination date for installation or use of halon in newly produced aircraft, based on designs already covered by a type certificate, before the 'end dates'.

24. The Agency has been mandated by the EU legislator[14] to take any necessary measure within its powers on the basis of said Basic Regulation, but also on the basis of 'other' Community legislation. It is therefore a precise duty of the Agency to propose rules aligned with Regulation (EU) No 744/2010, as presented in the paragraphs below.

---

12 Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer (OJ L 286, 31.10.2009, p. 1).

13 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halons (OJ L 218, 19.8.2010, p. 2).

14 Article 17.1(c) of the Basic Regulation.

Hand fire extinguishers

25. According to HTOC 2010 Report, suitable alternatives to replace halon 1211 in handheld extinguishers, meeting the FAA Minimum Performance Standards[15], already exist. The alternative agent must disperse in a manner that allows for a hidden fire to be suppressed and shall not cause any unacceptable visual obscuration, passenger discomfort, and toxic effects where people are present.

26. Mentioned MPS was published in August 2002. As of 2003, three halon alternatives, HFC-227ea, HFC-236fa and HCFC Blend B, had successfully completed all of the required tests and were made commercially available.

27. These units have different volume and weight characteristics compared to existing halon 1211 extinguishers. Therefore new brackets and supports may be required for new airframes and/or retrofit.

28. The change to one of the mentioned alternative suppression agents may also require that a new training programme be developed for crew.

29. These new agents can be contained in fire extinguishers as e.g. those listed in the FAA Advisory Circular AC 20-42D of 14 January 2011[16].

30. In any case, according to Regulation (EU) No 744/2010, new aircraft designs (i.e. those for which the application for type certification is filed after the 'cut-off' date) encompassing halon 1211 or 2402 in handheld fire extinguishers, shall NOT be accepted after 31 December 2014.

31. In conclusion, the Agency presently believes that the cut-off (i.e. for new applications for type certificates) date of end of 2014 for handheld (portable) fire extinguishers to be used in aircraft is feasible.

Extinguishers in lavatories

32. Historically, Halon 1301 has been used in lavatory extinguishing (lavex) systems, which are designed to extinguish trash receptacle (Class A) fires in the lavatories of pressurised cabins.

33. Halon alternatives meeting the Minimum Performance Standard[17] for lavex systems, which includes the ability to extinguish a Class A fire and in case of discharge, do not create an environment that exceeds the chemical agent's 'no observable adverse effect level' (NOAEL), have been developed.

34. Research and testing has shown that there are suitable alternative suppression systems available for this application that meet the criteria for space and weight, the toxicological factors, and cost the same or less than the halon systems being replaced. According to the HTOC 2010 Report, currently all Airbus and Boeing new production aircraft are equipped with non-halon lavatory systems that contain either HFC-227ea or HFC-236fa. In addition, still according to HTOC, some airlines (e.g. Lufthansa) are replacing existing halon 1301 lavex systems with these alternative systems during scheduled maintenance operations.

35. In conclusion, the Agency presently believes that the cut-off (i.e. for new applications for type certificates) date of end of 2011 for lavex is feasible.

---

[15] http://www.fire.tc.faa.gov/pdf/01-37.pdf.

[16] http://rgl.faa.gov/Regulatory_and_Guidance_Library%5CrgAdvisoryCircular.nsf/0/5B54C6823103CD96862578290074382B?OpenDocument.

[17] http://www.fire.tc.faa.gov/reports/searchresults.asp?searchType=number&searchPhrase=DOT%2FFAA%2FAR-96%2F122&searchSubmit=Search.

Fire protection of engine nacelles and APUs

36. Halon 1301 is typically used in engine nacelles and APUs to protect against Class B fires. The requirements of fire suppression systems for engine nacelle and APUs are particularly demanding, since these compartments contain fuels and other volatile fluids in close proximity to high temperature surfaces. The surrounding environment also typically has complex airflows at low temperature and pressure, making most non-halon agents ineffective.

37. Although alternatives have been implemented in military aircraft, according to HTOC 2010 Report there have been no actual examples to date of the replacement of halon 1301 in the engine nacelles or APUs of civil aircraft.

38. A finalised MPS for engine nacelle/APU protection could most probably be available in 2–3 years (i.e. around 2013), as being discussed in the International Aircraft Systems Fire Protection WG; both Airbus and Boeing are involved in these developments.

39. In conclusion, the Agency presently believes that the cut-off (i.e. for new applications for type certificates) date of end of 2014 for engine nacelles and APUs is feasible.

Cargo compartments

40. To date, according to HTOC 2010 Report, there have been no cases of halon 1301 replacement with an alternative agent in cargo compartments of civil aircraft. MPS testing of halocarbon agents has shown that they are neither technically nor economically feasible. This is mainly because of the space and weight requirements necessary to meet the MPS, in particular for maintaining the high concentrations of these agents that would be sufficient to successfully control fires in said compartments.

41. Further research and development of alternative agents is underway, including a combination of water mist and nitrogen which apparently could meet the requirements of the current MPS. Industry has voiced its concerns mainly in terms of weight and volume, but also towards compatibility with aircraft materials.

42. Minimum Performance Standards are already available[18] and therefore the Agency is confident that the cut-off date of 2018 for fire suppression in cargo compartments is equally feasible.

43. In any case, should the European Commission amend Regulation (EU) No 744/2010 in order to propose new 'cut-off' or 'end' dates, the Agency will take action to align its CSs with prevailing EU law.

SAE Minimum Operational Performance Specifications

44. In January 2011 the Agency requested the Society of Automotive Engineers (SAE) to develop new Minimum Operational Performance Standards (MOPS) for fire extinguishers not containing halon, initially for portable and lavatory fire extinguishers. The MOPS should not specify the extinguishing agent, but should provide the performance and operational requirements that need to be demonstrated.

45. SAE has accepted the Agency's request and the first meeting of SAE S-9 Cabin Safety Provisions Technical Committee took place in June 2011. It is envisaged that, in due time, the SAE MOPS will enable the Agency to issue European Technical Standard Orders (ETSO) for built-in lavatory fire extinguishers and handheld fire extinguishers. Such possible ETSO is out of scope of the present NPA, since said MOPS are not yet available.

[18] http://www.fire.tc.faa.gov/reports/searchresults.asp?searchType=number&searchPhrase=DOT%2FFAA%2FAR-00%2F28&searchSubmit=Search.

The envisaged changes to Decision 2010/008/R (CS-23) are:

Book 1

46. CS-23 contains Certification Specifications for Normal, Utility, Aerobatic and Commuter Aeroplanes. No mention of halon is contained therein in Book 1: hence the only amendments to Book 1 proposed by the present NPA are to change the title of 23.851, for clarity purposes, by adding the word 'hand' and adding the reference to the newly proposed AMCs.

Book 2 — Hand fire extinguishers

47. Halon is mentioned in Book 2 in AMC 23.851(c), where reference is made, in the present text, to 'pending results of research into replacement of halon' in relation to handheld (portable) fire extinguishers for use on aircraft.

48. Since alternatives are now available, a modified text of AMC 23.851(c) is accordingly proposed. In particular the proposal:

- does not imply any retrofit on CS-23 aircraft already in the fleet;
- does not forbid to use halon 1211 (or 2402) in hand fire extinguishers installed in aircraft produced, even after 31 December 2014, but according to a type certificate issued earlier;
- does not mandate any specific extinguishing agent, so leaving the possibility for applicants to propose new alternative agents, providing that they satisfy the MPS and be 'accepted' by the Agency.

49. EASA Part 21 does neither define the term 'approved' nor 'accepted'. In the present context the definitions in EU OPS.1.003[19] (although not legally applicable to CSs) are used, where:

- 'accepted' means not objected by the competent authority as suitable for the purpose intended; while
- 'approved' means documented (by an official approval issued by the competent authority) as suitable for the purpose intended.

50. In the case of CS-23, any extinguishers and related agents will be approved as part of the aircraft design and therefore they do not need a separate application/approval process. In other words, the term 'accepted' is sufficient whereas the term 'approved' may be excessive.

Book 2 — Other fire suppression systems

51. Finally, in particular on commuter aircraft, even if not required by CS-23, designers may wish to implement fire suppression systems in lavatories, engine nacelles or cargo compartments. Therefore additional guidance, informing also on the 'cut-off' and 'end' dates from EU legislation in force, could be appropriate in new paragraph AMC 23.1197.

19 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:254:0001:0238:EN:PDF.

The envisaged changes to Decision 2010/013/R (CS-25 — Book 1) are:

General

52. CS-25 contains Certification Specifications for Large Aeroplanes. Halon is mentioned therein in Book 1 twice:

- In CS 25.851 in relation to handheld fire extinguishers; and
- In Appendix F Part II, par. (g) in relation to flammability testing for seat cushions.

53. The Agency considers that, in order to align with applicable EU law, the term 'halon' should be removed from Book 1.

54. Furthermore, a note should be added in CS 25.1197 (Fire extinguishing agents for powerplants), in order to make reference to the proposed new AMC to it.

