COMMENT RESPONSE DOCUMENT (CRD) TO NOTICE OF PROPOSED AMENDMENT (NPA) 2011-14

for amending

Decision No 2010/008/R of the Executive Director of the European Aviation Safety Agency of 28 September 2010 on Certification Specifications for Normal, Utility, Aerobatic and Commuter Aeroplanes (CS-23),

AND

Decision No 2011/004/R of the Executive Director of the European Aviation Safety Agency of 4 July 2011 on Certification Specifications for Large Aeroplanes (CS-25)

AND

Decision No 2008/010/RM of the Executive Director of the European Aviation Safety Agency of 17 November 2008 on Certification Specifications for Large Rotorcraft (CS-29)

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

Reactions to this CRD should be submitted via the CRT by clicking the '*add a general reaction*' button.

Please indicate clearly the applicable paragraph.

EXECUTIVE SUMMARY

The scope of this rulemaking activity, aiming at replacing halon on aircraft, 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.

A different rulemaking task (i.e. RMT.0368, formerly MDM.091) deals with the issue of preventing the use of contaminated halon, through provisions on continuous airworthiness.

The purpose of NPA 2009-14 was 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 said NPA was 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, CS-25 and CS-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).

46 comments were received from 17 commentators. Present CRD replies individually to each of them.

In principle stakeholders agreed to amend CS-23, CS-25 and CS-29 in order to be compliant with EU legislation and with the Amendment 103 to ICAO Annex 8.

They also acknowledged that in the future, and through proper consultation, the Agency may issue an ETSO covering hand-held fire extinguishers using agents different from halon.

The EU legislation implies compliance with recent amendments (i.e. applicable in December 2011) to ICAO Annex 6 (i.e. newly produced aircraft based on existing Type Certificates) only in 2020 and 2025. Present CRD does not include any rule in this respect, but, following comments by stakeholders, it suggests that the Agency will launch a subsequent rulemaking task in order to ensure compliance well before 2020/25.

Finally a number of commentators stated that the 'end dates' (i.e. retrofit) established by EU legislation may neither be feasible, nor justified comparing the cost of retrofit with the very small quantities of halon released by aviation in the atmosphere. This requirement is not dictated by the Agency, but by other EU legislation and therefore the Agency cannot take action on this. The Agency will however convey to the European Commission a summary of the views expressed by stakeholders. The Agency also understands that the matter will be discussed at the 38th ICAO General Assembly in 2013, on the basis of Resolution A37-9.

In conclusion the Agency intends to adopt the amendments to CS-23, CS-25 and CS-29, as modified following suggestions by stakeholders. Subsequently the Agency may progress, through different specific tasks:

- prevention of use of contaminated halon in aircraft (i.e. RMT.0368);

- ETSO for halon-free hand-held fire extinguishers;
- Alignment of EASA rules with ICAO Annex 6; rules however addressed to aircraft manufacturers for newly produced aircraft (based on existing TCs) and not to operators (= no retrofit).

Explanatory Note

I. General

1. The purpose of the Notice of Proposed Amendment (NPA) 2011-14 was 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. This implies amending the following 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 2011/004/R of 4 July 2011 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).

II. Consultation

2. NPA 2011-14 was published on the web site (http://www.easa.europa.eu) on 8 August 2011.

   By the closing date of 9 November 2011, the European Aviation Safety Agency ('the Agency') had received 46 comments from 17 National Aviation Authorities, professional organisations and private companies.

III. Publication of the CRD

3. All comments received have been acknowledged and incorporated into this Comment Response Document (CRD) with the responses of the Agency.

4. In responding to comments, a standard terminology has been applied to attest the Agency's acceptance of the comment. This terminology is as follows:

   - **Accepted** – The comment is agreed by the Agency and any proposed amendment is wholly transferred to the revised text;
   - **Partially Accepted** – Either the comment is only agreed in part by the Agency, or the comment is agreed by the Agency but any proposed amendment is partially transferred to the revised text;
   - **Noted** – The comment is acknowledged by the Agency but no change to the existing text is considered necessary; and
   - **Not Accepted** - The comment or proposed amendment is not shared by the Agency

   The resulting text highlights the changes as compared to the current rule.

5. The Executive Director Decision on the update of CS-23, CS-25 and CS-29 in order to comply with EC regulations on replacement of halon will be issued at least two months after the publication of this CRD to allow for any possible reactions of stakeholders regarding possible misunderstandings of the comments received and answers provided.

6. Such reactions should be received by the Agency not later than **10 April 2012** and should be submitted using the Comment-Response Tool at http://hub.easa.europa.eu/crt.

IV. CRD table of comments, responses and resulting text

(General Comments)	-

comment	*1a* comment by: *Gulfstream Aerospace Corporation* Attachment #1 Gulfstream appreciates the opportunity to review and provide comments on this NPA concerning the phase out of Halon. Please see the attached document for Gulfstream's response.
response	Noted. Comments are addressed in the detail in the following.

comment	*20* comment by: *Cessna Aircraft Company* Cessna Aircraft Company has no comment on this issue at this time.
response	*Noted*

comment	*22* comment by: *Swiss International Airlines / Bruno Pfister* SWISS Intl Air Lines accepts the NPA 2011-14 without further comments
response	*Noted*

comment	*24* comment by: *Pilatus* Pilatus does not support the NPA, as no acceptable and effective substitute for Halon is currently available. Furthermore, any acceptable substitute is most likely to have different volume and weight characteristics, probably heavier which means more aircraft fuel is required for the identical operation which defeats the object to be more environmentally friendly as more fuel is used; hence more CO2 is released into the atmosphere. Since extinguishers are not all that often discharged, the pollution from Halon is negligible.

response

Not accepted

Phasing out of halon is not mandated by EASA, but required by ICAO standards and Commission Regulation (EC) 744/2010.
In any case the word 'halon' is neither today present in CS-23 Book 1, nor proposed by the Agency to be inserted. In Book 2 of CS-23 the proposed text does not mandate any specific agent (halon or else), of course provided that it is safe, effective and compliant with applicable legislation.

Finally the statement that no alternatives are available is not true, at least for portable fire extinguishers and for installations in lavatories, as explained in the NPA.

comment

26a comment by: *Luftfahrt-Bundesamt*

The LBA agrees with the proposals made for amending the Certification Specifications (CS) as proposed in NPA 2011-14.

response

Noted

Support is noted

CONCLUSION ON GENERAL COMMENTS:

Only one aircraft manufacturer in principle opposed the amendment of CS-23, -25 and -29 as proposed by NPA 2009-11. Other stakeholders and one authority instead expressed support in principle. Therefore the Agency concludes that Rulemaking Task RMT.0273 (MDM.071) can be progressed.

A. Explanatory Note - I. General p. 4-5

comment

3 comment by: *Airbus*

Page 5, paragraphs 7.b, c, d: stringency comparisons between the proposed rule and the ICAO standards are not relevant. The ICAO standards set halon replacement dates. The proposed rule does not. It just amends the certification specifications as needed to allow certification of halon-free systems.

Paragraph 7.e: it would be more accurate to change the paragraph as follows:

~~is harmonised with~~ **refers to** the relevant Advisory Circulars and minimum Performance Specifications (MPS) for extinguishing agents, published by the FAA.

response

Noted

The suggestions for the wording of the Explanatory Note in NPA 2011-14 are correct and appreciated. However that text was only for illustrative purposes. It will neither be republished, nor become regulatory material.

A. Explanatory Note - IV. Content of the draft Decisions – Background, alternatives to halon, and EC Regulations p. 6-8

comment

4 comment by: *Airbus*

Page 8, paragraph 22, 2nd bullet: we suggest clarification of the sentence between parentheses as follows:

(i.e. retrofit **with halon-free systems** ~~may be~~ **is** required **on or before the end date**)

response

Noted

The comment is noted. However:

- the Explanatory Note will not be republished; and
- nothing prevents that aircraft are phased-out or sold outside the EU, before the end date, which will avoid retrofit.

comment

43c comment by: *AEA*

Apart of that, the adaptation by EASA mainly comprises the change of wording, e.g. from "Halon" to "fire extinguishing agents" in order to enable the use of alternative fire extinguishing agents.

response

Noted

Indeed the proposed wording in Book 1 of CS-XX does not mandate any specific agent (i.e. halon or alternative), providing that it is safe, effective, not creating unacceptable collateral effects and compliant with legislation.

CONCLUSION ON COMMENTS ON BACKGROUND, GENERAL REQUIREMENTS FOR HALON REPLACEMENT AND SUMMARY OF EU LEGISLATION:

In general stakeholders shared the summary information provided in NPA 2011-14.

A. Explanatory Note - IV. Content of the draft Decisions – Hand-held fire extinguishers p. 9

comment

28 comment by: *Boeing*

Page: 9 - Item 27. The stated changes do not adequately address the impacts.

We suggest the following revisions be made:

*"27. These units have different **chemical** volume and weight characteristics compared to existing halon 1211 extinguishers. Therefore ~~new brackets and supports may be required for new airframes and/or retrofit~~ **significant changes may be required with the potential for future replacement**."*

JUSTIFICATION: The alternatives also pose significant installation and operational challenges. Because the alternative extinguishers are between 4 to 6 pounds heavier and 1.5 to 2.0 times larger, design and structural changes to current production aircraft will be required (e.g., increased bracket support and potentially additional sidewall structural support). In some aircraft, extinguishers are located in small cabinets, underneath seats, or below flight decks. Those locations may not be large enough for the bigger extinguishers, may require reconfiguration, and may necessitate the relocation of other equipment elsewhere in the cabin and/or flight deck. One aircraft type alone has over 80 different fire extinguisher configurations in the passenger cabin and 12 for the flight deck.

Moreover, some of the potential alternatives have higher attributed global warming potential (GWP) values compared to halon, with little substantive change in the actual release of ozone depleting substances. Handheld fire extinguishers are used only in the rare event of actual smoke or fire in aircraft. Two of the alternatives for hand-held extinguishers are hydro-fluorocarbons (HFCs) (HFC-236fa and HFC-227ea); they have global warming potential (GWP) values 2.6 and 7.2 times greater than Halon 1211, and are designated greenhouse gases under the Kyoto Protocol. It is anticipated that regulatory restrictions or bans will be imposed on HFCs in fire protection applications. The third alternative agent for handhelds, HCFC-123, has a lower ozone depleting potential (ODP) than Halon 1211, but its use for fire extinguishing applications is not permitted under Regulation (EC) No. 2037/2000.

response

Noted

Indeed the text of paragraph 27 in the Explanatory Note could have been more precise. However, it will not become regulatory material.

Furthermore, the proposed amendments to CSs do not mandate any specific agent for portable hand-held fire extinguishers. The recent 2nd ICAO International Halon Replacement Coordination Meeting (IHRCM/2 in November 2011) confirmed that few alternatives are available, including some promising "drop-in" (i.e. similar volume and structural requirements) alternatives.

Proposed CS-XX text allows industry to propose any suitable alternative, providing that it complies with applicable MPS and legislation (including

Regulation (EC) 2037/2000).

comment

29 comment by: *Boeing*

Page 9 - Item 31. The proposed text states:

"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."

The conclusion drawn by EASA does not acknowledge that the International Civil Aviation Organization (ICAO) has adopted a different deadline for handheld replacements. In light of this, we recommend the following statement be added:

"EASA will monitor the halon replacement dates established by ICAO as it conducts regular reviews of the status of potential halon alternatives to ensure that the replacement dates are appropriate."

JUSTIFICATION: Halon replacement will require full cooperation of all stakeholders and coordination to achieve uniform and orderly implementation of optimal alternatives that provide adequate technical performance, certification, and long-term environmental benefit. Stakeholders include environmental and aviation regulatory agencies, manufacturers, including chemical agent manufacturers, airlines, and halon recyclers.

response

Partially accepted

1. The dates for replacing halon in hand-held fire extinguishers used in cabins and crew compartments in newly manufactured aircraft are not substantially different between EU legislation and ICAO Annex 6. The former in fact establishes a 'cut-off' date of 2014 for new applications for Type Certificate, while the latter 2016 for any newly produced aircraft (i.e. also based on an existing Type Certificate). Assuming two years between the application and the issue of the TC, the two dates are in practice very close. Experience shows that in several cases this period is even longer than two years.

2. Indeed the Agency intends to participate, within the limits of the available resources, to the collective monitoring through the International Halon Replacement Working Group (IHRCM).

comment

43d comment by: *AEA*

Moreover the adapted standards now include evidence of available alternatives per fire extinguisher type:

- Looking at hand fire extinguishers the use of alternatives seems to be realistic so that according to EASA the given "cut-off-date" at the end of 2014 looks feasible.

response	*Noted* Support for the 'cut-off' date for hand fire extinguishers is noted.

CONCLUSION ON COMMENTS ON HAND-HELD FIRE EXTINGUISHERS:

In general stakeholders shared the approach presented in NPA 2011-14 in relation to hand-held fire extinguishers. However EASA will continue to monitor the situation in coordination with the ICAO International Halon Replacement Coordination Meeting (IHRCM).

A. Explanatory Note - IV. Content of the draft Decisions – Extinguishers in lavatories p. 9

comment	*43e* comment by: *AEA* Moreover the adapted standards now include evidence of available alternatives per fire extinguisher type: o Looking at extinguishers in lavatories alternatives already exist so that according to EASA the given "cut-off-date" at the end of 2011 looks feasible.
response	*Noted* Support for the "cut-off" date for fire extinguishers in lavatories is noted.

CONCLUSION ON COMMENTS ON FIRE EXTINGUISHERS IN LAVATORIES:

In general stakeholders shared the approach presented in NPA 2011-14 for fire extinguishers installed in lavatories.

A. Explanatory Note - IV. Content of the draft Decisions – Fire protection of engine nacelles and APUs p. 10

comment	*1b* comment by: *Gulfstream Aerospace Corporation* For engine and APU fire extinguishing systems, Gulfstream recommends both the cut-off and end dates not be fixed until such time the FAA issues the MPS and the industry has a viable FAA/EASA approved analyser for agents other

than Halon.

response

Not accepted

The cut off and end dates for fire extinguishing agents in APUs and engine nacelles are not fixed by EASA rules, but by European Commission Regulation (EC) No 744/2010. The end date (i.e. 2040) is sufficiently away not to require any urgent attention today. The cut-off date (applicable to new aircraft type designs) of 2014, compliant with amendment 103 of ICAO Annex 8, is currently considered feasible. In fact according to the recent International Halon Replacement Coordination Meeting (IHRCM/2) held in ICAO at end of 2011, at least two promising alternative agents are under testing.

comment

*1d*comment by: *Gulfstream Aerospace Corporation*

Gulfstream's review of the leading candidates has determined that there are still significant issues with these alternatives. HFC 125, which is a leading candidate for Halon replacement, is a greenhouse gas and also depletes the ozone layer, so in the spirit of the rule change this could not be considered as anything beyond an interim step towards a 'green' alternative to Halon 1301. Furthermore, although not confirmed, it is anticipated from the data available that approximately a 25% to 50% increase in weight would be required in order to achieve an effective installation. This would result in a complex and burdensome modification for existing fleet installations. Additionally, alternatives that add significant weight would most likely be counterproductive with regard to greenhouse gas emissions. Net greenhouse gas emissions would be increased due to increased fuel burn on aircraft on every flight as opposed to the relatively small amount of Halon being discharged infrequently in the event of a fire or accidental discharge. Other agents being suggested for Engine and APU are BTP or CF3I, which are known to be effective, but have serious operational hazards to personnel and material (highly corrosive and toxic).

response

Noted.