Hand fire extinguishers

55. Hence an amendment to CS 25.851(a) is proposed by the present NPA, replacing the term 'halon' by the term 'accepted extinguishing agent'. This proposal of course does not imply that halon is replaced by any alternative mandatory agent. In other words, the proposal moves away from the prescriptive regulations while making the EASA rule on the subject more objective oriented. The amendment gives the opportunity to simplify and streamline the text of CS 25.851(a).

Fire Classes

56. Furthermore, it is believed appropriate to identify, at the level of CS-25 Book 1, the four fire categories currently used to assess fire suppression systems in aviation, i.e. Class A (paper and other ordinary material), Class B (flammable fluids), Class C (electric fires) and Class D (combustible metals). A new paragraph (c)(1) is hence proposed in CS 25.851.

Fire protection of powerplants

57. Mentioned EU legislation covers also engine nacelles and APU. Since a new AMC 25.1197 is proposed below, a reference becomes appropriate in CS 25.1197.

Appendix F

58. Finally, the term 'halon' can easily be replaced by an 'appropriate' extinguishing agent in paragraph (g) of Appendix F, Part II, which again does not prescribe at the level of Book 1 any specific agent, so leaving the possibility of technical evolution, without the need to change the rule.

The envisaged changes to Decision 2010/013/R (CS-25 — Book 2) are:

Hand fire extinguishers

59. Only for clarity purposes it is suggested to add the word 'hand' in the title of AMC 25.851(a), AMC 25.851(a)(1) and AMC 25.851(a)(2).

60. AMC 25.851(a)(2) contains reference to a 'suitable' extinguishing agent against fires originating from flammable fluids or electric equipment. Here it is proposed to refer to Classes B and Class C fires, while adding more information on alternatives to halon for handheld fire extinguishers along the same lines proposed above in relation to CS-23.

Built-in fire extinguishers in cargo compartments

61. AMC 25.851(b) is focused on fire protection of cargo compartments. This could be clarified in the title. These compartments are typically located below the passenger compartment, or below the main deck on freighter aircraft. In case of fire today a quick discharge of halon is deployed into the protected space to suppress the fire, which is followed by a discharge that is released slowly to maintain a concentration of halon to prevent re-flame. The slow discharge is maintained until the aircraft is landed to protect against any reduction in the concentration of halon caused by ventilation or leakage.

62. Extensive guidance on acceptable concentration of halon is already contained in paragraph 4 of AMC 25.851(b). It is felt appropriate that this paragraph remains in Book 2 of CS-25, since halon is not yet totally prohibited in cargo compartments. However, the title could more specifically address halon 1301 (as in the present text), since more guidance may be required in the future for alternative agents. In other words, it should be clear that said paragraph 4 applies only to halon 1301 and not to alternative agents. Consequently, in this paragraph, it is felt appropriate to maintain the term 'halon'. Only minor additional editorial amendments are proposed in said paragraph 4.

63. A simple editorial amendment (even if not related to halon) is believed to be appropriate in subsequent paragraph 5 (in (a)(2) therein), still in AMC 25.851(b).

64. Furthermore, since research may lead to alternatives to halon even in cargo compartments, but since the related test methods are not yet consolidated, it is felt appropriate to maintain the reference to case-by-case Certification Review Items (CRI) in a revised text in paragraph 7 in AMC 25.851(b).

65. Equally minor modifications could be introduced in paragraph 11 (which will become 9 if the EASA proposal in this NPA is accepted) related to the use of 'simulants' during testing and in the title of paragraph 8.

Alternatives to halon

66. In 2007 amendment 4[20] to CS-25 introduced extensive information on alternatives to halon in current paragraph 9 of AMC 25.851(b). However, important developments occurred since then, including adoption of regulations (EC) No 1005/2009 and (EU) No 744/2010. The text of said paragraph therefore needs to be revised. The proposal is based on EU law (including 'end' dates) and on the HTOC 2010 Report. References to the latest FAA documents on the matter are also proposed.

67. However, the greatest part of the existing AMC 25.851(b) refers to halon, whose use is still permitted in cargo compartments. It is hence proposed to move existing paragraphs 9, 10 & 15 of said AMC 25.851(b) into a new AMC 25.851(c). In fact the original AMC 25.851(b) only relates to cargo systems, and therefore it would not be consistent to add material on other extinguishing systems in this AMC. It would be more logical to move paragraphs 9, 10 & 15, complemented as necessary, to address alternative agents for all systems, into a new AMC 25.851(c). Cross-reference could be provided from paragraph 3 (today 'reserved') of AMC 25.851(b), while the remaining paragraphs of 25.851(b) need of course to be renumbered.

Editorials

68. It is suggested to use the term 'competent authority' in paragraph 12 (which will become 10 if the attached draft Decision is accepted) of AMC 25.851(b), in line with the current EASA semantics.

69. Equally the list of references in (old) paragraph 15 in AMC 25.851(b), now contained in proposed paragraph 7 in AMC 25.851(c), needs to be updated.

70. The same applies to AMC to CS 25.855 and 25.877 in order to change the reference from FAA AC 20-42C to edition D of the same document.

Fire extinguishing agents for powerplants

71. Halon is not mentioned explicitly in Subpart E (Powerplant) of Book 2 of CS-25. However, since this agent is still widely used in engine nacelles and APU, it is felt appropriate to propose a new AMC 25.1197 in order to provide to powerplant designers appropriate information on the phasing out of halon.

[20] http://www.easa.europa.eu/ws_prod/g/doc/Agency_Mesures/Agency_Decisions/Change%20Information%20CS-25%20A4.pdf.

The envisaged changes to Decision 2010/010/RM (CS-29) are:

Book 1

72. CS-29 contains Certification Specifications for Large Rotorcraft. No mention of halon is contained therein in Book 1: hence no amendment to Book 1 is proposed by the present NPA, except the reference to the two new proposed AMCs.

Book 2

73. A new paragraph AMC 29.851 is proposed in Book 2, concerning handheld fire extinguishers, along the same lines as proposed for CS-23.

Furthermore a new AMC 29.1197 is proposed to give information on the halon phase out, based on the Montreal Protocol and consequent EU legislation. Other EASA CSs

74. No amendment is necessary to any other EASA CS and in particular no amendment is necessary in:

- CS-22 (Sailplanes and powered sailplanes);
- CS-27 (Small rotorcraft);
- CS-31 HB (Hot air balloons)
- CS-APU;
- CS-E (Engines);
- CS-VLA (Very Light Aeroplanes); and
- CS-VLR (Very Light Rotorcraft).

75. In the future new rulemaking tasks or deliverables may include:

- ETSO referring to MOPS for fire extinguishers;
- Amendment of CS-26 or Implementing Rules which are not yet published, in order to comply with the EU end dates (earliest in 2020);
- Amendment to CS-ADR or Part-ADR (aerodromes) which are presently under development, following the second extension of the EASA mandate, should this be necessary[21].

[21] Presently Article 8a of the EASA Basic Regulation is not yet in force and therefore responsibility for implementing Commission Regulation (EU) No 744/2010, for the aerodrome aspects, is in the exclusive competence of the Member States.

Consistency with OPS rules for hand fire extinguishers

76. In addition, it should be noted that hand fire extinguishers are also mentioned in rules addressed to aircraft operators. The EU rule OPS 1.790[22] in force today, already allows the use of alternative fire extinguishing agents 'equivalent' to halon 1211.

77. The mentioned rule OPS 1.790 is expected to be replaced by EASA CAT.IDE.A.250[23] and associated AMC1[24], where no mention to halon is present at all. The same approach is proposed in the corresponding rule for helicopters (CAT.IDE.H.250).

78. In other words, the applicable (or envisaged) rules on EU commercial aircraft operators are already compliant with Regulation (EU) No 744/2010. The same approach is proposed by the Agency for non-commercial operators of complex aircraft (NCC) and for operators of other than complex aircraft (NCO).

79. Consequently the present NPA does not need to propose any changes to OPS rules and therefore there is no impact on aircraft operators.

80. Aircraft operators should however be aware of the 'end' dates already established by the mentioned Regulation (EU) No 744/2010 (the earliest is in 2020), which may imply retrofit or decommissioning of the aircraft and prevail on any EASA CS or AMC.

22 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:254:0001:0238:EN:PDF.

23 As proposed by Opinion 04/2011: http://www.easa.europa.eu/agency-measures/docs/opinions/2011/04/Annexes%20to%20Regulation.pdf.

24 http://www.easa.europa.eu/rulemaking/docs/crd/part-ops/CRD%20b.3%20-%20Resulting%20text%20of%20Part-CAT%20(A,H)-corrigendum-1.pdf.

New ICAO Standards adopted in June 2011

81. The EU legislation establishes timelines for aircraft for which a new application for type certificate is submitted (i.e. 'cut-off') and for aircraft in service ('end'). ICAO General Assemblies instead proposed a time limit for new production aircraft (based on an existing type certificate).

82. The resulting standards, adopted by the ICAO Council in June 2011, have been disseminated by ICAO State Letters, in particular by SL/44[25] for Annex 6 Part I. Similar amendments have been adopted for Part II and III of Annex 6, as communicated through State Letters 2011/45 and 46.

State Letter 2011/43 communicates the adopted amendment 103 to Annex 8. Annex 8 to the Chicago Convention (after Amendment 103) now hence contains the prohibition of halon in fire suppression systems in lavatories, engine nacelles and APUs, for aircraft for which the application for type certification will be submitted from 31 December 2014 onwards. These ICAO 'cut-off' dates are not more stringent that the ones established by the EU legislation, with which the EASA CSs proposed by the present NPA are compliant.

83. The amendments to Annex 6 mentioned above, introduce the prohibition of halon in fire suppression systems on newly produced aircraft (including those for which a type certificate already exist) from:

- end of 2011 for fire extinguishing systems in lavatories; and
- end of 2016 for handheld (portable) fire extinguishers on aircraft.

84. These recently adopted ICAO standards differ from Regulation (EU) No 744/2010, since:

- EU law covers new applications for type certificate, but (differently form the ICAO SARPs) not newly produced aircraft according to an existing type certificate;
- ICAO SARPs do not contain any 'end' date for retrofit on existing aircraft.

[25] ICAO State Letter Type II AN 11/1.3.24-11/44 of 11 July 2011: adoption of Amendment 35 to Annex 6, Part I.

85. A summary of all the applicable dates is presented in the table below:

Halon phase out dates

Commission Regulation (EU) No 744/2010[26]					ICAO standards adopted in 2011[27]	
Purpose	Type of extinguisher	Type of halon	Dates		Dates	
			Cut-off[28]	End	New products[29]	Cut-off[30]
Normally unoccupied cargo compartments	Fixed	1301 1211 2402	2018	2040		N.A.
Cabins and crew compartments	Portable (Handheld)	1211 2402	2014	2025	2016	N.A.
Engine nacelles and APU	Fixed	1301 1211 2402	2014	2040		2014
Inerting of fuel tanks	Fixed	1301 2402	2011	2040		
Lavatory waste receptacles	Fixed	1301 1211 2402	2011	2020	2011	2014
Dry bays	Fixed	1301 1211 2402	2011	2040		

86. It could therefore be necessary to inform ICAO that, based on applicable EU law, the 27 EU Member States comply with Amendment 103 to Annex 8, but not yet with the amendments to Annex 6.

87. According to the applicable EU law (i.e. Regulation 744/2010) the EU States will be compliant with the mentioned amendments to Annex 6 respectively in 2020 (lavatories) and 2025 (handheld). Two main alternatives may be envisaged:

---

26 Commission Regulation (EU) No 744/2010 does NOT mention a date for newly produced aircraft, according to an existing type certificate.

27 Proposed ICAO SARPs do not contain end dates for removal of halon from aircraft already in service.

28 No new application for Type Certificates possible, if halon is present in the design.

29 E.g. aircraft for which individual certificate of airworthiness is issued after the stated date, but for which model type certificate already exists.

30 For aircraft whose application for type certification will be submitted on or after 31 December of that year.

A. Maintain a common difference notified to ICAO by all EU Member States (in turn ICAO Contracting States) with reference to Article 38 of the Chicago Convention, until respectively 2020 and 2025; or

B. The European Commission (e.g. new amendment to Regulation (EC) No 1005/2009) and/or the Agency (e.g. Airworthiness Directives (ADs) to holders of Type Certificates or a different regulatory instrument, like e.g. planned Part 26), may take action in order to mandate replacement of halons (for the applications and in line with the dates covered by the ICAO SARPs) on newly produced aircraft according to said existing type certificates, earlier than 2020.

88. Any suggestion or comment from stakeholders is welcome in relation to any paragraph of the present NPA, including on the paragraph immediately above, if so wished. Conversely ALL stakeholders are kindly invited to reply, but only either 'A' or 'B' to the question below:

Question	The Agency would be interested in knowing whether stakeholders prefer: • alternative A (i.e. do not affect newly produced aircraft based on existing type certificates and notify a difference to ICAO until 2020/25)? • or alternative B (i.e. take action in the EU to comply with the new ICAO SARPs before 2020)?

V. Regulatory Impact Assessment

89. Purpose and intended effect

a. Issue which the NPA is intended to address

Halon 1301, halon 1211 and halon 2402 (hereinafter referred to as 'halons') are ozone depleting substances listed as controlled substances in Group III of Annex I to Regulation (EC) No 1005/2009. Their production in Member States has been limited in 1985 and finally banned since 1994, in line with the requirements of the Montreal Protocol.

Their use, however, continues to be permitted for certain 'critical uses' as set out in Annex VI to Regulation (EC) No 1005/2009.

In particular, halons are used in civilian aircraft for:

- the protection of cargo, cabin and crew compartments;
- the protection of engine nacelles and APU; and
- the protection of lavatory waste receptacles.

The European Commission (EC) has evaluated the current use of halons and the availability and implementation of technically and economically feasible alternatives or technologies that are acceptable from the standpoint of environment and health (hereinafter referred to as 'alternatives').

The review has shown that, with few exceptions, halons are no longer necessary to meet fire protection needs in new designs of equipment and new facilities, and that alternatives are now routinely being installed in many segments of industry activity.

However, halon extinguishers and fire protection systems continue to be necessary in some equipment, in particular portable fire extinguishers and fire suppression systems on board aircraft, in particular in cargo compartments on large aeroplanes.

In the light of these results, Commission Regulation (EU) No 744/2010 established for each application:

- 'cut-off' dates after which halons for new equipment would not be considered 'critical use' and the installation of a halon extinguisher or fire protection system would therefore not be permitted (i.e. related to new applications for type certificates);
- 'end dates' after which the use of halons for fire extinguishers or fire protection systems in all equipment and facilities, whether in existing equipment and existing facilities or in equipment that is, or will be, produced to existing designs, would cease to be considered critical use (i.e. decommissioning or retrofit of aircraft in the fleet equipped with halon).

Furthermore ICAO, based on the Assembly Resolutions, has adopted standards for Annex 6 to establish dates after which newly produced aircraft (i.e. new individual aircraft built in compliance with an existing type certificate) shall no longer employ halon for certain applications.

b. Scale of the issue

Potentially the aircraft affected are:

- aeroplanes and rotorcraft already in the fleet, under the responsibility of an aircraft operator and accompanied by a valid individual certificate of airworthiness (COFA);
- new individual aircraft produced according to a design already approved through an existing type certificate;
- new applications for type certification.

According to the HTOC 2010 Report[31], the total number of commercial aircraft in service in the world (excluding Russian built aircraft), can be estimated in:

TOTAL number of commercial aircraft in service world wide (excluding Russian built aircraft)

Type	2010	2015	2020
Large passenger aeroplanes	16,078	19,172	22,265
Commuter passenger aeroplanes	4,527	5,398	6,269
Large freighter aeroplanes	896	1,011	1,126
Commuter freighter aeroplanes	970	1,095	1,220
TOTAL Commercial aeroplanes	**22,471**	**26,676**	**30,880**

Assuming that 25 % of these aircraft are under the responsibility of EU air operators, the following figures can be estimated:

TOTAL number of commercial aircraft in service in the EU

Type	2010	2015	2020
Large passenger aeroplanes	4,020	4,793	5,566
Commuter passenger aeroplanes	1,132	1,350	1,567
Large freighter aeroplanes	224	253	282
Commuter freighter aeroplanes	242	274	305
TOTAL Commercial aeroplanes	**5,618**	**6,442**	**7,720**

Assuming an average life of 20 years for each aircraft, one could assume that every year about 5 % of the aircraft in service will be 'newly' produced and registered in the EU:

TOTAL number of commercial aircraft registered in the EU in the year (newly produced)

Type	2010	2015	2020
Large passenger aeroplanes	201	240	278
Commuter passenger aeroplanes	57	67	78
Large freighter aeroplanes	11	13	14
Commuter freighter aeroplanes	12	14	15
TOTAL Commercial aeroplanes	**281**	**334**	**385**

31 Table 7-1 on page 59 therein.

It is finally assumed that 80 % of the newly assembled and delivered aircraft will have been produced according to an 'old' type certificate, while only 20 % on the basis of recent type certificate:

TOTAL number of commercial aircraft registered in the EU in the year (newly produced and based on a recent type certificate)

Type	2010	2015	2020
Large passenger aeroplanes	40	48	56
Commuter passenger aeroplanes	11	13	16
Large freighter aeroplanes	2	3	3
Commuter freighter aeroplanes	2	3	3
TOTAL Commercial aeroplanes	**55**	**67**	**78**

c. Brief statement of the objectives of the NPA

The objective of this NPA is to remove reference to halon from CS Book 1 and to provide suitable information and guidance (on halon whilst still permitted and on alternatives) in CS Book 2. This will apply for new applications for type certificates.

Recent ICAO amendments to Annex 6 impact on newly produced aircraft (including those based on an existing type certificate).