In fact the 'promising' agents for engine nacelles and APU identified by IHRCM/2 do not include HFC, BTP or CF3I.

comment

2 comment by: *GE Aviation*

Work on replacements for Halon 1301 has encountered difficulties. Some of the proposed replacements have been less effective than initially thought, when tested. Others have damaging effects when used in the nacelle environment. As of late 2011, attempts to certify with a substitute for Halon 1301 have not been successful. GE Aviation requests that no cut-off date for engine/nacelle fire protection be advocated until the industry can identify and validate an effective and non-damaging substitute for Halon 1301.

response	*Noted* It is true that the development of alternatives for halon replacement in engine nacelles and APU compartments has been long and difficult. However, the last information available to the Agency (i.e. conclusions of 2nd ICAO International Halon Replacement Coordination Meeting (IHRCM/2)) confirmed that two promising agents are under development. In any case the 'cut off' dates are not mandated by the proposed EASA CSs (which do not prohibit halon), but by Regulation (EC) 744/2010 which is not in the remit of the Agency.

comment	*5* comment by: *Airbus* Page 10, paragraph 38: what is the source of the information that the final MPS for engine/nacelle/APU protection could be available around 2013?
response	*Noted* Confirmed by 2nd ICAO International Halon Replacement Coordination Meeting (IHRCM/2) in November 2011.

comment	*6* comment by: *Airbus* Page 10, paragraph 39: it should not be forgotten that, once the MPS is available and the extinguishing agent has passed it, there are still a lot of requirements, including aircraft installation certification, to be met before an alternative can be fully implemented. This may take several years
response	*Not accepted* The 'cut off' date, (i.e. for new applications for Type Certificates) is established by Regulation (EC) 744/2010. Proposed EASA CSs neither mandate not prohibit halon. Applicants for TC have to demonstrate safety of legally acceptable solutions of their design solutions, even in the absence of detailed published specifications. Where necessary the Agency will issue Certification Review Items (CRI).

comment	*21a* comment by: *AIR-120* My comment for page 10 paragraph 38 is: The FAA's engine nacelle/APU MPS revision 3 currently remains available although revision 4 is anticipated soon. The major difference between revision 3 & revision 4 is that the latter would accommodate a powder based extinguishing agent.
response	Noted

comment	*30* comment by: *Boeing* Page: 10 - Items 38 & 39? The proposed text states: *"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."* We find these statements misleading because they do not address the other implementation and certification requirements beyond Minimum Performance Standards. We therefore recommend the following revision for Item 38: *"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.* ***While the two OEMs have been actively working with the FAA on candidates, significant development and testing requirements for certification approval have not yet been defined****."* **JUSTIFICATION:** There are many regulations over and above those tested by MPS, and all of them must be satisfied to field a new agent. It is entirely possible for something to perform in a satisfactory manner on MPS testing, but still not be certifiable due to other issues. The certifying authorities do not accept MPS as proof of fire extinguishing capability. The statement that it is feasible by 2014 solely because the requirements are defined is not appropriate.
response	*Noted* 1. It is true that the development of alternatives for halon replacement in engine nacelles and APU compartments has been long and difficult. However, the last information available to the Agency (i.e. conclusions of 2nd ICAO International Halon Replacement Coordination Meeting (IHRCM/2) confirmed that two promising agents are under development. In any case the 'cut off' dates are not mandated by the proposed EASA CSs (which allow halon), but by Regulation (EC) 744/2010 which is not in the remit of the Agency. 2. The absence of detailed specifications by EASA or others does not prevent certification programmes to be progressed (e.g. through Certification Review Items - CRIs).

comment	*43f* comment by: *AEA* Moreover the adapted standards now include evidence of available alternatives per fire extinguisher type: o Looking at fire protection of engine nacelles and APUs alternatives have just been tested in military aircraft nevertheless according to

	EASA the given "cut-off-date" at the end of 2014 looks feasible.
response	*Noted*

CONCLUSION ON COMMENTS ON FIRE PROTECTION OF ENGINE NACELLES AND APUs:

Stakeholders expressed many doubts about the availability and maturity of solutions, alternative to halon, for fire protection of engine nacelles and APUs in the time frame established by Regulation (EC) 744 and by ICAO Annex 8 ('cut-off' date in both of them is 2014).

Agency observes that:

- recent 2nd ICAO International Halon Replacement Coordination Meeting (IHRCM/2, Nov. 2011) concluded that two promising alternatives to halon do exist, although they are not yet completed tested;
- the 'cut-off' dates however derive not from EASA rules, but form other sources;
- in any case proposed amendments to Book 1 of CS-23, -25, -29 do neither prohibit halon, nor mandate any specific alternative agent;
- furthermore, the proposed text in Book 2 acknowledges the difficulties and recalls that, when necessary, Certification Review Items (CRIs) may be used, while technology evolves.

In conclusion the Agency maintains the approach proposed in NPA 2011-14 for amending the mentioned CSs. The concerns raised by stakeholders will however be submitted to the attention of the European Commission.

A. Explanatory Note - IV. Content of the draft Decisions – Cargo compartments p. 10

comment	*7* comment by: *Airbus* Page 10, paragraph 43: due to its location under the Cargo compartment title, this statement may be understood as applicable to cargo compartments only. In fact it is valid for all applications.
response	*Noted* Indeed. Observation is correct.

comment	*21b* comment by: *AIR-120*

My comment for page 10 paragraph 40 is: The cargo MPS does not specify space nor weight requirements. This is a consideration of the airframe manufacturer.

response *Noted*

comment *21c* comment by: *AIR-120*

My comment for page 10 paragraph 42 is: Testing to date has shown that halon replacement agents that were effective in other aircraft applications have not been able to pass all four tests of the cargo MPS. Therefore, I am puzzled at why the 2018 cut-off date is feasible. What is this confidence based on, the combined system of water mist/nitrogen?

response *Noted*

The estimation of the feasibility of alternatives for fire extinguishing in cargo compartments in 2018 is based on the extrapolation of the information available today. In any case the proposed AMC 25.851(c) already envisages different alternatives (including water spray) and the use of Certification Review Items (CRIs) for specific projects if necessary.

comment *31* comment by: *Boeing*

Page 10 - Item 42. The proposed text states:
"42. Minimum Performance Standards are already available and therefore the Agency is confident that the cut-off date of 2018 for fire suppression in cargo compartments is equally feasible."

However, there are many regulations over and above those tested by MPS, and all of them must be satisfied to field a new agent. It is entirely possible for something to perform in a satisfactory manner on MPS testing, but still not be certifiable due to other issues. The certifying authorities do not accept MPS as proof of fire extinguishing capability. Therefore, we suggest that Item 42 be **deleted**.

JUSTIFICATION: The statement that it is feasible by 2018 solely because the requirements are defined is not appropriate. It also disagrees with Items 40 and 41m, which explain that the only possible alternative has been determined to not be viable by industry.

response *Noted*

The comment by Boeing is reasonable. Replacement of halon in cargo compartments has so far proved to be the most difficult. However:

1. the proposed EASA CS-XX do not prevent to use halon in said compartments;
2. the 'cut off' date of 2018 stems from Regulation (EC) 744/2010, which is not paralleled by any ICAO standard;

3. it is expected that the ICAO Contracting States (including the 27 Members of the European Union) will discuss the matter at the 38th ICAO General Assembly in 2013, based on report by the ICAO Council requested by Resolution A37-9. EASA, within the limits of its remit, will do its best to contribute to the ICAO progress.

comment

32 comment by: *Boeing*

Page 10 - Item 43. The proposed text states:
"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."

The conclusion drawn by EASA does not acknowledge that the International Civil Aviation Organization has not adopted a deadline for cargo replacements. We therefore recommend that the following statement be added:
"EASA will monitor the halon replacement dates established by ICAO as it conducts regular reviews of the status of potential halon alternatives to ensure that the replacement dates are appropriate."