'End' dates (2020 at the earliest) for removal of halon, impacting on aircraft in the fleet, and respective operators, are established by mentioned Regulation (EU) No 744/2010.

90. Options

The following options have been identified:

a. Option 1: Do nothing;

b. Option 2: Amend CS-23, CS-25 and CS-29 to mandate halon replacement (for some applications as discussed above) only in relation to new applications for type certificate;

c. Option 3: The same as 2, but also issue a number of Airworthiness Directives to holders of type certificates in order to mandate halon replacement (in the cases mentioned in recent amendments to ICAO Annex 6) on all newly produced aircraft (even when based on existing type certificates);

d. Option 4: The same as 3, but in addition amend the EASA rules on aircraft operations (OPS) in order to comply with the 'end' dates mandated by Regulation (EU) No 744/2010.

91. Sectors concerned

The introduction of these identified subjects into EASA rules will mainly affect aircraft manufacturers and possibly (i.e. option 4) aircraft operators.

92. Impacts

a. All identified impacts are qualitatively assessed ('light' RIA) and expressed in terms of a score = a numerical single digit from –3 (highly negative) to +3 (highly positive). Safety scores, since safety is the primary objective of EASA as per Article 2 of the Basic Regulation, are assigned a 'weight' of 3. Environmental scores, based on the same Article, have a weight of 2. Other scores have a weight of 1.

i. Safety

Options	1	2	3	4
	Do nothing	**Amend only CSs (i.e. covering only new applications for type certification)**	**CSs and ADs for all newly produced aircraft (including those based on existing type certificates)**	**CSs, ADs and amendment of EASA OPS rules, in relation to 'end' dates**
Assessment	Discrepancy between EASA CSs and EU law could create uncertainties, slightly detrimental to safety.	CS Book 1 will not mandate any specific fire extinguishing agent, but only contain: • Performance-based requirements; and • Information on EU 'cut-off' dates. This will increase certainty and awareness, while leaving the possibility of choosing agents that are mature, safe and effective.	Replacing halon may imply new safety risks (e.g. from toxicity to strength of mountings). Therefore option 3 is not safer than option 2.	No further benefit since 'end' dates are already established by EU law. Furthermore no obligation to use halon is contained in the proposed EASA OPS rules. In any case, the earliest 'end' date is 2020 and therefore there is time for EASA to issue rules, if necessary, at a later stage.
Score (un-weighted)	–1	2	2	2
Weight	Multiply the un-weighted score by: 3			
Score (weighted)	**–3**	**6**	**6**	**6**

ii. Environmental

Options	1 Do nothing	2 Amend only CSs (i.e. covering only new applications for type certification)	3 CSs and ADs for all newly produced aircraft (including those based on existing type certificates)	4 CSs, ADs and amendment of EASA OPS rules, in relation to 'end' dates
Assessment	CS-25 Book will continue to mandate Halon 1211 in hand fire extinguishers on board aircraft. According to HTOC 2010 Report, in 2010 these produced almost 12 tons of emitted halon.	This option will be beneficial for the environment. Continuing research of alternatives to halon, voluntary modifications by industry and shortage of recycled halon on the market would further enhance its effects.	The transition to aircraft equipped with halon alternatives would be quicker than in option 2.	No more beneficial than option 3 since 'end' dates are anyway mandated by EU law.
Score (un-weighted)	–3	2	3	3
Weight	Multiply the un-weighted score by: 2			
Score (weighted)	**–6**	**4**	**6**	**6**

iii. Economic

Options	1 Do nothing	2 Amend only CSs (i.e. covering only new applications for type certification)	3 CSs and ADs for all newly produced aircraft (including those based on existing type certificates)	4 CSs, ADs and amendment of EASA OPS rules, in relation to 'end' dates
Assessment	EU law applies anyway, even in the absence of EASA rules. The cost for technical modifications will be identical to option 2. But uncertainty of the rules will require to dedicate more working hours to the interpretation of the rules and debate.	Implementing alternatives to halon only to new designs is the cheapest and easiest way to phase out halon from aviation.	In this option EASA will have to spend time to issue several ADs. And holders of type certificates will be obliged to design changes virtually to all aircraft in their catalogue.	Effort needed to draft, discuss and adopt EASA rules on OPS. In any case, this will not change the dates already mandated by EU law. In summary, this option will cost even more than option 3.
Score (un-weighted)	–1	3	–2	–3
Weight	Multiply the un-weighted score by: 1			
Score (weighted)	**–1**	**3**	**–3**	**–3**

iv. Social

No impact expected.

v. Other aviation requirements outside the EASA scope

Options	1 Do nothing	2 Amend only CSs (i.e. covering only new applications for type certification)	3 CSs and ADs for all newly produced aircraft (including those based on existing type certificates)	4 CSs, ADs and amendment of EASA OPS rules, in relation to 'end' dates
Assessment	EASA rules neither compliant with EU law nor recent ICAO standards, nor with recent FAA material.	EASA rules complaint with EU law, but not with recent amendments to ICAO Annex 6.	EASA rules complaint with EU law and with ICAO standards.	As option 3, since neither ICAO nor FAA have published 'end' dates.
Score (un-weighted)	–3	2	3	3
Weight	Multiply the un-weighted score by: 1			
Score (weighted)	**–3**	**2**	**3**	**3**

b. Equity and fairness in terms of distribution of positive and negative impacts among concerned sectors.

All applicants are equally affected.

93. Summary and final assessment

a. Comparison of the positive and negative impacts for each option evaluated

Using the Multi-Criteria Analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed:

Options	1	2	3	4
	Do nothing	Amend only CSs (i.e. covering only new applications for type certification)	CSs and ADs for all newly produced aircraft (including those based on existing type certificates)	CSs, ADs and amendment of EASA OPS rules, in relation to 'end' dates
	Weighted score			
Safety	–3	6	6	6
Environment	–6	4	6	6
Economic impact	–1	3	–3	–3
Social impact	0	0	0	0
Regulatory harmonisation	–3	2	3	3
TOTAL	**–13**	**15**	**12**	**12**

b. Final assessment and recommendation of a preferred option

Option 1 ('do nothing') is clearly the worst and not acceptable one.

All other three options exhibit a positive total (weighted) score and are equivalent in terms of safety. Among them, option 2 has the highest total score and in particular it is slightly worse than either 3 or 4 from the environmental point of view, but it is, by far, the most advantageous in economic terms. Option 2 will imply a difference with ICAO standards until 2020/25.

Option 2 is therefore the preferred one.

B. Draft Decisions

I. Draft Decision CS-23

Book 1

SUBPART D

CS 23.851 Hand Fire extinguishers
(See AMC 23.851 (c))

(a) There …

SUBPART E

CS 23.1197 Fire extinguishing agents

(see AMC 23.1197)

Book 2

AMC SUBPART D

AMC 23.851(c) Hand Fire extinguishers

~~Acceptance of existing FAA AC 20-42C as AMC to 23.851(c) pending the results of research into halon replacement~~

Halon 1211, 1301 and Halon 2402 are no longer acceptable extinguishing agents, based on EU Law[32], for hand fire extinguishers in newly designed aircraft installations, after 31 December 2014.

The guidance regarding hand fire extinguishers in FAA Advisory Circular AC 20-42D is considered acceptable by EASA. See paragraph AMC CS 23.1197 for more information on Halon alternatives.

AMC SUBPART E

AMC 23.1197 Fire extinguishing agents

The Montreal Protocol, in existence since 1987, is an international agreement to phase out production and use of ozone-depleting substances, including halogenated hydrocarbons also known as Halon. A European Regulation[33] governing substances that deplete the ozone layer was published in 2000 containing initial provisions for Halon phase-out, but also exemptions for critical uses of **Halon**, including fire extinguishing in aviation.

---

32 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

33 Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.

'Cut-off' (i.e. Halon no longer acceptable in new applications for type certification) and 'end' (i.e. halon no longer acceptable for use in aircraft) dates have been subsequently established by a new Regulation in 2010[34], as presented in Table 4.1 below:

Table 4.1: 'Cut-off' and 'end' dates

Aircraft compartment	Type of extinguisher	Type of halon	Dates	
			Cut-off	End
Lavatory waste receptacles	Built-in	1301 1211 2402	31 December 2011	31 December 2020
Cabins and crew compartments	Hand (portable)	1211 2402	31 December 2014	31 December 2025
Propulsion systems and Auxiliary Power Units	Built-in	1301 1211 2402	31 December 2014	31 December 2040
Normally unoccupied cargo compartments	Built-in	1301 1211 2402	31 December 2018	31 December 2040

9.2 Lavatory extinguishing systems and agents

Historically, Halon 1301 has been the most widespread agent used in lavatory extinguishing (lavex) systems, to be used in the event of a Class A fire (i.e. originating from paper and other common materials). Any alternative acceptable fire extinguishing agent must meet the Minimum Performance Standards (MPS) laid down in Appendix D to Report DOT/FAA/AR-96/122 of February 1997, which include the ability to extinguish a Class A fire and, in case of discharge, does not create an environment that exceeds the chemical agent's 'No Observable Adverse Effect Level' (NOAEL). Research and testing has shown that there are suitable alternatives to halon for built-in fire extinguishers in aircraft lavatories meeting the MPS for effectiveness, volume, weight and toxicology. Currently HFC-227ea or HFC-236fa are widely used on large aeroplanes and are usually considered acceptable by EASA.