JUSTIFICATION: It is premature to specify timeframes for cargo compartment applications, given the status of the challenging research work on alternatives for that application and the lack of alternatives successfully meeting the FAA MPS test requirements. Halon replacement will require full cooperation of all stakeholders and coordination to achieve uniform and orderly implementation of optimal alternatives that provide adequate technical performance, certification, and long-term environmental benefit. Stakeholders include environmental and aviation regulatory agencies, manufacturers (including chemical agent manufacturers), airlines, and halon recyclers.

response

Noted

It is acknowledged that replacement of halon in cargo compartments has so far proved to be the most difficult. However:

1. the proposed EASA CS-XX do not prevent to use halon in said compartments;
2. the "cut off" date of 2018 stems from Regulation (EC) 744/2010, which is not paralleled by any ICAO standard;
3. said Regulation is outside the scope of EASA remit (i.e. safety and implementation of ICAO Annex 16);
4. it is expected that the ICAO Contracting States (including the 27 Members of the European Union) will discuss the matter at the 38th ICAO General Assembly in 2013. The Agency, within the limits of its remit, will do its best to follow the ICAO Resolutions;
5. it is the Agency's intention to participate to the ICAO International Halon Replacement Coordination Meetings (IHRCM) in order to pool efforts for common progress and monitoring.

comment

43g comment by: *AEA*

Moreover the adapted standards now include evidence of available alternatives

	per fire extinguisher type: O Looking at Cargo compartments, alternatives do not exist. Nevertheless according to EASA the given "cut-off-date" at the end of 2018 looks feasible. This assessment seems to be problematic. Looking at the volume of cargo compartments and indefinable cargo characteristics alternatives are quite rare especially because a change of the fire extinguisher agent's weight or efficiency leads to an enormous influence to aircraft structures. Indeed – as the discussed EASA standards just adapt given European requirements– a change of this "cut-off-date" cannot be initiated here. Existing doubts were expressed during the discussion according to the implementation of EC 744/2010 in line with the whole aviation industry.
response	*Noted* Indeed the replacement of halon in cargo compartments looks today the most problematic one. Nothing in proposed EASA CS-XX prohibits continuing use of halon for such applications. The 'cut off' date of 2018 is not established by the Agency, but by EC Regulation 744/2010.

CONCLUSION ON COMMENTS ON FIRE PROTECTION OF CARGO COMPARTMENTS:

Stakeholders expressed many doubts about the availability and maturity of solutions, alternative to halon, for fire protection of cargo compartments in the time frame established by Regulation (EC) 744/2010 (i.e. "cut-off" in 2018). Some also noted that ICAO has not established any date for application of halon in such compartments.

Agency observes that:

- the "cut-off" dates however derive not from EASA rules, but from other sources;
- in any case proposed amendments to Book 1 of CS-23, -25, -29 do not prohibit halon, nor mandate any specific alternative agent;
- the proposed text in Book 2 acknowledges the difficulties and recalls that, when necessary, Certification Review Items (CRIs) may be used, while technology evolves;
- It is EASA intention to participate to the ICAO International Halon Replacement Coordination Meetings (IHRCM) in order to pool efforts for common progress and monitoring;
- It is expected that the ICAO Contracting States (including the 27 Members of the European Union) will discuss the matter at the 38th ICAO General Assembly in 2013.

In conclusion the Agency maintains the approach proposed in NPA 2011-14 for amending the mentioned CSs. In addition the Agency intends to:

- Participate to the work of the ICAO International Halon Replacement Coordination meeting (IHRCM); and
- Inform the European Commission on the concerns raised by stakeholders in relation to the "cut-off" and "end" dates in Regulation (EC) 744/2010.

A. Explanatory Note - IV. Content of the draft Decisions – SAE Minimum Operational Performance Specifications p. 10

comment	*8* comment by: *Airbus* Page 10, paragraph 45: When the MOPS is available, it should also be referred to in the CS.
response	*Accepted* Indeed. It is the Agency's intention to refer to the Eurocae MOPS, when available, in the related and planned CS-ETSO.

CONCLUSION ON COMMENTS ON SAE MOPS FOR HAND-HELD FIRE EXSTINGUISHERS:

No stakeholder opposed in principle the idea of issuing an ETSO once the SAE MOPS will be available. This will in any case be subject to consultation, so stakeholders will have in due time the possibility of expressing their opinions on this specific topic.

A. Explanatory Note - IV. Content of the draft Decisions - The envisaged changes to Decision 2010/008/R (CS-23) p. 12

CONCLUSION ON COMMENTS ON THE ENVISAGED CHANGES TO CS-23:

No specific comments received on paragraph 46 to 51 of NPA 2011-14.

A. Explanatory Note - IV. Content of the draft Decisions - The envisaged changes to Decision 2010/013/R (CS-25 — Book 2) p. 14-15

comment	*27* comment by: *Boeing* Creating an entirely new AMC is unnecessary. The existing AMC should be revised so that it covers non-halon agents as well. **JUSTIFICATION:** The existing AMC should be modified to broaden the applicability to cover non-halon agents as well, with a tacit understanding that

	it will likely need to be updated once new agents are actually ready to certify and at which time the certification details will be defined.

response	*Not accepted*
	
	On the possible introduction of new AMC 25.851(c) EASA observes that:
	
	• existing AMC 25.851(b) mainly (but not exclusively) deals with fire extinguishers in cargo compartments. For such applications halon will continue to be used at least until 2018 (ref. Regulation (EC) 744/2010). Therefore it needs to continue to be part of CS-25 Book 2;
	• however, in the existing (very long) text, also alternatives to halon (and for different applications) are mentioned;
	• it is hence considered editorially more appropriate to:
	  ○ Limit the title and content of AMC 25.851(b) to cargo compartments; and
	  ○ introduce a separate AMC 25.851(c) in order to provide more general guidance on alternatives to halon for other applications;
	• in any case the technical content does not change in relation to the paragraph scheme.

comment	*33* comment by: *Boeing* Page 14 - Item 61. The proposed text states: *"61.These compartments are typically located below the passenger compartment, or below the main deck on freighter aircraft. …"* We recommend the following revision: *"61. These compartments are typically located below **and behind** the passenger compartment, or below the main deck on freighter aircraft. …"* **JUSTIFICATION:** The statement should be revised to recognize that many baggage compartments are also located behind the passenger cabin. This is the case for most regional jets/turboprops, as well as some business jets.
response	*Noted* Comment by Boeing technically correct. However, no paragraph in the proposed CS-XX and associated AMCs makes reference to the location of the compartments, while the Explanatory Note will neither be republished nor become regulatory material.

CONCLUSION ON COMMENTS ON THE ENVISAGED CHANGES TO CS-25:

The received comments do not justify changing the approach proposed in paragraphs 52 to 71 of NPA 2011-14.

A. Explanatory Note - IV. Content of the draft Decisions - The envisaged changes to Decision 2010/008/R (CS-29) p. 15

CONCLUSION ON COMMENTS ON THE ENVISAGED CHANGES TO CS-29:

No specific comments received on paragraph 72 to 75 of NPA 2011-14.

A. Explanatory Note - IV. Content of the draft Decisions – Consistency with OPS rules p. 16

CONCLUSION ON COMMENTS ON CONSISTENCY WITH OPS RULES:

No specific comments received on paragraph 76 to 80 of NPA 2011-14.

A. Explanatory Note - IV. Content of the draft Decisions - New ICAO Standards adopted in June 2011 – "cut-off dates" p. 17-18

comment

11 comment by: *Airbus*

Page 18, footnotes 28 and 30:
It is unclear why EU and ICAO cut-off dates are described in a different way, while they have the same meaning.

response

Noted

However, the two footnotes do not appear in the proposed regulatory material.

comment

25 comment by: *SVFB/SAMA* (Swiss Aircraft Maintenance Association, representing Swiss Maintenance and Production Organisations)

Our comments are directed to the dates from when on alternatives must be used.

- Up to now the replacement agents are with few exceptions unknown.
- They must be equal or better in their fire fighting properties.
- Equivalence must include that the alternatives will cause equal of better fuel consumption in order not to provoke other negative effects on the

environment.
- Therefore the end dates must be flexible to allow further use until such equivalent or better alternatives in regard to all aspects are available.
- With these changes to your proposal we leave it up to you and the manufacturers to choose the best options.

response

Noted

The principle that any alternative has to be at least as effective as halon, while on the other side it shall not create other adverse effects is shared. In fact no specific fire extinguishing agent is proposed by EASA in any CSs.

However, the dates for phasing out halon are not decided by the Agency, but by ICAO standards and by EU legislation.

CONCLUSION ON COMMENTS ON "CUT-OFF" DATES:

Based on the comments received, including those in previous paragraphs in this CRD, the Agency concludes that the majority of stakeholders could accept the established 'cut-off' dates for replacement of halon in hand-held fire extinguishers and in lavatories.

The conclusion for engine nacelles/APU and cargo compartments are reported in the specific paragraphs above.

A. Explanatory Note - IV. Content of the draft Decisions - New ICAO Standards adopted in June 2011 – "end dates" in Regulation (EC) 744/2010 p. 17-18

comment

1c comment by: *Gulfstream Aerospace Corporation*

Furthermore, in lieu of mandating fleet replacement of Halon and the costs/burden thereof, Gulfstream recommends Halon be replaced on an attrition basis since the incidence of in-flight fires is low, and so there are very few discharges of Halon extinguishers.

response

Partially accepted

Retrofit (i.e. end dates) is mandated not by EASA rules but by European Commission Regulation (EC) No 744/2010. So this requirement cannot be cancelled through Agency's action.

The method of phasing out halon through 'attrition' (i.e. by replacement on newly manufactured aircraft, even if based on existing Type Certificates) is mandated by ICAO in amendment 35 to Annex 6 Part I, and similar amendments 30 and 16 respectively to Part II and III of the same Annex 6. The Agency acknowledges that no rules were proposed in NPA 2011-14 in order to transpose said ICAO amendments. However, based on the results

of the consultation and on results of mentioned IHRCM/2, the Agency now proposes to align its rules to current ICAO Annex 6, but through a different Rulemaking Task, which would aim at introducing these retroactive airworthiness requirements, addressed not to aircraft operators (= no retrofit), but to aircraft manufacturers in relation to newly produced aircraft.

comment	*43a* comment by: *AEA* EASA adapted the standards to include alterations out of EC 1005/2009 what means in detail that for all types of fire extinguishers "cut-off" and "end-dates" are included in the standards now (in line with the annex of EC 1005/2009 implemented by EC 744/2010).
response	*Noted* The statement that the Agency is proposing rules to comply with the 'end dates' (i.e. retrofit) in EC Regulation 744/2010 (based on 1005/2009) is not true. The proposals are limited to CSs (i.e. 'cut off' dates affecting new applications for Type Certificates) and even for them, halon is not prohibited by the proposed CS-XX text in Book 1.
comment	*43b* comment by: *AEA* In line with EC 744/2010 two deadlines are defined for phase-out of Halon: o "cut-off-date": here all new type certificates (which have to be approved) are affected whereas these deadlines don't apply for new produced aircraft based on existing type certificates. Moreover cut-off-dates don't apply for aircraft in operation (no retrofit has to take place); o "end-dates": After the "end-date-deadline" Halon in existing aircraft or type certificates is also not allowed anymore; o in contrast deadlines established by ICAO also refer to already approved aircraft types which demand for retrofit.
response	*Noted* The statement that 744/2010 requires retrofit at the 'end dates' is true. But the statement that ICAO requires retrofit is today not true. In fact, although the related standards are published in ICA0 Annex 6, they address newly produced aircraft (based on existing TCs), and hence aircraft manufacturers (i.e. before delivery to customers) and not retrofit by aircraft operators.

comment	*44d* comment by: *ICCAIA* In particular, all manufacturers expect significant burden with regard to offering retrofit solutions for in-service aircraft. As the regulations and standards are written now, only the EU is defining retrofit requirements. ICCAIA members made significant progress in developing alternatives to the use of halon as a

	fire extinguishing agent in civil aviation. The ICAO standards were adopted after careful consideration of the progress and expectations for each halon application. We expect different standards or regulations will not benefit striving for a safe and environmentally acceptable solution.
response	*Noted* Indeed the retrofit requirement stems from Regulation (EC) 744/2010 and not from EASA rules.

CONCLUSION ON COMMENTS ON "END" DATES (I.E. RETROFIT):

All the commentators on the matter expressed opposition to the 'end dates', which imply retrofit on the fleet in service in the established year.

Some observed that:

- these dates are established by Regulation (EC) 744/2011 and not by ICAO;
- the number of halon installations in the fleet will decrease due to the "cut-off" dates and the ICAO provisions in Annex 6 for newly produced aircraft (including in ICAO Contracting States not members of the EU, like e.g. Brazil, Canada, USA, etc.);
- therefore the environmental impact of residual halon installations is negligible, compared with the cost of retrofit (for both manufacturers and operators).

The Agency observes that nothing in NPA 2011-14 mandates retrofit. AMCs only provide information on the dates established by Regulation (EC) 744/2010, which is outside the remit of the Agency, on the basis of Article 6 of Regulation 216/2008.

The Agency will however convey the concerns expressed by stakeholders to EC, recalling that the 27 EU Member States may discuss the matter at the next 38th ICAO General Assembly in 2013, based on the report from the ICAO Council requested by Resolution A37-9.

A. Explanatory Note - IV. Content of the draft Decisions – Compliance with ICAO Annex 6 (amendments adopted in June 2011) p. 19

comment	*23* comment by: *UK CAA* **Page No:** 20 - **Paragraph No:** 88 **Comment:** UK CAA supports alternative 'A'
response	*Noted*

comment	*26b* comment by: *Luftfahrt-Bundesamt* As the NPA proposals as well as the requirements in EU Regulation 744/2010 for replacing halon as an extinguishing agent in fire extinguishers on board aircraft are partly less stringent as the applicable SARPS in ICAO Annex 6, Part I, II and III, it was questioned within the NPA if States are intending to file a difference to ICAO, indicating that national operating rules will not comply with the corresponding ICAO Standards. Please note that the issue of filing differences compared to the operational Standards in ICAO Annex 6 is not covered by NPA 2011-14, dealing with the amendment of applicable certification requirements. Hence, this issue will need to be evaluated separately within the Administration, bearing in mind that the future EASA – OPS rules will have to follow ICAO constraints, as required by the basic Regulation 216/2008. Insofar, we assume that future EASA – OPS rules will mirror the applicable ICAO Standards. As a result, there may be a discrepancy between the operational rules on the use of halon replacements and the applicability rules for the use of such agents in EU Regulation 744/2010. Bearing in mind the above, we see a certain need to possibly adjust the entries for the applicability dates to the Table of EU Regulation 744/2010. Therefore, we will coordinate further steps with the German Administration.
response	*Accepted* Indeed transposition of recent amendments to ICAO Annex 6, in relation to halon replacement on newly manufactured aircraft (based on existing TCs) was not covered by NPA 2011-14 and cannot be covered by amending CSs. The Agency intends to cover the subject through a different Rulemaking Task, which will of course be subject to proper consultation. Meanwhile the preference for alternative B is noted.

comment	*41* comment by: *KLM EASA DOA 21J.012* Ref par 88 option A is preferred.
response	*Noted*

comment	*42* comment by: *Embraer - Indústria Brasileira de Aeronáutica - S.A.* Embraer appreciates the opportunity to send the following comments: Embraer believes that the harmonization between EASA and ICAO requirements should be pursued. It is important to notice that EASA's

requirements for Halon replacement will cause a global cost higher than ICAO's ones, mainly for operators, with little gain to environment protection.

Moreover, Embraer believes that any requirement for cargo compartment is impracticable for now, since there are no replacements available or even predicted for these systems.

Thus, we suggest to review the NPA and adopt the option b in item 88 (*i.e.* take action in the EU to comply with the new ICAO SARPs before 2020).

response *Noted*

1. Support for alternative B (i.e. align EASA rules, as soon as possible, not only with ICAO Annex 8, but also 6) is noted.

2. The 'cut off' date for cargo compartments is not established by the Agency, but by Regulation (EC) 744/2010. It is however expected that the ICAO Contracting States (including the 27 Members of the EU) will discuss the matter at the 38th ICAO General Assembly in 2013.

comment *43h* comment by: *AEA*

Differences of deadlines defined by EC 1005/2009 and ICAO

- In the here discussed version EASA standards implement deadlines given by European requirements. On the contrary ICAO standards differ from European deadlines as ICAO requires the use of alternatives in "new products". In this way ICAO standards also apply for new aircraft of existing type certificates what leads to a demand for retrofit.
- In the here discussed version the EASA standards would comply with European law but would just fully comply with ICAO standards after 2020 / 2025 (due to differences in deadlines)
- Now EASA offers two possibilities: First you could accept the differences of the deadlines and the fact that compliance to European requirements **and** ICAO will just take place after 2020/2025 (called "Option A"). Secondly you could appeal to European responsible to adapt European deadlines to ICAO standards or to adapt Airworthiness Directives (ADs) of EASA accordingly (called "Option B").