9.3 Hand fire extinguishers and agents

Historically, Halon 1211 has been the most widespread agent in handheld (portable) fire extinguishers to be used in aircraft compartments and cabins. Minimum Performance

[34] Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

Standards (MPS) for the agents are laid down in Appendix A to Report DOT/FAA/AR-01/37 of August 2002, while acceptable criteria to select the fire extinguishers containing said agents are laid down in the FAA Advisory Circular AC 20-42D. Three agent alternatives to halon are presently known meeting the MPS: HFC-227ea, HFC-236fa and HCFC Blend B. However, these agents are heavier and occupy a greater volume than Halon 1211. This may indirectly (i.e. additional weight of the fire extinguisher and additional weight of the structures supporting it) increase CO_2 emissions. Furthermore, some of these agents have also been identified for having a global warming potential much higher than halon. Therefore, further research is underway to develop additional alternatives to Halon 1211 for hand fire extinguishers.

Should an applicant wish to propose, even before the end of 2014, any alternative agent for hand fire extinguishers, meeting the mentioned MPS, the EASA will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

9.4 Fire protection of propulsion systems and APU

Historically, Halon 1301 has been the most widespread agent used in engine nacelles and APU installations to protect against Class B fires (i.e. originating from fuel or other flammable fluids). The MPS for agents to be used in these compartments are particularly demanding, because of the presence of fuel and other volatile fluids in close proximity to high temperature surfaces, not to mention the complex air flows and the extremely low temperatures and pressures surrounding the nacelles. Various alternatives are being developed (e.g. FK-5-1-12), while the FAA is aiming at issuing a report containing the MPS.

Should an applicant wish to propose, even before the end of 2014, any alternative agent for Class B fire extinction in engine or APU compartments, even in the absence of a published MPS, the EASA will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

9.5 Fire protection of cargo compartments

MPS for cargo compartment fire suppression systems have has already been published in the Report DOT/FAA/AR-00/28 of September 2000. However, to date there are no known and sufficiently developed alternatives to Halon 1301.

[Amdt No: 23/X]

II. Draft Decision CS-25

Book 1

SUBPART D DESIGN AND CONSTRUCTION

CS 25.851 Fire extinguishers

(a) *Hand fire extinguishers*

(See AMC 25.851(a).)

(1) The following minimum number of hand fire extinguishers …

(6) ~~At least one of t~~The required fire extinguishers located in the passenger compartment ~~of an aeroplane with a passenger capacity of at least 31 and not more than 60, and at least two of the fire extinguishers located in the passenger compartment of an aeroplane with a passenger capacity of 61 or more~~ must contain ~~Halon 1211 (bromochlorodifluoromethane, CBrC1F2), or equivalent, as the~~ an accepted extinguishing agent~~. The type of extinguishing agent used in any other extinguisher required by this paragraph must be~~ that is appropriate for the kinds and classes of fires likely to occur where used.

(7) …

(b) *Built-in fire extinguishers* …

(c) *Fire extinguishing agents*

(See AMC 25.851(c).)

(1) Fire classes against which fire extinguishing agents may be employed are:

- Class A: Fires involving ordinary combustible materials, such as wood, cloth, paper, rubber and plastics;
- Class B: Fires involving flammable liquids, petroleum oils, greases, tars, oil base paints, lacquers, solvents, alcohols and flammable gases;
- Class C: Fires involving energized electrical equipment where the use of an extinguishing agent that is electrically non-conductive is important;
- Class D: Fires involving combustible metals, such as magnesium, titanium, zirconium, sodium, lithium and potassium.

`

SUBPART E POWERPLANT

CS 25.1197 Fire extinguishing agents

(See AMC 25.1197.)

(a) Fire extinguishing agents must –

(1) Be capable of extinguishing flames …

(2) Have thermal stability …

(b) If any toxic extinguishing agent is used, …

Appendix F – Part II – Flammability of seat cushions

(a) Criteria for acceptance

…

(g) Test procedures. The flammability of each set of specimens must be tested as follows:

(1) …

(6) Expose the seat bottom cushion specimen to the burner flame for 2 minutes and then turn off the burner. Immediately swing the burner away from the test position. Terminate test 7 minutes after initiating cushion exposure to the flame by use of an gaseous extinguishing agent ~~(i.e. Halon or CO2)~~.

(7) …

Book 2

AMC SUBPART D

AMC 25.851(a) Hand Fire Extinguishers

…

AMC 25.851(a)(1) Hand Fire Extinguishers

…

AMC 25.851(a)(2) Hand Fire Extinguishers

There should be at least one fire extinguisher suitable for ~~both flammable fluid and electrical equipment~~ Class B and C fires installed in each pilot's compartment. Additional extinguishers may …

Halon 1211, 1301 and Halon 2402 are no longer acceptable extinguishing agents, based on EU Law[35], for hand fire extinguishers in newly designed aircraft installations for which type certification is requested after 31 December 2014.

The hand fire extinguishers and related agents listed in the FAA Advisory Circular AC 20-42D are considered acceptable by EASA. See AMC 25.851(c) for more information on Halon alternatives.
NOTE: Dry chemical fire extinguishers …

AMC 25.851(b) Built-in Fire Extinguishers for Cargo Compartments

1. PURPOSE

…
3. ~~RESERVED~~ BAN ON HALON 1301
Halon 1301 is no longer an acceptable extinguishing agent, based on EU Law[36], for cargo compartment fire extinction systems to be installed on newly designed aircraft types, for which type certification is requested after 31 December 2018. See AMC 25.851(c) for more information on Halon alternatives.

4. BACKGROUND ON CONCENTRATION OF HALON 1301

Minimal written guidance …

Cargo fire extinguishing systems installed in aeroplanes ~~today~~ have primarily used **Halon** 1301 as the fire suppression agent. One widely used method to certify **Halon 1301** cargo …

Since **Halon 1301** is approximately five times heavier than air, it tends to stratify and settle after it is released into the cargo compartment. Also, due to temperature

35 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

36 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

differences and ventilation patterns, in a ventilated compartment, **Halon 1301** will start to stratify shortly after discharge and the concentration level will decay faster in the upper locations of the compartment than in the lower locations. **Halon 1301** will also have a tendency to move aft due to any upward pitch or forward in any downward pitch of the aeroplane in flight. For some products the concentration levels of **Halon 1301** have been measured at various locations throughout …

Testing at the FAA Technical Center and other data from standardised fire extinguishing evaluation tests indicate that the use of averaging techniques may not substantiate that there are adequate concentration levels of fire extinguishing agent throughout the compartment to effectively suppress a cargo fire. If a cargo fire occurred, and was subsequently suppressed by **Halon 1301**, the core of the fire could remain hot for a period of time. If the local concentration of **Halon 1301** in the vicinity of the fire core dropped below three percent by volume and sufficient oxygen is available, re-ignition could occur. The FAA tests have shown that when the **Halon 1301** concentration level drops below three percent by volume and the cargo fire reignites, the convective stirring caused by the heat of the fire may be insufficient to raise the local concentration of **Halon** in the vicinity of the fire. Therefore, …

5. COMPARTMENT CLASSIFICATION

All cargo compartments …

a. A Class A compartment is …

(1) Typically, a Class A compartment is …

(2) Because a Class A compartment does not have a liner, it is *absolutely essential* that the compartment be small and located close enough to a crew member that any fire that might occur could be discovered and extinguished immediately. Without a liner to contain it, an undetected or uncontrolled fire could quickly become catastrophic by burning out of the compartment and spreading throughout the aeroplane. All portions of the compartment must be within arms length of the crew member in order for any fire to be detected immediately and extinguished in a timely manner. Although there may be some exceptions, such as a 'U-Shaped' compartment for example, a Class A compartment greater than 1.42 cubic metres (50 cubic feet) in volume would not typically have the accessibility required by CS 25.857(a)(2) for fighting a fire.

b. …

6. FIRE EXTINGUISHING OR SUPPRESSION SYSTEMS

…

7. TESTING VOLUMETRIC CONCENTRATION LEVELS

For the product it should be demonstrated that the cargo fire extinguishing system provides adequate concentration levels of extinguishing agent to combat a fire anywhere where baggage and cargo is placed within the cargo compartment for the time duration required to land and evacuate the aeroplane. A combination of flight-testing and analysis may be used to comply with this requirement. If **Halon 1301** is used, an initial minimum concentration of five percent by volume is required to knock down a cargo fire. …

The fire extinguishing agent concentration levels should be measured at sufficient vertical, horizontal, and longitudinal locations to ensure that sufficient resolution exists to …

The concentration levels …

…

Certification flight test demonstration is required for a 'dump' system … certification data must include analysis and/or data taken after landing at a time increment representative of the completion of an evacuation of all occupants.

Acceptable extinguishing agents, alternative to Halon and based on internationally recognized Minimum Performance Standards (MPS), may be accepted by EASA. In the absence of internationally accepted concentration levels, the EASA will initiate a Certification Review Item addressing the use of an alternate fire extinguishing agent.

~~If it is proposed for a product to use a fire extinguishing agent other than Halon 1301, the Agency should be contacted. The EASA will initiate a Certification Review Item addressing the use of an alternate fire extinguishing agent.~~

8. AEROPLANE TEST CONDITIONS FOR USE OF HALON 1301 IN CARGO COMPARTMENTS

Flight tests are required to …

~~9. EVALUATION OF ALTERNATE GASEOUS EXTINGUISHING/SUPPRESSION SYSTEMS AND ALTERNATE AGENTS.~~

~~The Montreal Protocol, in existence since 1987, is an international agreement to phase out production of ozone-depleting substances, including halogenated hydrocarbons also known as Halon. The Montreal Protocol prohibits the manufacture or import of new Halon in all developed countries as of January 1, 1994, and will extend this prohibition to developing countries in the future. The US Environmental Protection Agency (EPA) has subsequently released a regulation banning the intentional release of Halons during repair, testing, and disposal of equipment containing Halons and during technician training. However, the EPA has provided the aviation industry an exemption from their ban on the intentional release of Halons in determining compliance with airworthiness standards. A European Regulation[37] governing substances that deplete the ozone layer has also been published and contains provisions that allow exemptions for critical uses of **Halon**, including fire extinguishing in aviation. It should be noted that the EPA/EU exemption is predicated on the basis that there is currently no suitable alternate agent or system available for use on commercial transport category aeroplanes. It is the understanding of the EASA that once a suitable replacement extinguishing agent or system has been found then the EPA/EU will remove the exemption.~~

~~To date, FAA Technical Center testing of alternate gaseous extinguishing/suppression agents has not yielded any acceptable alternate **Halon** replacement agents for use in cargo compartments. For example, testing at the Technical Center utilising HFC-125 demonstrated the need for large concentrations of this agent that would carry weight penalty and toxicity concerns. The Technical Center will continue to pursue this line of research to identify alternate gaseous and liquid and other fire extinguishing / suppression agent systems. Acceptable means of compliance for these immature systems are beyond the scope of this AMC. Future revisions to this AMC will be accomplished as soon as suitable standards are developed for these systems.~~

[37] Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.

~~Should the EASA be approached with the intent of utilising for the product an alternate agent or alternate gaseous fire extinguishing system in lieu of a **Halon 1301** system, then the recommended approach would be to perform testing on the product which meets the Minimum Performance Standards for that application as developed by the International **Halon** Replacement Working Group. The International **Halon** Replacement Working Group was established in October 1993. This group was tasked to work towards the development of minimum performance standards and test methodologies for non-**Halon** aircraft fire suppression agents/systems in cargo compartments, engine nacelles, hand held extinguishers, and lavatory trash receptacles. The International **Halon** Replacement Working Group has been expanded to include all system fire protection R&D for aircraft and now carries the name, International Aircraft Systems Fire Protection Working Group.~~

~~To ensure acceptable means of compliance, the following must be provided:~~

~~a. The test data and gaseous agent distribution profiles which meet the certification criteria as expressed below and in the Minimum Performance Standards as developed by FAA Technical Center as part of the International Halon Replacement program. (See paragraph 15 for the listing of the references.)~~

~~b. A system description document that includes a description of the distribution of the gaseous agent under the test conditions in the cargo compartment.~~

~~c. A detailed test plan.~~

~~d. Chemical data which describes the agent and any toxicity data.~~

~~9.1 Pre-Test Considerations:~~

~~a. An EASA accepted analyser (for example, Statham-derivative analyser) capable of measuring the agent distribution profile in the form of volumetric concentration is required.~~

~~b. An EASA accepted analyser (for example, Statham-derivative analyser) and associated hardware are configured for the particular application.~~

~~c. The fire suppression system should be completely conformed prior to the test.~~

~~d. The fire extinguisher bottle(s) should be serviced and prepared for the prescribed test(s).~~

~~9.2 Test Procedures:~~

~~a. Perform the prescribed distribution test in accordance with the test plan approved by the Agency. See Paragraph 7 for guidance on probe placement.~~

~~b. An EASA accepted analyser (for example, Statham-derivative analyser) should record the distribution profile as volumetric concentration for the agent.~~

~~9.3 Test Result Evaluation:~~

~~a. Produce the data from the EASA accepted analyser (for example, Statham-derivative analyser) in graphical format. This format should be the volumetric concentration of the agent versus time. A specific percent volumetric initial concentration and a specific percent volumetric metered concentration for the length of the test duration as determined by previous testing conducted per the established minimum performance standards is required for airworthiness approval of cargo compartment systems.~~

~~b. Using the appropriate MPS evaluation criteria, evaluate the distribution profile of the agent for acceptable performance. The acceptability of the test data would be dependent upon the distribution profile and duration exhibited by each probe per (1) above and Paragraph 7 for cargo compartment fire extinguishing systems~~

~~10. EVALUATION OF ALTERNATE LIQUID AGENT AND FIRE EXTINGUISHING/ SUPPRESSION SYSTEMS.~~

~~The FAA Technical Center has released a Technical Note that represents the latest Minimum Performance Standards (MPS) for a water spray system. However, as mentioned within the body of the report, additional developmental testing would be needed for the product and the FAA to be approached regarding certification of such a system. Additional testing would be required to demonstrate compliance with an Aerosol spray can fire threat. The Technical Center continues to perform research towards identifying alternate liquid and other fire extinguishing / suppression systems. Acceptable means of compliance for these immature systems are beyond the scope of this AMC. Future revisions to this AMC will be accomplished as soon as suitable standards are developed for these systems.~~

~~If for the product it is proposed to use a liquid fire extinguishing agent or system, the EASA should be contacted. The EASA will initiate a Certification Review Item addressing the use of an alternate fire extinguishing agent or system.~~

~~11~~9. USE OF SIMULANTS FOR CERTIFICATION TESTING

The aviation industry may continue to use **Halon** in cargo fire suppression applications in relation to new application for type certificate, until the end of 2018. ~~as long as acceptable alternatives have not been identified and shown to provide an equivalent level of safety.~~

The EPA/EU ~~is~~ are allowing the aviation industry to use **Halon** to demonstrate system functionality as long as a simulant or alternate extinguishing agent or alternate fire extinguishing system cannot be used in place of the **Halon** during system or equipment testing for technical reasons. It should be noted, however, that certain states continue to ban the release of **Halon** for testing. The FAA Technical Center and the International Aircraft Systems Fire Protection Working Group are concentrating efforts on evaluating alternative fire extinguishing agents and the use of simulants during certification testing. The EASA plans to approve a simulant which can be used in place of **Halon 1301** during certification tests of aircraft fire extinguishing systems to predict actual **Halon 1301** volumetric concentration levels. When approved, the use of a simulant will be the preferred method for demonstrating compliance.

As of the date of this AMC, no suitable simulant for cargo compartment gaseous fire extinguishing systems has been identified. However, should the EASA be approached with the intent to utilise for the product a simulant in lieu of a **Halon 1301** system or other gaseous fire extinguishing system, then the recommended approach would be to perform testing which meets the Minimum Performance Standards for that application as developed by the International Aircraft Systems Fire Protection Working Group. To ensure successful acceptable means of compliance, the same information as outlined above in paragraph 7 should be provided.

A simulant is defined in this AMC as …

For the application the distribution of the simulant must be described as compared with **Halon 1301** under the following conditions:

a. Given the same filling conditions, the simulant is loaded into the fire extinguisher bottle based on an equivalent liquid fraction to the **Halon 1301** charge weight required. This is an equivalent statement to the mass of the simulant being a specific percentage of the **Halon** 1301 charge weight required.

b. The fire extinguisher bottle containing the simulant is pressurised with nitrogen in an identical manner required by the **Halon** 1301 charge weight.

c. The simulant is discharged into the test environment, i.e. cargo compartment.

~~11~~9.1 Pre-Test Considerations:

a. …

c. The fire suppression system should be completely conformed for **Halon 1301**.

d. …

~~11~~9.2 Test Procedures:

a. …

~~11~~9.3 Test Result Evaluation:

a. …

b. Using the **Halon 1301** certification criteria, evaluate …

~~12~~10. ESTABLISHING DURATION FOR THE SUPPRESSION SYSTEM

The adequacy of the capacity of the 'built-in system' is understood to mean that there is sufficient quantity of agent to combat the fire anywhere where baggage and cargo is placed within the cargo compartment for the time duration required to land and evacuate the aeroplane. Current built-in cargo fire extinguishing systems utilise **Halon 1301** as the fire extinguishing agent. Protection is afforded as long as the minimum concentration levels in the cargo compartment do not drop below three percent by volume. The time for which a suppression system will maintain the minimum required concentration levels should be identified as a certificate limitation.