Looking at the last aspect EASA asks stakeholders to report back which option is preferred.
Due to technical reasons the AEA prefers Option A. In case ICAO standards would be integrated to European law existing aircraft and whole fleets have to be adjusted accordingly. Due to differences of fire extinguisher agents (looking at volume, weight etc.) an adjustment would mean an enormous effort. Indeed - European deadlines also comprise end-dates (after which Halon is forbidden in all aircraft) but these end-dates will be relevant at a significant later date (earliest end-date is 2020 for extinguishers in lavatories). Our preference of option A is also in line with the assessment stated on page 27 of NPA No2011-14." (Final assessment and recommendation of a preferred option)

response *Noted*

AEA preference for option A is noted (i.e. delay until 2020/25 compliance with ICAO Annex 6), Although based on the wrong assumption that ICAO requires retrofit. The issue of halon (including possible retrofit) is expected to be discussed again at the 38th ICAO General Assembly in 2013.

comment

44a comment by: *ICCAIA*

Attachment #2

The ICCAIA Airworthiness Committee would like to draw your attention on international compatibility aspects linked to your NPA 2011-14. Our members are aware that this NPA is the administrative tool to introduce the European Commission decisions on Halon Replacement into the EASA Certification Specification framework. However, we are concerned about significant differences between ICAO standards in Annexes 6 and 8, and the European legislation as now transposed via this NPA.

response

Noted

comment

44b comment by: *ICCAIA*

Commercial aviation is organized globally. Over the decades, ICAO standards have been developed and demonstrated as worldwide accepted standards to ensure an adequate level of safety and environmental protection while avoiding unequal treatment and disturbances to economic competition. Manufacturing industry will experience significant economic burden to implement the Commission Regulation and to provide, as a second standard, ICAO compliant products for non-EU customers.
ICCAIA commented: Further, having in mind the importance of commercial aviation for the global economy, ICCAIA supports worldwide harmonization through implementation of ICAO standards.

response

Noted

comment

44c comment by: *ICCAIA*

The key issue is:
• The ICAO standards address new type certificates and newly produced aircraft;
• The EC Regulation addresses new type certificates after the cut-off dates, and all in-service aircraft after the end dates."

response

Noted

True.

It is agreed that for manufacturing industry a single standard applicable world-wide is the ideal situation. However, the proposed EASA rules are compliant with current version of Annex 8 (i.e. new TCs). Regulation (EC) 744/2010 in

addition contains 'end dates' (i.e. retrofit) which are not in contrast with ICAO SARPs (these dates are simply not covered by current SARPs). Finally nothing in proposed EASA CSs prevents the holder of a (S)TC to develop changes to its design in order to remove halon. This way of 'voluntary' compliance may be too weak, but it is not imposing a standard different from ICAO Annex 6 for newly produced aircraft (based on existing TCs), since the halon solution is no longer mandated.

comment

44e comment by: *ICCAIA*

In NPA 2011-14, paragraphs 81 through 88, EASA asks stakeholders to express their preference between alternative A (i.e. do not affect newly produced aircraft based on existing type certificates and notify a difference to ICAO until 2020/2025) and alternative B (i.e. take action in the EU to comply with the new ICAO SARPs before 2020).
For the reasons expressed above, ICCAIA supports alternative B, provided the end dates are withdrawn.

response

Accepted

EASA intends, through a different Rulemaking Task, to transpose the provisions in current ICAO Annex 6, addressing newly produced aircraft. However the 'end dates' in the EU legislation are not in the scope of the Agency's remit. This latter topic may be discussed, including by the 27 EU Member States, at the forthcoming 38th General Assembly of ICAO in 2013.

comment

46a comment by: *Silvano Manera* (IATA)

General – IATA Position

On-going research on new extinguishing agents indicates that valid alternatives are not identified yet. The forecasted date of 2013 for new products appears to be more an auspice than indication of certain results.
Industry needs validated products in order to make a correct risk evaluation and assessment and, consequently, modify operational processes and procedures.

Safety data on actual use of extinguishers are statistically irrelevant and do not justify the need for short term changes.

Environmental impact, although is an IATA priority, ought to be better weighted.

ICAO new SARPS will be met upon the entry into force of the R.744/2010 "end dates".

PARTA IV . CONTENT OF THE DRAFT DECISIONS Page 19 – Point 88

<IATA is in favour of "Alternative A">

response	*Noted* 1. Dates for 'new products' are contained in ICAO Annex 6 and not proposed by NPA 2011-14. In said Annex the target dates (for replacement of halon in newly produced aircraft based on existing TCs) is 2011 (for lavatories) and 2016 (for hand-held extinguishers in the cabin). The Agency believes these dates are considered feasible by manufacturers and by the halon experts around the world. 2. Replacement of halon is not required because of safety reasons, but because of environmental reasons (i.e. depletion of the ozone layer). Nevertheless EASA rules and specifications cannot contrast other pieces of EU legislation (in this case Regulation (EC) 744/2010). 3. Support for option 'A' (i.e. do not issue rules to comply with ICAO Annex 6) is noted.

CONCLUSION ON COMMENTS ON COMPLIANCE WITH ICAO ANNEX 6 (AFFECTING NEWLY PRODUCED AIRCRAFT, BASED ON EXISTING TCs):

The Agency, in NPA 2011-14 had proposed two alternatives:

A. Do not introduce additional dates in addition to the 'cut-off' and 'end' dates established by Regulation (EC) 744/2010, which implies non-compliance with the amendments to ICAO Annex 6 (Parts I, II and III) applicable on 15 December 2011 (amendments not affecting aircraft operators, but, even if published in Annex 6, addressed to manufacturers of new aircraft based on existing TCs); or
B. Align EASA rules to said ICAO amendments (which in any case do not imply retrofit).

The consultation did not show a clear majority for either of the proposed alternatives. One authority and aircraft operators (some however wrongly believing that the amendments in Annex 6 where addressed to them and requiring retrofit) preferred option A. A different authority and aircraft manufacturers preferred alternative B.

Furthermore the 2nd IHRCM already mentioned above, recommended to the Agency to take action in order to align its rules, as soon as possible, to the ICAO standards concerning newly produced aircraft (based on existing TCs) at the moment they leave the factory.

The Agency hence intends to:

- progress present RMT.0273 (former MDM.071) in order to amend CS-23, CS-25 and CS-29 which is anyway necessary;
- include compliance with Annex 6 (applicable since Dec 2011; affecting newly produced aircraft and not retrofit; extract in Appendix B) in a separate Rulemaking Task, related to production 'cut in', to be initiated as soon as possible;
- possible retrofit remains voluntary until the "end dates" fixed by Regulation (EC) 744/2010;
- inform the European Commission on the concerns expressed by stakeholders, mainly on the "end dates", in order to contribute to the planned discussion of the matter at the 38th ICAO General Assembly in 2013.

A. Explanatory Note - V. Regulatory Impact Assessment p. 21-28

comment

12 comment by: *Airbus*

Page 22, table on newly produced aircraft based on a recent type certificate:

The meaning of this table is unclear. What is a "recent" type certificate? Is it a type certificate for which application is filed after a cut-off date? In this case, which one? And, typically, first deliveries for a new type certificate are about 5 years after the application for type certificate.

response

Accepted

However the Regulatory Impact Assessment will not be republished as regulatory material.

comment

13 comment by: *Airbus*

Page 23, safety impact table:

Option 1 "Do nothing": it is unclear why it would be "slightly detrimental to safety".

Option 2 "Amend only CSs": there is no obvious safety increase, compared to safety ensured by halon systems. In addition, the possible safety risks that are mentioned for option 3 would also apply to option 2.

response

Noted

Even if option 1 were 'neutral' in terms of safety, the overall conclusion would not change.

The safety score for Options 2, 3 and 4 is indeed identical.

comment

34 comment by: *Boeing*

Page 24-28
Item 92, paragraph a.i., Table, "Do nothing" risk assessment

The risk assessment incorrectly categorizes that there is a risk if CS-25 is not changed. However, we consider that risk to safety, environment, economic, and harmonization should all be zero.

JUSTIFICATION: CS 25.851 does NOT require the use of halon for handhelds; rather, it allows an agent equivalent to halon ("halon or equivalent"). Likewise, CS-25 does not mention halon for built-in fire extinguishers.