The designer of the product should work with the aircraft owner and the ~~civil aviation~~ competent authority providing operational approval to ensure that the cargo fire extinguishing system provides the required protection time (i.e., proper sizing of the cargo fire extinguishing system) for the specific route structure. The competent ~~civil aviation~~ authority may insist on some holding time to allow for weather and other possible delays, and may specify the speeds and altitudes used to calculate aeroplane diversion times based on one-engine-out considerations.

The competent ~~civil aviation~~ authority providing operational approval for the aeroplane determines …

~~13~~11. MANUAL CONSIDERATIONS

…

~~14~~12. PLACARDS AND MARKINGS IN CARGO COMPARTMENTS

…

~~15. REFERENCES.~~

~~a. Report No. FAA-RD-71-68, Fire Extinguishing Methods for New Passenger Cargo Aircraft, dated November 1971.~~

~~b. Civil Aviation Authority (CAA) Paper 91003, Cargo Bay Fire Suppression, dated March 1991.~~

~~c. Report No. DOT/FAA/AR-96/5, Evaluation of Large Class B Cargo Compartment's Fire Protection, dated June 1996.~~

~~d. Report No. DOT/FAA/AR-00-28, Development of a Minimum Performance Standard for Aircraft Cargo Compartment Gaseous Fire Suppression Systems, dated September 2000.~~

~~e Report No. DOT/FAA/AR-TN01/1, Water Spray as a Fire Suppression Agent for Aircraft Cargo Compartment Fires, dated March 2001.~~

APPENDIX 1: ANALYTICAL METHODS FOR DETERMINING **HALON 1301** CONCENTRATION LEVELS

...

AMC 25.851(c) Alternative fire extinguishing agents

1. General

The Montreal Protocol, in existence since 1987, is an international agreement to phase out production and use of ozone-depleting substances, including halogenated hydrocarbons also known as Halon. The Montreal Protocol prohibits the manufacture or import of new Halon in all developed countries as of January 1, 1994. The US Environmental Protection Agency (EPA) has released a regulation banning the intentional release of Halons during repair, testing, and disposal of equipment containing Halons and during technician training. However, the EPA has provided the aviation industry an exemption from their ban on the intentional release of Halon in determining compliance with airworthiness standards. A European regulation[38] governing substances that deplete the ozone layer was also published, containing initial provisions for Halon phase-out, but also exemptions for critical uses of **Halon**, including fire extinguishing in aviation. It should be noted that the exemptions were predicated on the basis that there were, at that time, no suitable alternate agents or systems available for use on commercial transport category aeroplanes.

'Cut-off' dates (i.e. Halon no longer acceptable in new applications for type certification) and 'end' dates (i.e. halon no longer acceptable for use in aircraft) have been subsequently established by a new regulation in 2010[39], as presented in Table 4.1 below:

Table 4.1: 'Cut-off' and 'end' dates

[38] Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.

[39] Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

Aircraft compartment	Type of extinguisher	Type of halon	Dates	
			Cut-off	End
Inerting of fuel tanks	Fixed	1301 2402	31 December 2011	31 December 2040
Lavatory waste receptacles	Built-in	1301 1211 2402	31 December 2011	31 December 2020
Dry bays	Fixed	1301 1211 2402	31 December 2011	31 December 2040
Cabins and crew compartments	Hand (portable)	1211 2402	31 December 2014	31 December 2025
Propulsion systems and Auxiliary Power Units	Built-in	1301 1211 2402	31 December 2014	31 December 2040
Normally unoccupied cargo compartments	Built-in	1301 1211 2402	31 December 2018	31 December 2040

2 Lavatory extinguishing systems and agents

Historically, Halon 1301 has been the most widespread agent used in lavatory extinguishing (lavex) systems, to be used in the event of a Class A fire. Any alternative acceptable fire extinguishing agent meeting the Minimum Performance Standards (MPS) laid down in Appendix D to Report DOT/FAA/AR-96/122 of February 1997, which includes the ability to extinguish a Class A fire and, in case of discharge, does not create an environment that exceeds the chemical agent's 'No Observable Adverse Effect Level' (NOAEL) will be acceptable. Research and testing have shown that there are suitable alternatives to Halon for built-in fire extinguishers in aircraft lavatories meeting the MPS for effectiveness, volume, weight and toxicology. Currently HFC-227ea or HFC-236fa are widely used on large aeroplanes and usually considered acceptable by EASA.

3 Hand fire extinguishers and agents

Historically, Halon 1211 has been the most widespread agent in handheld (portable) fire extinguishers to be used in aircraft compartments and cabins. Minimum Performance Standards (MPS) for the agents are laid down in Appendix A to Report DOT/FAA/AR-01/37 of August 2002, while acceptable criteria to select the fire extinguishers containing said agents are laid down in the FAA Advisory Circular AC 20-42D. Three agent

alternatives to Halon are presently known meeting the MPS: HFC-227ea, HFC-236fa and HFC Blend B. However, these agents are significantly heavier and occupy a greater volume than Halon 1211. This may indirectly (i.e. additional weight of the fire extinguisher and additional weight of the structures supporting it) increase CO_2 emissions. Furthermore some of these agents have also been identified for having a global warming potential much higher than Halon. Therefore further research is underway to develop additional alternatives to Halon 1211 for hand fire extinguishers.

Should an applicant wish to propose, even before the end of 2014, any alternative agent for hand fire extinguishers, meeting the mentioned MPS, the EASA will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

4 Fire protection of propulsion systems and APU

Historically, Halon 1301 has been the most widespread agent used in engine nacelles and APU installations to protect against Class B fires. The MPS for agents to be used in these compartments are particularly demanding, because of the presence of fuel and other volatile fluids in close proximity to high temperature surfaces, not to mention the complex air flows and the extremely low temperatures and pressures surrounding the nacelles. Various alternatives are being developed (e.g. FK-5-1-12), while the FAA is aiming at issuing a Report containing the MPS.

Should an applicant wish to propose, even before the end of 2014, any alternative agent for Class B fire extinction in engine or APU compartments, even in the absence of a published MPS, the EASA will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

5 Fire protection of cargo compartments — Gaseous agents

MPS for cargo compartment fire suppression systems have already been published in the Report DOT/FAA/AR-00/28 of September 2000. However, to date there are no known and sufficiently developed alternatives to Halon 1301.

Should the EASA be approached with the intent to utilise for the product an alternate agent or alternate gaseous fire extinguishing system in lieu of a **Halon 1301** system, then the recommended approach would be to perform testing on the product which meets the Minimum Performance Standards for that application as developed by the International Halon Replacement Working Group. The International Halon Replacement Working Group was established in October 1993. This group was tasked to work towards the development of minimum performance standards and test methodologies for non-Halon aircraft fire suppression agents/systems in cargo compartments, engine nacelles, handheld extinguishers, and lavatory waste receptacles. The International Halon Replacement Working Group has been expanded to include all system fire protection R&D for aircraft and now carries the name 'International Aircraft Systems Fire Protection Working Group'.

To ensure acceptable means of compliance, the following must be provided:

a. The test data and gaseous agent distribution profiles which meet the certification criteria as expressed below and in the Minimum Performance Standards as developed by the FAA Technical Center as part of the International Halon Replacement program. (See paragraph 7 for the listing of the references.)

b. A system description document that includes a description of the distribution of the gaseous agent under test conditions in the cargo compartment.

c. A detailed test plan.

d. Chemical data which describes the agent and any toxicity data.

5.1 Pre-test considerations:

a. An EASA accepted analyser (for example, Statham-derivative analyser) capable of measuring the agent distribution profile in the form of volumetric concentration is required.

b. An EASA accepted analyser (for example, Statham-derivative analyser) and associated hardware are configured for the particular application.

c. The fire suppression system should be completely conformed prior to the test.

d. The fire extinguisher bottle(s) should be serviced and prepared for the prescribed test(s).

5.2 Test procedures:

a. Perform the prescribed distribution test in accordance with the test plan approved by the Agency. See Paragraph 7 in AMC 25.851(b) for guidance on probe placement.

b. An EASA accepted analyser (for example, Statham-derivative analyser) should record the distribution profile as volumetric concentration for the agent.

5.3 Test result evaluation:

a. Produce the data from the EASA accepted analyser (for example, Statham-derivative analyser) in graphical format. This format should be the volumetric concentration of the agent versus time. A specific percentage of volumetric initial concentration and a specific percentage of volumetric metered concentration for the length of the test duration as determined by previous testing conducted per the established minimum performance standards is required for airworthiness approval of cargo compartment systems.

b. Using the appropriate MPS evaluation criteria, evaluate the distribution profile of the agent for acceptable performance. The acceptability of the test data would be dependent upon the distribution profile and duration exhibited by each probe per (1) above and Paragraph 7 for cargo compartment fire extinguishing systems.

6. EVALUATION OF ALTERNATE LIQUID AGENT AND FIRE EXTINGUISHING/SUPPRESSION SYSTEMS

The FAA Technical Center has released a Technical Note that represents the latest Minimum Performance Standards (MPS) for a water spray system. However, as mentioned within the body of the report, additional developmental testing would be needed for the product and the FAA to be approached regarding certification of such a system. Additional testing would be required to demonstrate compliance with an Aerosol spray. The Technical Center continues to perform research towards identifying alternate liquid and other fire extinguishing/suppression systems. Acceptable means of compliance for these immature systems are beyond the scope of this AMC. Future revisions of this AMC will be accomplished as soon as suitable standards are developed for these systems.

If for the product it is proposed to use a liquid fire extinguishing agent or system, the EASA should be contacted. The EASA will initiate a Certification Review Item addressing the use of an alternate fire extinguishing agent or system.

7. REFERENCES

a. Report No FAA-RD-71-68, Fire Extinguishing Methods for New Passenger Cargo Aircraft, dated November 1971.

b. UK Civil Aviation Authority (CAA) Paper 91003, Cargo Bay Fire Suppression, dated March 1991.

c. Report No DOT/FAA/AR-96/5, Evaluation of Large Class B Cargo Compartment's Fire Protection, dated June 1996.

d. Report No DOT/FAA/AR-96/122, Development of a Minimum Performance Standard for Lavatory Trash Receptacle Automatic Fire Extinguishers, dated February 1997.

e. Report No DOT/FAA/AR-00-28, Development of a Minimum Performance Standard for Aircraft Cargo Compartment Gaseous Fire Suppression Systems, dated September 2000.

f. Report No DOT/FAA/AR-TN01/1, Water Spray as a Fire Suppression Agent for Aircraft Cargo Compartment Fires, dated March 2001.

g. Report No DOT/FAA/AR-01/37, Development of a Minimum Performance Standard for Hand-Held Fire Extinguishers as a Replacement for Halon 1211 on Civilian Transport Category Aircraft, dated August 2002.

h. 2010 Report of the UN Halons Technical Options Committee – 2010 Assessment

i. FAA Advisory Circular AC 20-42D, Hand Fire Extinguishers for use in Aircraft, dated 14 January 2011.

AMC to CS 25.855 and 25.857 Cargo or baggage compartments

1. PURPOSE

...

2. RELATED DOCUMENTS

a. Certification Specifications

...

b. FAA Advisory Circulars (AC)

The following FAA Advisory Circulars are accepted by the Agency as providing acceptable means of compliance with CS 25.857:

AC 25-17, …

AC 20-42~~C~~D, Hand Fire Extinguishers for use in Aircraft

...

3 BACKGROUND

...

4. COMPARTMENT CLASSIFICATION

...

5. FIRE PROTECTION FEATURES

...

b. Access

(1) Class B. Class B compartments must provide sufficient accessibility …

(2) Class F. In the case of a Class F compartment, a means should be provided to control or extinguish a fire without a crew member entering the compartment.

… For **Halon 1301** fire extinguishing agent, a minimum five percent concentration by volume at all points in the compartment is considered adequate for initial knock-down of a fire, and a three percent concentration by volume at all points in the compartment is considered the minimum for controlling a fire after it is knocked down. This option requires the use of a liner as stated in CS 25.855 (b).

...

c. Extinguishing agent

In order to effectively extinguish or control a fire in a Class B or F cargo or baggage compartment, sufficient fire extinguishing agent must be allocated. Guidance on this topic ~~has been~~ is contained in the FAA AC 20-42~~C~~D. This guidance material is accepted by the Agency as addressing how to implement the provisions of CS 25.851(a) that require that

at least one hand fire extinguisher be located in the pilot compartment, at least one readily accessible hand fire extinguisher be available for use in each Class A or Class B cargo/baggage compartment and in each accessible Class E or Class F cargo/baggage compartment, and one or more hand fire extinguishers be located in the passenger compartment for aeroplanes with a passenger seating capacity of 7 or more.

d. Fire control

...

6 PROCEDURES AND LIMITATIONS

...

7. AFM CONSIDERATIONS

...

AMC 25.1197 Fire extinguishing agents

Halon 1301 is no longer an acceptable extinguishing agent, based on EU Law[40], for engine nacelle and APU fire extinction systems to be installed on newly designed aircraft types, for which type certification is requested after 31 December 2018. See AMC 25.851(c) for more information on Halon alternatives.

[Amdt No: 25/XX]

40 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

III. Draft Decision CS-29

Book 1

CS 29.851 Fire extinguishers

(see AMC 29.851)

29.1197 Fire extinguishing agents

(see AMC 29.1197)

Book 2

AMC

AMC 29.851 Hand fire extinguishers

Halon 1211, 1301 and Halon 2402 are no longer acceptable extinguishing agents, based on EU Law[41], for hand fire extinguishers in newly designed aircraft installations after 31 December 2014.

The hand fire extinguishers and related agents listed in the FAA Advisory Circular AC 20-42D are considered acceptable by EASA. See paragraph AMC CS 29.1197 for more information on Halon alternatives.

AMC 29.1197 Fire extinguishing agents

1. The Montreal Protocol, in existence since 1987, is an international agreement to phase out production and use of ozone-depleting substances, including halogenated hydrocarbons also known as Halon. A European regulation[42] governing substances that deplete the ozone layer was published in 2000 containing initial provisions for Halon phase-out, but also exemptions for critical uses of Halon, including fire extinguishing in aviation.

2.

'Cut-off' dates (i.e. Halon no longer acceptable in new applications for type certification) and 'end' dates (i.e. Halon no longer acceptable for use in aircraft) have been subsequently established by a new regulation in 2010[43], as presented in Table 4.1 below:

Table 4.1: 'Cut-off' and 'end' dates

41 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

42 Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer.

43 Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halon (OJ L 218, 19.8.2010, p. 2).

Aircraft compartment	Type of extinguisher	Type of halon	Dates	
			Cut-off	End
Lavatory waste receptacles	Built-in	1301 1211 2402	31 December 2011	31 December 2020
Cabins and crew compartments	Hand (portable)	1211 2402	31 December 2014	31 December 2025
Propulsion systems and Auxiliary Power Units	Built-in	1301 1211 2402	31 December 2014	31 December 2040
Normally unoccupied cargo compartments	Built-in	1301 1211 2402	31 December 2018	31 December 2040

3. Readers should also check the latest ICAO standards in Annex 6 and 8 and EU regulations concerning permitted agents and any amendment to replacement schedules.

4. This AMC provides further guidance and acceptable means of compliance to supplement FAA AC 29.1197 Change 3 (Certification of transport category rotorcraft), to meet the Agency's interpretation of CS 29.1197. As such it should be used in conjunction with the FAA AC but take precedence over it, where stipulated in the EU legislation, in the showing of compliance. Specifically, this AMC addresses alternatives to halon in the areas mentioned in following paragraphs 6 to 9.

5. In the course of halon replacement, novel agent types such as fluorine ketone liquids and aerosols are being developed. In contrast to the gaseous agents, e.g. Halon 1301, which disperse more or less easily inside a given volume when released, liquid and powder-type substances require the evaluation of precise spray vectors and more complex piping configurations inside the compartment in order to achieve the concentration-over-time certification limits as required to act as an effective fire agent.

6.

7. Hand fire extinguishers and agents

Historically, Halon 1211 has been the most widespread agent in handheld (portable) fire extinguishers to be used in aircraft compartments and cabins. Minimum Performance Standards (MPS) for the agents are laid down in Appendix A to Report DOT/FAA/AR-01/37 of August 2002, while acceptable criteria to select the fire extinguishers containing said agents are laid down in the FAA Advisory Circular AC 20-42D. Three agent alternatives to Halon are presently known meeting the MPS: HFC-227ea, HFC-236fa and HFC Blend B. However, these agents are significantly heavier and occupy a greater volume than Halon 1211. This may indirectly (i.e. additional weight of the fire

extinguisher and additional weight of the structures supporting it) increase CO_2 emissions. Furthermore some of these agents have also been identified for having a global warming potential much higher than Halon. Therefore, further research is underway to develop additional alternatives to Halon 1211 for hand fire extinguishers.

Should an applicant wish to propose, even before the end of 2014, any alternative agent for hand fire extinguishers meeting the mentioned MPS, the EASA will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

8 Fire protection of propulsion systems and APU

Historically, Halon 1301 has been the most widespread agent used in engine nacelles and APU installations to protect against Class B fires (i.e. fuel or other flammable fluids). The MPS for agents to be used in these compartments are particularly demanding, because of the presence of fuel and other volatile fluids in close proximity to high temperature surfaces, not to mention the complex air flows and the extremely low temperatures and pressures surrounding the nacelles. Various alternatives are being developed (e.g. FK-5-1-12), while the FAA is aiming at issuing a report containing the MPS.

Should an applicant wish to propose, even before the end of 2014, any alternative agent for Class B fire extinction in engine or APU compartments, even in the absence of a published MPS, the EASA will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

[Amdt No: 29/X]

III.