Item 76 (see page 17) of this NPA makes that same point as above regarding the OPS. Additionally, Item 79 (page 17) concludes that, because the OPS rules state that agents "equivalent to Halon 1211" may be used, a revision to those rules is not required. The same argument can be made regarding CS 25.851: a change is not required, and there is no impact if the change is not made.

response *Partially accepted*

It is acknowledged that there are no appreciable safety differences between the listed Options.

The driving factors are economic impact (clearly much larger if retrofit were mandated) and regulatory harmonisation, which, inter alia, obliges the Agency to comply with EU legislation.

comment *46b* comment by: *Silvano Manera* (IATA)

PART V. RIA (REGULATORY IMPACT ASSESSMENT) PAG. 22- POINT 90

< IATA is in favour of "OPTION 2">

response *Noted*

Support for 'option 2', indeed the one proposed by NPA 2011-14, is noted.

CONCLUSION ON COMMENTS ON RIA:

Although some comments highlighted shortcomings in the RIA, overall the preference for "option 2" (i.e. amend CSs, but not OPS rules and do not use Airworthiness Directives), was confirmed.

B. Draft Decisions - I. Draft Decision CS-23 p. 29-31

comment *35* comment by: *Boeing*

Page: 29. Paragraph: AMC 23.851(c), *Hand fire extinguishers*

The proposed text states:

"*Halon 1211, 1301 and Halon 2402 are no longer acceptable extinguishing agents, based on EU Law, for hand fire extinguishers in newly designed aircraft*

installations, after 31 December 2014. …"

We recommend that this paragraph related to EU law be **deleted**.

JUSTIFICATION: EU law stands on its own and is the authority for environmental (and other) rules. The CS and AMC should remain focused on aviation safety, per their intended purpose. Use of halon is not unsafe for the airplane or occupants. Including dates controlled by another entity could lead to future revisions of the CS/AMC due to date changes or other unforeseen circumstances.

response

Partially accepted

Indeed the dates mandated by EU legislation are not included in Book 1 (i.e. the certification specifications), but only in Book 2, which, under the label of 'AMC', presently contains also guidance material. In the case of halon, many lines of informative material are in fact already published, e.g. in AMC 25.851(b), when it is believed that this could facilitate the readers in tracing other relevant information.
Text will however be partially amended, taking into account Airbus comment 14 on AMC 25.851(a)(2).

resulting text

The resulting text of the draft Decision to amend CS-23 is contained in Appendix C.

B. Draft Decisions - II. Draft Decision CS-25 p. 32-47

comment

36 comment by: *Boeing*

Page 32. Paragraph: CS 25.851(c)(1), *Fire extinguishing agents*

The proposed text states:

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

…

- *Class D: Fires involving combustible metals, such as magnesium, titanium, zirconium, sodium, lithium and potassium."*

However, current cargo fire protection systems are not designed to fight Class D (metal) fires, nor do the regulations require it. Listing Class D fires in the AMC may cause unnecessary confusion or concern; we suggest it be **deleted**.

JUSTIFICATION: Current regulations require built-in cargo fire extinguishing systems protect against Class A, B, and C type fires. Adding Class D fires as a

	fire fighting requirement appears to be beyond the scope of this NPA.
response	*Accepted* Class D fires deleted from proposed CS 25.851(c)(1).

comment	*9* comment by: *Airbus* Page 12, paragraph 57: reference to the new AMC 25.1197 should also be added to CS 25-1197.
response	*Accepted* Reference to AMC 25.1197 is added to CS 25.1197.

comment	*14* comment by: *Airbus* Page 33, AMC 25.851(a)(2): For clarification, the following text is suggested in the second paragraph: Halon 1211, 1301 and Halon 2402 are no longer acceptable extinguishing agents, based on EU Law, for hand fire extinguishers **to be installed** in ~~newly designed~~ aircraft ~~installations~~ **types** for which type certification is requested after 31 December 2014.
response	*Accepted* Thank you for the suggestion. Proposed text improves text of the NPA.

comment	*37* comment by: *Boeing* Page: 34. Paragraph: AMC 25.851(a)(2) The proposed text states: *"Halon 1211, 1301 and Halon 2402 are no longer acceptable extinguishing agents, based on EU Law, for hand fire extinguishers in newly designed aircraft installations for which type certification is requested after 31 December 2014."* We recommend that this paragraph be **deleted**. **JUSTIFICATION:** EU law stands on its own and is the authority for environmental (and other) rules. The CS and AMC should remain focused on aviation safety, per their intended purpose. Use of halon is not unsafe for the airplane or occupants. Including dates controlled by another entity could lead to future revisions of the CS.AMC due to date changes or other unforeseen

	circumstances.
response	*Not accepted* The fact that law is anyway applicable, whether or not recalled in EASA non-binding regulatory publications is true. However, in the current structure of EASA rules, including text on halon in amendment 11 of CS-25, AMC contain also explanatory guidance material, possibly useful to readers to recall other relevant provisions.

comment	*15* comment by: *Airbus* Page 33, AMC 25.851(b), section 3: The words 'newly designed' are redundant. The important information is the date of request for type certification. Proposed wording: Halon 1301 is no longer an acceptable extinguishing agent, based on EU Law, 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.
response	*Accepted* Text is amended.

comment	*38* comment by: *Boeing* Page: 34 Paragraph: CS 25.851(b)(3). The proposed text states: *"3. BAN ON HALON 1301:* *Halon 1301 is no longer an acceptable extinguishing agent, based on EU Law36, 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."* We recommend that this paragraph be **deleted**. **JUSTIFICATION:** If the halon ban is already required by EU law, it is not necessary to restate it in the AMC.
response	*Not accepted* The fact that legislation is anyway applicable, whether or not recalled in EASA non-binding regulatory publications is true. However, in the current structure of EASA rules, including text on halon in amendment 11 of CS-25, AMC contain also explanatory guidance material, possibly useful to readers to recall other relevant provisions.

comment	*16* comment by: *Airbus* Page 35, AMC 25.851(b), section 7, last paragraph: The exact reference of the internationally recognised MPS should be added.
response	*Accepted* Reference is added.

comment	*39* comment by: *Boeing* Page: 40. Paragraph: AMC 25.851(c) *Alternative fire extinguishing agents*, 1. *General* The discussion of the European regulation banning the use of Halon and the related chart should be **deleted**. **JUSTIFICATION:** Restating the law in the AMC is unnecessary. It is tacitly understood that applicants will need to comply with all applicable laws. Restating them in the AMC is duplicative and may drive unnecessary revisions to the AMC if the regulations change in the future. In addition, the

	data will become unnecessary after the laws take effect.
response	*Not accepted* The fact that legislation is anyway applicable, whether or not recalled in EASA non-binding regulatory publications is true. However, in the current structure of EASA rules, including text on halon in amendment 11 of CS-25, AMC contain also explanatory guidance material, possibly useful to readers to recall other relevant provisions.

comment	*40* comment by: *Boeing* Page: 41. Paragraph: AMC 25.851(c) *Alternative fire extinguishing agents*, *3. Hand fire extinguishers and agents* We suggest the proposed text be revised as follows: *"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~~.* ***Selection of fire extinguishers will be guided by AC20-42C until*** *acceptable criteria to select the fire extinguishers containing said agents are laid down in the FAA Advisory Circular AC 20-42D. …"* **JUSTIFICATION:** All of the supporting guidance material needed in order to use AC 20-42***D*** has not been completed nor released. Testing for stratification effects is scheduled for November 7-11, 2011, with a report to follow. We need to be able to continue to use AC 20-42C until the supporting guidance material has been vetted through industry and released. The FAA has approved this approach.
response	*Accepted* Text is amended.

comment	*17* comment by: *Airbus* Page 41, AMC 25.851(c), section 4: MPSe revision 4 is available on the FAA technical Center web site, but its official release is not yet planned. Beyond requiring compliance with the MPS, current certification review items or issue papers contain additional certification requirements.

response	*Accepted* Text is amended.

comment	*21d* comment by: *AIR-120* My comment on page 41 paragraph 4 is: Revision 3 of the engine nacelle/APU MPS is currently available but a revision 4 is presently being validated.
response	*Accepted* Text of par. 4 of AMC 25.851(c) revised to mention FAA MPS rev 03 and 04.

comment	*45* comment by: *James Crotty, FAA* Comments: 1. Page 10 paragraph 38: The FAA's engine nacelle/APU MPS revision 3 currently remains available although revision 4 is anticipated soon. The major difference between revision 3 & revision 4 is that the latter would accommodate a powder based extinguishing agent. 2. Page 10 paragraph 40: The cargo MPS does not specify space nor weight requirements. This is a consideration of the airframe manufacturer. 3. Page 10 paragraph 42: Testing to date, has shown that halon replacement agents that were effective in other aircraft applications have not been able to pass all four tests of the cargo MPS. Therefore, I am puzzled at why the 2018 cut-off date is feasible. What is this confidence based on, the combined system of water mist/nitrogen? 4. Page 41 paragraph 4: Revision 3 of the engine nacelle/APU MPS is currently available but a revision 4 is presently being validated.
response	*Accepted* 1. Comment on Par. 38 of the Explanatory Note EASA response: Noted 2. Comment on Par. 40 of the Explanatory Note EASA response: Noted 3. Comment on Par. 42 of the Explanatory Note EASA response: Noted The estimation of the feasibility of alternatives for fire extinguishing in cargo compartments in 2018 is based on the extrapolation of the information available today. In any case the proposed AMC 25.851(c) already envisages different alternatives (including water spray) and the use of Certification Review items (CRIs) for specific projects if necessary. 4. Comment on Par. 4 on page 41 (proposed AMC 25.851(c) EASA response: Accepted

Text of par. 4 of AMC 25.851(c) revised to mention FAA MPS rev 03 and 04.

comment

18 comment by: *Airbus*

Page 43, AMC 25.851(c), section 6:

The exact reference of the FAA Technical Centre's Technical Note should be given here. Is it reference f in section 7?.

response

Accepted

Indeed. Ref f in par. 7; added to text of par. 6.

comment

10 comment by: *Airbus*

Page 14, paragraph 71:

In addition to adding a new AMC 25.1197, AMC 25.1195(b) should be amended in order to provide clarification on the applicability of AC 20-100, which is referred to in this AMC. AC 20-100 establishes halon concentration levels to ensure the adequacy of the fire extinguishing system It does not address alternative agents.

response

Accepted

Now also amendment to AMC 25.1195(b) is proposed in present CRD.

comment

19 comment by: *Airbus*

Page 46, AMC 25.1197:

1/ The cut-off date is 31 December **2014**, instead of 2018.

2/ Consistent with our comments on AMC 25.851(a)(2) and AMC 25.851(b) section 3, we suggest removal of the words "newly designed".

Resulting text:

Halon 1301 is no longer an acceptable extinguishing agent, based on EU Law, 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~~ **2014**. See AMC 25.851(c) for more information on Halon alternatives.

response

Accepted

Proposed amendments are introduced.

resulting text	The resulting text of the draft Decision to amend CS-25 is contained in Appendix C

B. Draft Decisions - II. Draft Decision CS-29 p. 47-49

No comments were specifically received on the draft Decision amending CS-29. However, as result of some of the comments accepted in relation to CS-25, consistent amendments need also to be introduced in CS-29.

resulting text	The resulting text of the draft Decision to amend CS-29 is contained in Appendix C

Appendix A - Attachments

A&C-11-516, GAC Response to NPA 2011-14 Halon Phase Out.pdf

Attachment #1 to comment #1

ICCAIA AC Letter 057 ICCAIA Comment on EASA NPA2011-14.pdf

Attachment #2 to comment #44

Appendix B – Extract from Annex 6 to the Chicago Convention (as applicable on 15 December 2011)

A. Amendment 35 to ICAO Annex 6 Part I (Commercial Air Transport by aeroplanes), applicable 15 December 2011

6.2.2.1 Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2011 and any extinguishing agent used in a portable fire extinguisher in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2016 shall:

a) meet the applicable minimum performance requirements of the State of Registry; and
b) not be of a type listed in the 1987 *Montreal Protocol on Substances that Deplete the Ozone Layer* as it appears in the Eighth Edition of the *Handbook for the Montreal Protocol on Substances that Deplete the Ozone La*yer, Annex A, Group II.

Note.— Information concerning extinguishing agents is contained in the UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives *and* FAA Report No. DOT/FAA/AR-99-63, Options to the Use of Halons for Aircraft Fire Suppression Systems.

B. Amendment 30 to ICAO Annex 6 Part II (International General Aviation), applicable 15 December 2011

2.4.2.3 Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2011 and any extinguishing agent used in a portable fire extinguisher in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2016 shall:

a) meet the applicable minimum performance requirements of the State of Registry; and
b) not be of a type listed in the 1987 *Montreal Protocol on Substances that Deplete the Ozone Layer* as it appears in the Eighth Edition of the *Handbook for the Montreal Protocol on Substances that Deplete the Ozone La*yer, Annex A, Group II.

Note.— Information concerning extinguishing agents is contained in the UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives *and* FAA Report No. DOT/FAA/AR-99-63, Options to the Use of Halons for Aircraft Fire Suppression Systems.

C. Amendment 16 to ICAO Annex 6 Part III (International Helicopter Operations), applicable 15 December 2011

4.2.2.1 Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in a helicopter for which the individual certificate of airworthiness is first issued on or after 31 December 2011 and any extinguishing agent used in a portable fire extinguisher in a helicopter for which the individual certificate of airworthiness is first issued on or after 31 December 2016 shall:

a) meet the applicable minimum performance requirements of the State of Registry; and
b) not be of a type listed in the 1987 *Montreal Protocol on Substances that Deplete the Ozone Layer* as it appears in the Eighth Edition of the *Handbook for the Montreal Protocol on Substances that Deplete the Ozone La*yer, Annex A, Group II.

Note.— Information concerning extinguishing agents is contained in the UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives *and* FAA Report No. DOT/FAA/AR-99-63, Options to the Use of Halons for Aircraft Fire Suppression Systems.

Appendix C – Resulting text of draft Decisions

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 Legislation[1], for hand fire extinguishers to be installed in aircraft types for which the type certification is requested after 31 December 2014.

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

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1 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).

AMC SUBPART E

AMC 23.1197 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[2] 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' (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[3], 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

3. Lavatory extinguishing systems and agents

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

3 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).

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 the Agency.

4. 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 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 Agency will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

5. 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 Agency will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

6. 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;

`

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 Legislation[4], for hand fire extinguishers to be installed in aircraft types i 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 the Agency. 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 Legislation[5], for cargo compartment fire extinction systems to be installed on aircraft types, for which type

4 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).

5 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).

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 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), like e.g. Report No. DOT/FAA/AR-00-28, Development of a Minimum Performance Standard for Aircraft Cargo Compartment Gaseous Fire Suppression Systems, dated September 2000, may be accepted by the Agency. In the absence of internationally accepted concentration levels, the Agency 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[6] 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.~~

~~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~~

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

~~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[7] 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.

[7] 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' 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[8], 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
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

[8] 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).

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 20-42C. Version D of same AC (published in 2011) would be preferred when the needed supporting guidance material will have been released. 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). The FAA has issued Various alternatives are being developed (e.g. FK-5-1-12). ~~while~~ The FAA has issued Minimum Performance Standards (MPS) for halon replacement in fire extinguishing agents/systems of civil aircraft engine and APU compartments (MPSHRe rev03) and intends to issue rev04.

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 (ref. f in paragraph 7 below) 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 20-42C, Hand Fire Extinguishers for use in Aircraft, dated 07 March 1984.

j. 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 25.1195(b) Fire Extinguisher Systems

Acceptable methods to establish the adequacy of the fire extinguisher system are laid down in Advisory Circular 20-100, with reference to halon concentration levels. This AC is not applicable to extinguishing agents alternative to halon.

AMC 25.1197 Fire extinguishing agents

Halon 1301 is no longer an acceptable extinguishing agent, based on EU Law[9], for engine nacelle and APU fire extinction systems to be installed in aircraft types, for which type certification is requested after 31 December 2014. See AMC 25.851(c) for more information on Halon alternatives.

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[9] 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[10], for hand fire extinguishers installed in aircraft types 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 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[11] 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[12], as presented in Table 4.1 below:

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10 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).

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.

12 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).

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

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. 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 Agency will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

7. 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 Agency will initiate a Certification Review Item addressing the use of such an alternate fire extinguishing agent.

[Amdt No: 29/XX]